WMHP

WORLD MEDICAL & HEALTH POLICY

VOL. 13 NO. 2 JUNE 2021

CONTRIBUTIONS

(Contents continued on page 408)

PSO

World Medical & Health Policy

Aims and Scope

World Medical & Health Policy is a quarterly, peer-reviewed journal that considers the many factors shaping global health. We publish articles employing overlapping disciplines that include health policy and politics, political science, health economics, medical ethics, and public health. The journal's approach is unified by a thoroughgoing concern with critically examining the contexts within which policy is made, as well as more traditional considerations of processes, outcomes, and influences.

In converting empirical evidence into policy, ***World Medical & Health Policy*** helps policymakers design and promote programs that improve health outcomes, particularly for vulnerable populations. By bringing a global policy perspective to medical practice, the journal navigates the often-tangled world of global economic imperatives, international diplomacy, international agreements, the law, natural and humanmade disasters, humanitarian interventions, the social determinants of health, and local and international standards of care. The journal is committed to publishing practitioners' opinions and case studies alongside academic research articles.

Disclaimer

The Publisher, Policy Studies Organization, and Editors cannot be held responsible for errors or any consequences arising from the use of information contained in this journal; the views and opinions expressed do not necessarily reflect those of the Publisher, Policy Studies Organization, and Editors, neither does the publication of advertisements constitute any endorsement by the Publisher, Policy Studies Organization, and Editors of the products advertised.

Proceedings of the Policy Studies Organization are available online at http://www.psocommons.org/proceedings.

About the Policy Studies Organization

The Policy Studies Organization (PSO) is a publisher of academic journals and books, sponsor of conferences, and producer of programs. It seeks to disseminate scholarship and information to serve those making and evaluating policy. It was founded to serve those in a variety of fields who were interested in how public policy and organizational policy were being studied and discussed.

The PSO includes senior executives, undergraduate and graduate students, state legislators, architects, judges, military officers, environmentalists who want to "green" decision making, NGO executives who worry about the future of volunteerism, professors who are working on curriculum revision, government officials in numerous agencies — in short, PSO is for intellectually active people of all persuasions.

For more information: ipsonet.org

1527 New Hampshire Ave NW
Washington, DC 20036

About Westphalia Press

Westphalia Press is part of the Policy Studies Organization longtime mission to disseminate scholarship. Westphalia Press is multidisciplinary in scope and publishes titles on a wide range of topics including history, art, and literature, as well as politics and government.

Westphalia Press offers original and reprinted works for low prices to large audiences. Additionally, Westphalia offers attractive terms to authors and an ingenious marketing and distribution approach. We very much welcome opportunities for collaboration with other organizations in assisting with their publishing goals.

Please send any inquiries to Daniel Gutierrez, PSO Executive Director, at dgutierrezs@ipsonet.org.

westphaliapress.org

World Medical and Health Policy

Elevated Rates of Violence Victimization and Suicide Attempt Among Transgender and Gender Diverse Patients in an Urban, Safety Net Health System

Ana M. Progovac, Nathaniel M. Tran, Brian O. Mullin, Juliana De Mello Libardi Maia, Timothy B. Creedon, Emilia Dunham, Sari L. Reisner, Alex McDowell, Natalie Bird, María José Sánchez Román, Mason Dunn, Cynthia Telingator, Frederick Lu, Aaron Samuel Breslow, Marshall Forstein, and Benjamin Lê Cook

The extent to which violent victimization may explain higher rates of suicidality for transgender and gender diverse (TGD) populations is not well-understood. We identified likely-TGD patients using 2008–2019 electronic health record data and compared them with non-TGD patients to characterize differences in suicide attempt, ideation, and violent victimization. TGD patients ($n = 916$) had more suicide attempts (5.2 vs. 0.4 percent), ideation (20.5 vs. 1.8 percent), and violent victimization (5.4 vs. 1.7 percent, all $p < .001$) than non-TGDs ($n = 511{,}026$). Violent victimization and TGD cohort were independent predictors of suicide attempt (odds ratios [ORs], 7.23 and 10.84) and ideation (ORs, 6.83 and 11.03, all $p < .001$). We did not observe a differential impact of violent victimization for gender minorities. TGD patients are at higher baseline risk for suicidality, which is higher still for those experiencing violent victimization. Routine screening for both outcomes, including in primary care settings, may improve treatment.

KEY WORDS: transgender and gender diverse, LGBTQ, suicide attempt, victimization, electronic health record

Introduction

Transgender and gender diverse (TGD, i.e., transgender, gender non-binary, or gender non-conforming, also sometimes referred to as "gender minority") persons face elevated rates of many risk factors for poor mental health such as marginalization (James et al., 2016), financial strain (Blosnich et al., 2017a; Lehavot, Simpson, & Shipherd, 2016), housing instability (Blosnich et al., 2017a; Marshall et al., 2016), substance abuse (Clements-Nolle, Marx, & Katz, 2006), transphobia (McDermott, Hughes, & Rawlings, 2018), and healthcare discrimination based on gender identity (Seelman, Colon-Diaz, LeCroix, Xavier-Brier, & Kattari, 2017). As a result, many TGD individuals report high levels of internalized stigma (Marshall et al., 2016) more days with poor mental health than non-TGD populations (Meyer, Brown, Herman, Reisner, & Bockting, 2017), as well as higher rates of mental health conditions such as depression and anxiety (Clements-Nolle et al., 2006; Proctor,

doi: 10.1002/wmh3.403

Haffer, Ewald, Hodge, & James., 2016; Reisner et al., 2015). These and other factors likely contribute to high rates of suicide attempt and ideation among TGD youth and adults (Blosnich et al., 2016; Clements-Nolle et al., 2006; Connolly, Zervos, Barone, Johnson, & Joseph., 2016; Daniolos, Boyum, & Telingator, 2018; Kuper, Adams, & Mustanski, 2018; Lehavot et al., 2016; McDermott et al., 2018; Moody & Smith, 2013; Progovac et al., 2020; Suen, Chan, & Wong, 2017). Yet little is known about the degree to which violent victimization may contribute to higher suicidality rates among TGD people.

Estimates suggest that over their lifetimes, 55 percent of TGD people have suicidal ideation, and 29 percent attempt suicide (Adams, Hitomi, & Moody, 2017). These rates are much higher than the estimated 9.2 percent lifetime suicide ideation and 2.7 percent suicide attempt rates seen in the general population (Nock et al., 2018). Results from the National Transgender Discrimination Survey found that 41 percent of respondents had reported ever attempting suicide, with higher rates among those who had lost a job (55 percent) or were harassed or bullied in school due to their transgender identity (51 percent) (Grant et al., 2011). However, many existing studies have focused on mental health and suicide risks among TGD youth (Clements-Nolle et al., 2006; Connolly et al., 2016; Daniolos et al., 2018; McDermott et al., 2018) or Veterans (Blosnich, Brown, Wojcio, Jones, & Bossarte, 2014; Blosnich et al., 2016, 2017a; Lehavot et al., 2016; Tucker et al., 2018), and constraints on available data led to fewer research opportunities to address suicidality in typical community samples across age groups.

TGD populations are also at risk for higher levels of minority stress and economic precarity (Frost, Fine, Torre, & Cabana, 2019), which puts them at higher risk of forced sex (Clements-Nolle et al., 2006; James & Herman, 2017), and targeted discrimination, including violent victimization, than the general population. (Blosnich et al., 2017a; Clements-Nolle et al., 2006; Kuper et al., 2018; Langenderfer-Magruder, Whitfield, Walls, Kattari, & Ramos, 2016; Lehavot et al., 2016; Testa et al., 2017). TGD individuals face higher levels of housing- and employment-based discrimination than cisgender lesbian, gay, bisexual, or queer peers (Kattari, Whitfield, Eugene Walls, Langenderfer-Magruder, & Ramos, 2016). A Colorado community study found that 31.1 percent of transgender respondents reported lifetime interpersonal violence, compared with 20.4 percent of cisgender lesbian, gay, or bisexual respondents (Langenderfer-Magruder et al., 2016). In the U.S. Transgender survey, 15 percent of respondents reported being verbally harassed, physically attacked, or sexually assaulted because of their gender identity or gender expression in professional settings, 9 percent reported being physically assaulted in the past year due to being transgender, 10 percent reported past-year sexual assault, and 47 percent reported ever being sexually assaulted (James et al., 2016). Higher rates of homelessness also contribute to some TGD individuals pursuing sex work which raises the risk of violence exposure: 48.1 percent of U.S. Transgender Survey respondents who engaged in sex work reported being homeless, 37.3 percent reported being assaulted by shelter staff, and 35.4 percent report being *sexually* assaulted by the shelter staff (vs. 14.2, 13.0, and 8.8 percent of those who did not engage in sex work, respectively).

It is also worth noting that, although TGD persons are often considered under the broad umbrella of lesbian, gay, bisexual, transgender, or queer (LGBTQ+) populations, in fact, much of the LGBTQ+ research has focused on sexual orientation, with little attention on TGD populations (Collins, McFadden, Rocco, & Mathis, 2015). TGD identities have also been historically excluded from the psychology curriculum (Case, Stewart, & Tittsworth, 2009), and TGD students are often similarly overlooked in efforts to support LGBTQ+ students on college campuses (Newhouse, 2013). Historically, American gay and lesbian activists' views toward TGD persons and their inclusion in the broader LGBTQ+ movement have varied (Stone, 2009). TGD persons, therefore, have faced stigma and exclusion both from outside the LGBTQ+ community and from within it.

Childhood sexual abuse as well as intimate partner violence are associated with a higher risk for suicide attempts among cisgender women, and the relationship is likely causal (Devries & Seguin). Similarly, data from the National Longitudinal Study of Adolescent Health suggests that experiences of violence are a risk factor for future suicide, especially during the transition from adolescence into young adulthood (Van Dulmen et al., 2013). Among TGD populations, the Virginia Transgender Health Initiative Survey showed that a history of physical or sexual violence among transgender respondents was associated with higher rates of suicide attempt and multiple suicide attempts (Testa et al., 2012) and that when physical victimization was due to gender identity or expression, the relative impact on suicidal behavior was higher (Barboza, Dominguez, & Chance, 2016). Similarly, in a subset of 10 states and 9 large urban school districts responding to the Youth Risk Behavior Survey (YRBS) in 2017, transgender youth respondents were more likely to have reported a suicide attempt (adjusted prevalence ratio of 6.30 for transgender and 1.7 for female cisgender compared to male cisgender respondents) (Johns et al., 2019). However, less is known about these overlaps in community-based samples of TGD people, particularly using pragmatic data that may assist health systems in improving services for their TGD patient populations.

Health systems have typically not been able to study these outcomes among their patient populations due to lack of data on gender identity in surveys and administrative databases around gender identity (MacCarthy, Reisner, Nun, Perez-Brumer, & Operario, 2015). However, novel methods to identify TGD populations in claims (Dragon, Guerino, Ewald, & Laffan, 2017; Ewald et al., 2019; McDowell, Progovac, Cook, & Rose, 2019; Proctor et al., 2016; Progovac et al., 2018) and electronic health record (EHR) data (Ehrenfeld, Gottlieb, Beach, Monahan, & Fabbri, 2019; Roblin et al., 2016) have recently enabled the ability to study the overlap of these two important outcomes in health systems. Building upon these methods, we use EHR data and combine two methods of identifying potential TGD patients (diagnosis codes plus keyword search and rapid adaptive chart review) to compare the risk of suicide attempt and ideation as well as the degree to which documented violent victimization is associated with this risk for identified TGD patients compared to other health system patients. These data may help providers, health administrators, and public health officials in planning for needs assessments,

risk screenings, and intervention, and program development for under-studied TGD populations at high risk of suicide attempts and violent victimization.

Methods

Identifying Populations of Study

We used EHR data for patients in an urban, safety net health system between 2008 and 2019 to conduct this secondary data analysis of suicide attempts and ideation risk. This hospital system sees approximately 150,000 patients annually (including via over 90,000 emergency department and over 600,000 ambulatory visits) and has many lower-income patients with Medicaid insurance, as well as patients from diverse racial/ethnic and linguistic backgrounds.

We identified two cohorts for this study: (i) a population of patients who were likely to be TGD patients, and (ii) a general comparison group of other patients in the health system with at least one health system contact for each year of data used. The Institutional Review Board of Cambridge Health Alliance approved all aspects of this research.

We used two different methods to identify from the EHR data a likely-TGD patient cohort (which we will refer to as "*identified* TGD patients," "*likely*-TGD patients," or simply "TGD patients" throughout the paper). It is important to note that neither of these methods incorporates direct self-report of gender identity by patients, which we discuss in more detail below in the limitations section of the discussion.

The first method used an ICD-9/10 diagnosis code-based algorithm developed by the Centers for Medicare and Medicaid Services and described in prior studies (Dragon et al., 2017; Ewald et al., 2019; Proctor et al., 2016; Progovac et al., 2018). These diagnoses are often used for insurance billing when people receive medical care (e.g., hormone therapy) related to gender identity and include in ICD-9: "gender identity disorder" (302.6 and 302.85) and "transsexualism" (302.50–302.53); and the equivalent codes in ICD-10: F64.0, F64.1, F64.2, F64.8, F64.9, as well as Z87.890 (personal history of sex reassignment; see Supporting Information Appendix 1 for a full list of codes). Restricting to the population aged 12–80 years old in their last observed year of EHR data, this method yielded a total of 278 identified gender minorities in the observation years (see Figure 1 for Flow Diagram).

In the second identification method, we used Structured Query Language (SQL) to identify patient notes in the EHR containing keywords in clinical notes that were known to be potentially useful in identifying TGD patients in secondary administrative health system data sets, either as (i) shown in previous research (Roblin et al., 2016); (ii) recommended as part of a multi-stakeholder advisory board including both TGD researchers, advocates, and/or patients as well as clinicians within the health system familiar with the EHR database and treatment of TGD patients within this health system; and (iii) keywords identified during the initial qualitative review of the clinical notes (see Supporting Information Appendix 2 for a full list of keywords). A total of 4,338 patients were first identified

using this method. A senior researcher (the first author) then trained two research assistants to conduct a rapid adaptive chart review to confirm that keyword terms referred to the gender identity of the patient of record (rather than, for example, the gender identity of a parent or family member, or to another concept entirely). To capture the most diverse cohort of people with minority gender experiences, we included individuals with clear evidence of self-identifying as transgender, non-binary, or gender-fluid in the health records, but we also include cases where clinicians had noted people were questioning their gender identity or starting to experience distress related to questioning gender identity.

The chart review was conducted in Microsoft Access 2016, where we constructed a database that consisted of (i) the sentence preceding the search term, (ii) the sentence including the search term, and (iii) the sentence following the search terms. In the database, each of the three sets of sentences was also accompanied by the entire clinical note containing the relevant keyword, which could be further reviewed when the three sentences did not provide adequate context. The identified keywords and notes were also mapped onto an individual person, such that when a single person had multiple occurrences of search terms or multiple occurrences of the same term associated with them, the database listed all of the individual terms for possible review. To facilitate efficiency of chart review, the adaptive database (i) would automatically "flag" the individual and all related notes with the chart review decision once enough notes were reviewed for that person to make a definitive call (see categories below and in Figure 1), and (ii) the Access database also included a number of adaptive features to "hide" cases or "show" certain cases that were identified as being helpful to facilitate chart review. For example, we identified many instances of the term "transgender" were included in clinical notes referring to an LGBTQ hotline and/or a standard structured EHR notes feature copied over into many notes ("[] male, [] female, [] transgender"), but that notes with that reference (without other keywords elsewhere) were almost never sufficient to conduct meaningful chart review. Those exact phrases were able to be "hidden" to reduce reviewer burden for cases where keywords or specific instances of keywords were deemed to be low-yield after starting the review.

Using the Access database, a trained research assistant would use these sentences to flag a given note as "yes" (indicating the person was almost certainly likely to be a likely-TGD patient; $n = 669$ patients were flagged this way), "no" (indicating that this note had no evidence the person was a TGD patient; $n = 2{,}621$ patients were ultimately flagged this way), "maybe" (iteratively discussed with second trained research assistant and/or senior researcher—later excluded if a definitive yes/no decision could not be made; final "maybe" count $n = 7$;), or were simply not reviewed based on the database's adaptive features to exclude non-relevant instances of otherwise relevant search terms ($n = 1{,}041$ patients were ultimately not reviewed). The first author conducted a quality check of the chart review on a keyword-by-keyword basis to ensure at least 95 percent accuracy of classifications performed by the research assistants: a minimum of 2.5 percent of cases were randomly reviewed, resulting in 251 cases quality-checked with an

overall accuracy of 98.0 percent on reviewed notes. Those $n = 5$ cases were also corrected at this stage.

We also identified someone as a likely-TGD patient across the entire study period, regardless of when their diagnosis code or keyword occurred in the study period. A comparison group of patients from the health system EHR was identified, including individuals in each year who have at least one engagement with the health system (which could include a visit but could also include a phone call, setting an appointment, etc.) and who were *not* part of the identified likely-TGD patient cohort. Finally, we restricted all analyses to individuals whose last year of record indicated an age between 12 and 80. The final cohorts included 916 identified likely-TGD patients and 511,026 non-TGD patients.

Identification of Outcome Variables and Covariates

Instances of suicide attempts, suicidal ideation, violence victimization, demographic variables, service utilization, and behavioral health comorbidities were identified using ICD-9 and ICD-10 codes extracted from the health system's EHR.

Measuring Suicidality. We capture suicide attempt using ICD-9 codes as described in prior studies: E95* (injuries of intentional intent; this is code that explicitly measures suicide), and V62.84 (suicidal ideation) (Barak-Corren et al., 2017; Ting, Sullivan, Boudreaux, Miller, & Camargo, 2012). In ICD-10, we capture suicidal ideation using code R45.851, and suicide attempt using the code T14.91 as well as the sub-codes of the T36–T71 series that indicate self-harm: this series of codes represents poisoning by drugs and biological substances, toxic effects of substances chiefly nonmedicinal as to source, and other and unspecified effects of external causes. We also include codes X60–X84 all of which represent intentional self-harm (Barak-Corren et al., 2017; Hedegaard et al., 2018; Simon et al., 2018) (see Supporting Information Appendix Table 3 for a full map of ICD-10 codes series, which are too complex to describe in full here).

Measuring Victimization From Violence and Assault. Violent victimization is often underreported and is difficult to measure in medical claims or EHR data. To increase our ability to capture violent victimization in claims data, we used a broad case definition including ICD-9 codes for abuse, assault, rape, emotional abuse/neglect, and intentional injury for example due to fighting, assault, poisoning, or criminal neglect (Reis, Kohane, & Mandl, 2009) and identified comparable codes in ICD-10 (see Supporting Information Appendix Table 4 for full list of codes).

Service Utilization. We examined primary care, other outpatient, physical health inpatient, emergency department, outpatient behavioral health, and inpatient behavioral health usage for both populations using department and place-of-service information available in the EHR. For each person, we report any use of the above services across their observation period.

Other Covariates or Descriptive Variables. We captured the following additional demographic covariates from the EHR for each patient: the number of years of data observed, age at last observation, sex of record (included in the description but not used in analyses because it is unclear how likely this is accurate for identified TGD patients), race/ethnicity of record (Asian, Black, Hispanic, Native American, other, Portuguese, White, or unknown/missing), last observed health insurance (Medicaid, Medicare, private, self-pay/uninsured, or unknown/missing), the language in which patients received medical care (English, a language other than English, or unknown/missing), and marital status (divorced/widowed/separated, married, single, or unknown/missing).

We also capture behavioral health diagnosis, based on *any* occurrence in observed years of data for the person meeting the Medicare Chronic Conditions Warehouse criteria (Centers for Medicaid and Medicare Services, 2019) for the following conditions: depressive disorder, anxiety disorder, schizophrenia or psychosis, bipolar disorder, tobacco use disorder, alcohol use disorder, or opioid use disorder (the "OUDNumber3" case definition available from medicare).

Statistical Analysis

Analyses were conducted at the person-level. Demographic descriptive comparisons between TGD and non-TGD patients were made using χ^2 (for distributions of categorical variables) or *t-tests* (to compare means of continuous outcomes) as appropriate (Table 1).

We analyzed the association between violence victimization and suicide attempt and ideation in a series of 4 logistic regression models using StataMP 15.1 software (StataCorp. 2017). In Model 1, we modeled the probability of any observed suicide attempt, adjusting for age (continuous), population (likely-TGD vs. non-TGD), violent victimization (yes/no), and the interaction between being identified as likely-TGD and having violent victimization. In other words, we test for whether the association between violent victimization and suicide attempt is the same (or stronger, weaker, or in a different direction) depending on whether someone is in the identified TGD group versus the comparison group of non-TGD patients.

Model 2 also modeled suicide attempt, but included two additional covariates: Medicaid insurance (yes/no, a proxy for the person being lower-income), and White race/ethnicity (yes/no; used as a binary due to small sample sizes limiting power to explore race/ethnicity with more granularity). Models 3 and 4 follow the same pattern as Models 1 and 2, but with the outcome variable of suicidal ideation. After each model, we produce a predicted probability for each outcome based on the model. These predicted probabilities produce population margin average treatment effects for the specified parameters, allowing the covariates to vary as observed (i.e., "marginal standardization") (Muller & MacLehose, 2014; Williams, 2012).

Table 1. Demographic Characteristics of *Identified* Transgender and Gender Diverse (TGD) Versus Other Health System Patients Identified Between 2008 and 2019

	Non-TGD Minority Patients ($n = 511,026$), n (%)	*Identified* TGD Patients ($n = 916$), n (%)	Between-Group Difference
Years observed, mean (SE)	3.4 (0.01)	4.9 (0.13)	***
Age, mean (SD)	38.7 (0.023)	30.3 (0.495)	***
Sex of record (Female)	260,392 (51.0)	511 (55.8)	***
Race/ethnicity (group-level comparison)			***
Asian	17,414 (3.4)	14 (1.5)	
Black	42,263 (8.3)	56 (6.1)	
Hispanic	50,144 (9.8)	70 (7.6)	
Native American	133 (0.03)	0 (0.0)	
Other	18,117 (3.5)	16 (1.7)	
Portuguese	47,511 (9.3)	45 (4.9)	
White	193,467 (37.9)	654 (71.4)	
Unknown/missing	141, 977 (27.8)	62 (6.7)	
Health insurance (group level comparison)			***
Medicaid	182,198 (35.7)	328 (35.8)	
Medicare	31,017 (6.1)	73 (8.0)	
Private	136,294 (26.7)	222 (24.2)	
Self-pay or uninsured	101,076 (19.8)	263 (28.7)	
Uknown/missing	60,437 (11.8)	30 (3.3)	
Language of care (group level comparison)			***
English	371,153 (72.6)	869 (94.9)	
Non-English	96,909 (19.0)	43 (4.7)	
Unknown/missing	42,964 (8.4)	4 (0.4)	
Marital status (group level comparison)			***
Divorced, widowed, or separated	32,451 (6.4)	37 (4.0)	
Married	142,556 (27.9)	69 (7.5)	
Single	279,985 (54.8)	792 (86.5)	
Unknown/Missing	51,131 (10.0)	18 (1.9)	

*$p < .05$.
***$p < .001$.

Results

Identified TGD patients differed significantly on observed demographic characteristics compared to the non-TGD patient comparison group (Table 1, all $p < .001$). They were on average younger (mean age 30.3 vs. 38.7), more likely to be White vs. to be from other racial/ethnic backgrounds (71.4 percent White vs. 37.9 percent White), and also less likely to have missing/unreported race/ethnicity in the EHR, had similar prevalence of Medicaid and Medicare insurance but were more likely to be in the self-pay/uninsured category, were more likely to receive health care in English (94.9 vs. 72.6 percent), and more likely to be single (86.5 vs.

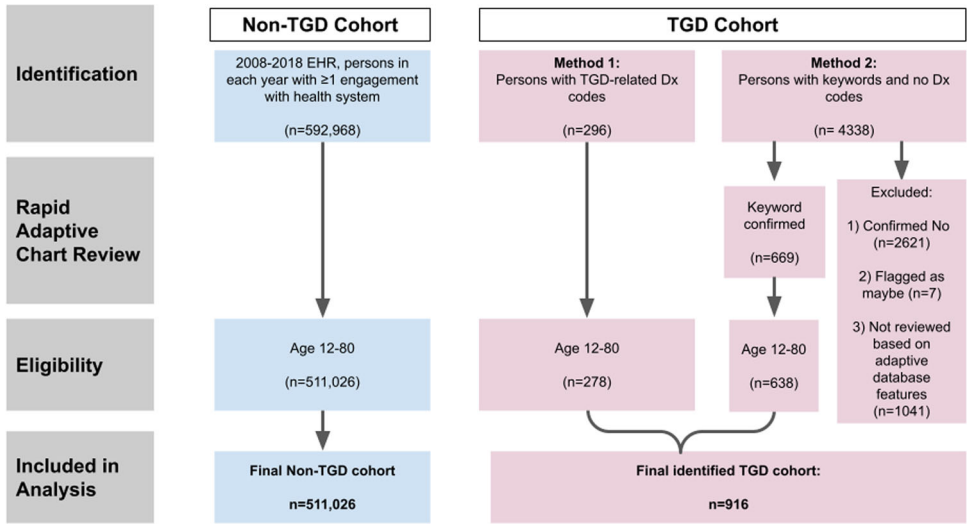


Figure 1 Analytic Cohort Selection Flow Diagram. Dx, diagnosis; TGD, transgender and gender diverse.

54.8 percent). Identified TGD patients also tended to have more years of observable data: 4.9 vs. 3.4 years for the non-TGD comparison group.

Identified TGD patients were more likely to have any documented suicide attempt (5.2 vs. 0.4 percent), suicidal ideation (20.5 vs. 1.8 percent), and violent victimization (5.4 vs. 1.7 percent) than the non-TGD patient comparison group (Table 2), all $p < .001$. TGD patients were statistically more likely ($p < .001$) to have all of the studied behavioral health diagnoses, with the exception of opioid use disorder (not significant). Depression and anxiety disorders were especially prevalent for identified TGD patients (43.7 and 43.2 percent, respectively). Not surprisingly given the relative distribution of indicated diagnoses, healthcare utilization patterns also differed substantially between identified TGD and comparison non-TGD patients, with TGD patients much more likely to have had an outpatient behavioral visit (55.3 vs. 12.6 percent) and a behavioral health inpatient hospitalization (29.9 percent vs. 3.1 percent), both $p < .001$. They were also significantly more likely to use primary care, physical health outpatient services (e.g., other non-mental health specialties), and to have a physical health hospitalization, although the magnitude of difference in utilization for these outcomes was not as large.

In *Model 1* (Table 3), age-adjusted logistic regression odds of suicide attempt was much higher for TGD patients compared to non-TGD patients (odds ratio [OR, 14.63; $p < .001$), and odds of suicide were also much higher for individuals with violent victimization (OR, 7.87; $p < .001$). Although we report interaction terms of logistic models in Table 3, we do not discuss them here due to the problems with interpretation of interaction terms in logistic models (Ai & Norton, 2003) (these results will be discussed via predicted probabilities). When adding Medicaid status and White vs. non-white race/ethnicity as covariates in *Model 2*, the odds of suicide

Table 2. Health and Service Use for *Identified* Transgender and Gender Diverse (TGD) Versus Other Health System Patients Identified Between 2008 and 2019

	Non-TGD Patients ($n = 511,026$), *n* (%)	*Identified* TGD Patients ($n = 916$), *n* (%)	Between-Group Difference
Primary variables of interest			
Any suicide attempt	1,873 (0.4)	48 (5.2)	***
Any suicide ideation	9,114 (1.8)	188 (20.5)	***
Any violence victimization	8,772 (1.7)	50 (5.4)	***
Behavioral health diagnoses			
Any mental health condition (depression, anxiety, schizophrenia/psychosis, or bipolar)	80,312 (15.7)	619 (67.6)	***
Depressive disorder	41,229 (8.1)	400 (43.7)	***
Anxiety disorder	40,570 (7.9)	396 (43.2)	***
Schizophrenia or psychosis	6,166 (1.2)	82 (9.0)	***
Bipolar disorder	10,420 (2.0)	171 (18.7)	***
Tobacco use disorder	21,011 (4.1)	91 (9.9)	***
Alcohol use disorder	11,319 (2.2)	61 (6.7)	***
Opioid use disorder	9,771 (1.9)	24 (2.6)	n.s.
Health-care utilization			
Any primary care visits	218,852 (42.8)	509 (55.6)	***
Any physical health outpatient visits (other than primary care)	173,268 (33.9)	372 (40.6)	***
Any behavioral health outpatient visits	64,178 (12.6)	507 (55.3)	***
Any behavioral health inpatient hospitalizations	15,879 (3.1)	274 (29.9)	***
Any physical health inpatient hospitalizations	88,881 (17.4)	191 (20.9)	**

Note: n.s., not significant.
**$p < .01$.
***$p < .001$.

attempt for TGD patients was still very elevated although somewhat attenuated (OR. 10.84; $p < .001$), and the odds for those patients who had experienced violentvictimization were similar (OR, 7.23; $p < .001$), while Medicaid insurance increased the risk of suicide attempt (OR, 1.16; $p < .01$), as did White race/ethnicity (OR, 2.76; $p < .001$). Given the different distribution of race/ethnicity between TGD and non-TGD patients, this result should be interpreted with caution.

For suicidal ideation in *Model 3* (age-adjusted), the risk of ideation was much higher for TGD compared with non-TGD patients (OR, 14.89; $p < .001$), and odds of ideation were much higher for individuals with violent victimization (OR, 7.48; $p < .001$). Adding Medicaid and White vs. non-White race/ethnicity as covariates in *Model 4*, similarly slightly attenuated the very elevated risk of suicidal ideation for gender minorities (OR, 11.03; $p < .001$) and by a history of violence victimization (OR, 6.83; $p < .001$). Medicaid (OR, 1.41; $p < .001$) and White race/ethnicity (OR, 3.16; $p < .001$) also predicted higher suicidal ideation.

Table 3. Modeling Results

	Outcome = Suicide Attempt				Outcome = Suicidal Ideation			
	Model 1: Adjusted for Age, Violence, TGD, Violence × TGD		Model 2: Adjusted for Age, Violence, TGD, Violence × TGD, Medicaid, Race/Ethnicity		Model 3: Adjusted for Age, Violence, TGD, Violence × TGD		Model 4: Adjusted for Age, Violence, TGD, Violence × TGD, Medicaid Status, Race/Ethnicity	
	Odds Ratios (OR) (95% CI)	*p* Value	Odds Ratios (OR) (95% CI)	*p* Value	Odds Ratios (OR) (95% CI)	*p* Value	Odds Ratios (OR) (95% CI)	*p* Value
Identified TGD (vs. non-GM)	14.63 (10.71, 19.97)	***	10.84 (7.93, 14.83)	***	14.89 (12.59, 17.61)	***	11.03 (9.30, 13.08)	***
Violence victimization ever (vs. never)	7.87 (6.84, 9.06)	***	7.23 (6.28, 8.33)	***	7.48 (6.97, 8.02)	***	6.83 (6.36, 7.34)	***
TGD × Violence victimization	0.28 (0.11, 0.75)	*	0.36 (0.13, 0.98)	*	0.19 (0.10, 0.36)	***	0.26 (0.13, 0.51)	***
Age (years)	0.99 (0.99, 0.99)	***	0.991 (0.988, 0.993)	***	0.996 (0.994,0.997)	***	0.997 (0.996, 0.998)	***
Medicaid (vs. other insurance; a proxy for lower income status)	n/a	n/a	1.16 (1.06, 1.27)	**	n/a	n/a	1.41 (1.36, 1.47)	***
White (vs. non-White)	n/a	n/a	2.76 (2.51, 3.03)	***	n/a	n/a	3.16 (3.02, 3.30)	***
Intercept	0.005 (0.004, 0.005)	***	0.002 (0.002, 0.002)	***	0.019 (0.018, 0.020)	***	0.008 (0.008, 0.008)	***

Note: CI, confidence interval; n/a, not applicable; TGD, (*Identified*) transgender and gender diverse patients.
*$p < .05$.
**$p < .01$.
***$p < .001$.

Table 4. Predicted Probabilities for Suicide Attempt and Suicidal Ideation

		Predicted Probabilities, mean (*SE*)					
		Non-TGD	*Identified* TGD	First Difference	First Difference, *p* Value	Difference in Difference	Diff-in-Diff, *p* Value
Model 1: Suicide attempt, adjusted for age, Violence × TGD	Prior violence	0.025 (0.002)	0.096 (0.041)	0.071 (0.041)	n.s.	0.028 (0.042)	n.s.
	No prior violence	0.003 (0.000)	0.046 (0.007)	0.043 (0.007)	***		
Model 2: Suicide attempt, adjusted for age, Violence × TGD, Medicaid, White (vs. non-White) race/ethnicity	Prior violence	0.023 (0.002)	0.084 (0.036)	0.061 (0.036)	n.s.	0.030 (0.036)	n.s.
	No prior violence	0.003 (0.000)	0.034 (0.005)	0.031 (0.005)	***		
Model 3: Suicide ideation, adjusted for age, Violence × TGD	Prior violence	0.110 (0.003)	0.257 (0.062)	0.147 (0.062)	*	−0.034 (0.063)	n.s.
	No prior violence	0.016 (0.000)	0.197 (0.013)	0.181 (0.013)	***		
Model 4: Suicide ideation, adjusted for age, Violence × TGD, Medicaid, White (vs. non-White) race/ethnicity	Prior violence	0.099 (0.003)	0.229 (0.055)	0.130 (0.055)	*	−0.002 (0.056)	n.s.
	No prior violence	0.016 (0.000)	0.148 (0.010)	0.132 (0.010)	***		

Note: n.s., not significant; TGD, transgender and gender diverse patients.
*$p < .05$.
***$p < .001$.

Predicted probabilities are shown in Table 4, and show that in general, TGD patients are at higher risk of each outcome (suicide attempt and suicidal ideation) compared with non-TGDs whether or not they had experienced violence victimization, but that rates of each outcome were also highest among those with violent victimization. For example, in Model 3, predicted probabilities of suicidal ideation were highest for TGD patients with violence victimization (0.257) and significantly higher than for non-TGD patients with violent victimization (0.110, comparison $p < .05$), but predicted probabilities for suicidal ideation were also fairly high for TGD patients *without* violent victimization (0.197) and significantly higher than for non-TGD patients without violent victimization (0.016, comparison; $p < .001$). There were two exceptions to this general rule: the "first differences" for predicted probabilities of suicide attempt for TGD versus non-TGD patients *among those patients who had violent victimization* were not significant in Model 1 or adjusted Model 2: while the point estimates were larger for TGD patients, the samples are too small to determine if this difference is significant. None of the second differences were significant when contrasting our predicted probabilities, meaning that we found no evidence for the differential impact of violent victimization for TGD versus non-TGD patients.

Discussion

Data derived from patients aged 12–80 years old in a safety net health system and based on two methods of identification for TGD patients from 2008 to 2019 in EHR data show that identified TGD patients have significantly higher rates of suicide attempt and ideation, as well as violence victimization, compared to non-TGD patients. In logistic regression models, TGD status and violence victimization are both very significant independent predictors of suicide attempt and ideation, even after adjustment for age, Medicaid status, and race/ethnicity. Using predicted probabilities, we did not find evidence for a significant interaction between violence victimization and TGD status (i.e., differential impact of violence victimization based on being an identified TGD patient), although some of these results should also be interpreted with caution due to the smaller sample sizes among TGD patients who had both violent victimization and suicide attempt. Overall, these data suggest that higher rates of suicide attempt and ideation for TGD patients may be both related to the higher rates of violent victimization among TGD patients, as well as a higher baseline rate of suicide attempt and ideation for TGD patients, even in the absence of violent victimization.

These data add to a growing literature identifying higher levels of suicidality for TGD populations, and that violence victimization as well as lower income levels are associated with these higher suicidality rates (Blosnich et al., 2014, 2016, 2017a; Borges et al., 2006; Brown & Jones, 2016; Clements-Nolle et al., 2006; Connolly et al., 2016; Daniolos et al., 2018; Lehavot et al., 2016; Marshall et al., 2016; McDermott et al., 2018; Moody & Smith, 2013; Pico-Alfonso et al., 2006; Suen et al., 2017). Prior work in this area which has been fundamental to calling attention to this significant public health problem has typically focused on survey data, or

specific sub-populations such as TGD youth (Clements-Nolle et al., 2006; Connolly et al., 2016; Daniolos et al., 2018; McDermott et al., 2018) or Veterans (Blosnich et al., 2014, 2016, 2017a; Lehavot et al., 2016; Tucker et al., 2018). Such data are critical to researchers, healthcare workers, public health, and health systems alike, but they can often be difficult to apply directly for health systems, for example, in the absence of a comparison group of patients. Our data are derived instead from a diverse sample of community-dwelling patients aged 12–80, using health record data. Although these data were observed over a long time period (2008–2019), the observed prevalence rates cannot be directly compared to those found in survey data asking about lifetime suicide attempt or ideation by recall: in this case, only those visits which result in a coded claim for suicide attempt or suicidal ideation would be captured. However, our findings for suicidality are similar to rates found in other EHR databases of transgender Veterans (where 13.8 percent had experienced suicidal ideation and 7.1 percent had attempted suicide) (Blosnich et al., 2017a). The observed rates of violent victimization in our data are lower than those observed by past-year self-report (Valentine et al., 2017), however, suggesting that many instances of violence are not observed in EHR data.

These data derived from EHRs also provide potential insights as far as strategies for identifying patients, and especially TGD patients, at high risk for suicidality or violence victimization. Of note, we found that identified TGD patients were at least as likely to have ever had a primary care visit (55.6 percent), and much more likely to have had outpatient behavioral health visits (55.3 percent), than non-TGD patients (41.8 and 12.6 percent, respectively). This suggests that, on the one hand, behavioral health providers may be uniquely positioned to help screen for suicide attempts as well as violence victimization for this high-risk patient population. On the other hand, it also demonstrates that as TGD patients in our sample frequented primary care clinics at least as often as they had passed through behavioral health clinics, primary care providers should also receive appropriate training for helping identify suicidal thoughts and/or violence victimization for TGD patient populations in order to facilitate better treatment.

There is a vast literature around screening for suicide risk in primary care, including literature suggesting it is feasible to identify suicidal ideation in primary care (Olfson, Weissman, Leon, Sheehan, & Farber, 1996) if providers are trained well, using either structured items or through meaningful questioning on the part of the primary care provider (Dueweke, Marin, Sparkman, & Bridges, 2018). Training for suicide risk assessments in primary care, whether using structured items (Diamond et al., 2017; Lawrence et al., 2010) or in conversation with the patient, may require increased training for primary care providers about additional concerns faced by many TGD patients. For example, healthcare discrimination based on gender identity is frequently reported by TGD patients, resulting in delaying or sometimes avoiding health care altogether (Seelman et al., 2017). Suicidal ideation in particular is also often not reported out of concerns for involuntary hospitalization (Richards et al., 2018), and perhaps in part because both physicians and patients express discomfort around having these conversations (Bajaj et al., 2008). Difficulty finding a trusting patient-provider relationship for TGD

patients (Poteat, German, & Kerrigan., 2013) may be partially explained or at least partially complicated by the fact that providers frequently lack training in properly caring for these patient populations (James et al., 2016). When TGD individuals are also seeking transition-related medical care, they may similarly avoid disclosing suicidal thoughts for fear that their treatment may be stopped or delayed (Bess & Stabb, 2009; Bockting, Robinson, Benner, & Scheltema, 2004). Patients and providers may have similar concerns about screening for violence exposures, including intimate partner or relationship-based violence; however, data suggest that patients are willing to speak about intimate provider violence if asked about these experiences and that, moreover, a number of brief, reliable, and valid screeners exist (Davis & Padilla-Medina., 2019; Portnoy et al., 2018). For providers of TGD patients, it may be important to note that mental healthcare providers are the second most common sources from which transgender survivors of intimate partner violence seek support (39.5 percent), preceded only by friends (76.7 percent), and followed by family (30.2 percent) (Kurdyla, Messinger, & Ramirez, 2019). Determining whether the types of routine screening that are conducted in physicians' offices (e.g., "Do you feel safe at home?") adequately capture risk for TGD populations, who may actually be more fearful of being victimized outside the home or in other settings, may be important to improving risk assessment and therefore treatment for TGD patients.

Although this study adds to a growing literature around violence victimization and suicidality for TGD patients, there are several important limitations. First, identification of TGD patients did not rely on self-report, and will therefore miss any people who may self-identify, but who did not either have an associated diagnosis code or who had an associated keyword in their record that indicated they may identify as TGD and/or that they were questioning or exploring their gender identity. Observing several notable differences between the TGD and non-TGD patient samples in our data (e.g., younger age, more likely to be white, more likely to speak English at home), it is also possible that older, non-White, or non-English speaking TGD patients are less likely to be captured using these methods. Second, our definition of identified TGD patients was broad, but there may be important differences in violence victimization for subgroups within our sample, such as transgender women, who may be more likely to be targets of violence. Third, observed rates of both suicide attempt and violence victimization in EHRs will be lower than the true rate, due to under-reporting or under recording. Fourth, and related to the third limitation, we do not capture the fear of violence victimization (Veldhuis, Drabble, Riggle, Wootton, & Hughes, 2018) and/or awareness of violence victimization experienced by others, including but not limited to news coverage about gender-based violence or knowledge of experiences of others in ones' social network who are also TGD. Fifth, TGD individuals identified had approximately 1.5 more years of follow-up time than non-TGD individuals, which may provide more opportunity to capture suicidality and violence victimization outcomes; a related possibility is that because TGD patients were more frequently seen in behavioral health settings, these providers may be more thoroughly documenting these outcomes.

Conclusions and Policy Implications

Overall, our data suggest much higher rates of suicide attempt, suicidal ideation, and violence victimization for identified TGD patients vs. non-TGD patients in an urban, safety net health system, and that higher rates of violence victimization contribute to but do not fully explain the large difference in suicide attempt and ideation among TGD patients.

Given that we observed TGD patients were frequently seen in both behavioral health and primary care settings over time, one direct policy implication at the clinic level is that it is important that both mental health and primary care providers have both the tools and skills to conduct suicide and violence risk assessments that are appropriate and acceptable for TGD patients in their care. At the level of institutions, hospitals and health systems should strive to adapt and implement transgender-affirming hospital policies such as those published by the Human Rights Campaign and Lambda Legal (Lambda Legal & Human Rights Campaign, 2016). As there continues to be a dearth of training in medical education about issues specific to TGD populations, health systems need to ensure that there are provider, staff, and leadership education and training to develop specific competencies around addressing the needs of TGD patients (Korpaisarn & Joshua, 2018; Stoddard, Leibowitz, Ton, & Snowdon, 2011). Moreover, health systems should strive to safely and respectfully collect information on self-reported gender identity as well social determinants of health (e.g., violence victimization, poverty, food insecurity, etc.) to facilitate easy identification of health disparities to facilitate targeted efforts to improve health and mental healthcare access, quality, and outcomes for this population (Blosnich et al., 2017b; Reisner, White, Bradford, & Mimiaga, 2014). These approaches, combined with leveraging of pragmatic readily available EHR data for health systems may enable not only enhance one-on-one risk assessment and appropriate treatment, but also help health systems coordinate efforts to provide evidence-based, multi-level, coordinated models for promoting wellness for TGD patient populations.

At the state and national level in the United States, improving well-being for TGD populations stems from advocating and advancing policies that promote inclusion and non-discrimination across a variety of sectors, including housing, employment, and health care. National-level policies about TGD-inclusion are constantly under debate, including for example: (i) the recent Housing and Urban Development proposed rule allowing individual housing shelters to make their own decisions about whether to admit TGD persons based on the religious beliefs of the shelter providers, which could lead to serious and dangerous delays in obtaining emergency housing for TGD individuals (ACLU, 2020; Office of the Secretary: Housing and Urban Development, 2020); and (ii) June 2020 updates by the Department of Health and Human Services that reversed a prior decision to interpret "sex discrimination" as including discrimination based on gender identity (HHS Press Office, 2020). As these debates and fluctuations in national-level protections continue, it is especially important for state-level Health and Human

Services and Medicaid agencies to renew commitments (or newly commit) to ensuring access to TGD-inclusive health coverage and non-discrimination.

Notes

We would like to thank all of the participants in our September 2018 Community Forum for their valuable direction and feedback. Preliminary data from this work were previously presented at the Dupont Summit in Washington, D.C. in December 2019. This work was conducted with support from Harvard Catalyst, The Harvard Clinical and Translational Science Center (National Center for Research Resources and the National Center for Advancing Translational Sciences, NIH Award UL1 TR001102-05), and financial contributions from Harvard University and its affiliated academic healthcare centers. Primary funding is through a sub-award pilot grant through Harvard Catalyst (Principal Investigator, Ana Progovac). The content is solely the responsibility of the authors and does not necessarily represent the official views of Harvard Catalyst, Harvard University and its affiliated academic healthcare centers, the NIH, or the Centers for Medicare and Medicaid Services.

Conflicts of interest: Brian Mullin reports stock ownership in the following healthcare-related companies: Proctor & Gamble, Shire PLC, Baxter International, Abbott Labs, Bristol-Meyers Squibb, and AbbVie Inc. No other financial disclosures were reported by the authors of this paper.

Corresponding author: Ana M. Progovac, aprogovac@cha.harvard.edu

Ana M. Progovac, PhD, is an instructor in the Department of Psychiatry at Harvard Medical School, Boston, MA, USA and Senior Scientist at the Health Equity Research Lab, Department of Psychiatry, Cambridge Health Alliance, Cambridge, MA, USA.

Nathaniel M. Tran is a PhD student in health policy at Vanderbilt University, Nashville, TN, USA.

Brian O. Mullin is a data scientist at the Health Equity Research Lab, Department of Psychiatry, Cambridge Health Alliance, Cambridge, MA, USA.

Juliana De Mello Libardi Maia, MA, is a community health educator and researcher at the Cambridge Health Alliance, Cambridge, MA, USA.

Timothy B. Creedon, PhD MA, is a research scientist at the Health Equity Research Lab, Department of Psychiatry, Cambridge Health Alliance, Cambridge, MA, USA.

Emilia Dunham, MPP MBA, is a manager of special projects, MassHealth Office of Behavioral Health at the Commonwealth of Massachusetts, Boston, MA, USA.

Sari L. Reisner, ScD, is the director of Transgender Health Research at the Brigham and Women's Hospital and The Fenway Institute at Fenway Health, an assistant

professor of medicine at the Harvard Medical School, and an assistant professor of epidemiology at the Harvard T.H. Chan School of Public Health, Boston, MA, USA.

Alex McDowell, PhD MPH MSN RN, is a research fellow at the Mongan Institute, Massachusetts General Hospital, Department of Medicine, Harvard Medical School, Boston, MA, USA.

Natalie Bird is the data and billing coordinator in the Department of Sexual and Reproductive Health, Cambridge Health Alliance, Cambridge, MA, USA.

María José Sánchez Román, MD MPH, is a doctor by training and a recent public health graduate in community health from the Milken Institute School of Public Health, George Washington University, Washington, DC.

Mason Dunn, JD, is Deputy Director for the Division of Education and Training at The Fenway Institute, Boston, MA, USA.

Cynthia Telingator, MD, is a child, adolescent and adult psychiatrist. She is an Assistant Professor in Psychiatry at Harvard Medical School, Boston, MA, USA. She is also Senior Consultant for the Gender and Sexuality Consultation Service in the Department of Psychiatry, Cambridge Health Alliance, Cambridge, MA. Dr. Telingator is in private practice in Cambridge, MA.

Frederick Lu is a Medical Student at the Boston University School of Medicine, Boston, MA, USA.

Aaron Samuel Breslow, PhD, is Assistant Professor of Psychiatry at the PRIME Center for Health Equity, Department of Psychiatry and Behavioral Sciences, Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY, USA.

Marshall Forstein, MD, is Associate Professor in Psychiatry at Harvard Medical School, Boston, MA, USA, and Vice Chair for Education and Training, Director of Adult Psychiatry Residency Training at Cambridge Health Alliance, Cambridge, MA, USA.

Benjamin Lê Cook, PhD MPH, is an Associate Professor in Psychiatry at Harvard Medical School and Director of the Health Equity Research Lab at Cambridge Health Alliance in Cambridge, MA, USA.

References

ACLU. 2020. *HUD Moves to Allow Anti-Trans Discrimination in Federally Funded Homeless Shelters*, New York, NY: American Civil Liberties Union (ACLU). https://www.aclu.org/press-releases/hud-moves-allow-anti-trans-discrimination-federally-funded-homeless-shelters-1

Adams, Noah, Maaya Hitomi, and Cherie Moody. 2017. "Varied Reports of Adult Transgender Suicidality: Synthesizing and Describing the Peer-Reviewed and Gray Literature." *Transgender Health* 2 (1): 60–75.

Ai, Chunrong, and Edward C. Norton. 2003. "Interaction Terms in Logit and Probit Models." *Economics Letters* 80 (1): 123–9.

Bajaj, Priya, Elena Borreani, Pradip Ghosh, Caroline Methuen, Melissa Patel, and Michael Joseph. 2008. "Screening for Suicidal Thoughts in Primary Care: The Views of Patients and General Practitioners." *Mental Health in Family Medicine* 5 (4): 229–35.

Barak-Corren, Yuval, Victor M. Castro, Solomon Javitt, Alison G. Hoffnagle, Yael Dai, Roy H. Perlis, Matthew K. Nock, Jordan W. Smoller, and Ben Y. Reis. 2017. "Predicting Suicidal Behavior From Longitudinal Electronic Health Records." *American Journal of Psychiatry* 174 (2): 154–62.

Barboza, Gia Elise, Silvia Dominguez, and Elena Chance. 2016. "Physical Victimization, Gender Identity and Suicide Risk Among Transgender Men and Women." *Preventive Medicine Reports* 4: 385–90.

Bess, J., and Sally Stabb. 2009. "The Experiences of Transgendered Persons in Psychotherapy: Voices and Recommendations." *Journal of Mental Health Counseling* 31 (3): 264–82.

Blosnich, John R., George R. Brown, Sybil Wojcio, and Robert M. Bossarte. 2014. "Mortality Among Veterans with Transgender-Related Diagnoses in the Veterans Health Administration, FY2000-2009." *LGBT Health* 1 (4): 269–76.

Blosnich, John R., Mary C. Marsiglio, Melissa E. Dichter, Shasha Gao, Adam J. Gordon, Jillian C. Shipherd, Michael R. Kauth, George R. Brown, and Michael J. Fine. 2017a. "Impact of Social Determinants of Health on Medical Conditions Among Transgender Veterans." *American Journal of Preventive Medicine* 52 (4): 491–8.

Blosnich, John R., Mary C. Marsiglio, Shasha Gao, Adam J. Gordon, Jillian C. Shipherd, Michael R. Kauth, George R. Brown, and Michael J. Fine. 2016. "Mental Health of Transgender Veterans in US States With and Without Discrimination and Hate Crime Legal Protection." *American Journal of Public Health* 106 (3): 534–40.

Blosnich, John R., Mary C. Marsiglio, Melissa E. Dichter, Shasha Gao, Adam J. Gordon, Jillian C. Shipherd, Michael R. Kauth, George R. Brown, and Michael J. Fine. 2017b. "Impact of Social Determinants of Health on Medical Conditions Among Transgender Veterans." *American Journal of Preventive Medicine* 52 (4): 491–8.

Bockting, Walter, Beatrice E. Robinson, Autumn Benner, and Karen Scheltema. 2004. "Patient Satisfaction With Transgender Health Services." *Journal of Sex & Marital Therapy* 30 (4): 277–94.

Borges, Guilherme, Jules Angst, Matthew K. Nock, Ayelet Meron Ruscio, Ellen E. Walters, and Ronald C. Kessler. 2006. "A Risk Index for 12-Month Suicide Attempts in the National Comorbidity Survey Replication (NCS-R)." *Psychological Medicine* 36 (12): 1747–57.

Brown, George R., and Kenneth T. Jones. 2016. "Mental Health and Medical Health Disparities in 5135 Transgender Veterans Receiving Healthcare in the Veterans Health Administration: A Case-Control Study." *LGBT Health* 3 (2): 122–31.

Case, Kim A., Briana Stewart, and Josephine Tittsworth. 2009. "Transgender Across the Curriculum: A Psychology for Inclusion." *Teaching of Psychology* 36 (2): 117–21.

Centers for Medicaid and Medicare Services. 2019. *Medicare Other Chronic and Disabling Conditions: Chronic Conditions Data Warehouse* [Online]. https://www2.ccwdata.org/web/guest/medicare-charts/medicare-other-chronic-and-disabling-conditions. Accessed March 21, 2020.

Clements-Nolle, Kristen, Rani Marx, and Mitchell Katz. 2006. "Attempted Suicide Among Transgender Persons." *Journal of Homosexuality* 51 (3): 53–69.

Collins, Joshua C., Ciarán McFadden, Tonette S. Rocco, and Mary Katherine Mathis. 2015. "The Problem of Transgender Marginalization and Exclusion: Critical Actions for Human Resource Development." *Human Resource Development Review* 14 (2): 205–26.

Connolly, Maureen D., Marcus J. Zervos, Charles J. Barone, Christine C. Johnson, and Christine L. M. Joseph. 2016. "The Mental Health of Transgender Youth: Advances in Understanding." *Journal of Adolescent Health* 59 (5): 489–95.

Daniolos, Peter T., Eric N. Boyum, and Cynthia J. Telingator. 2018. "Suicide and Self-Harm Among Sexual and Gender Minority Youth: Resilience, Coping, and Despair." In *Suicide Among Diverse Youth: A Case-Based Guidebook*, eds. A. J. Pumariega, and N. Sharma.(199–219). Cham: Springer International Publishing.

Davis, Maxine, and Diana M. Padilla-Medina. 2019. "Brief Intimate Partner Violence Perpetration Screening Tools: A Scoping Review." *Trauma, Violence & Abuse* 1: 1–14.

Devries, Karen M., and Maureen Seguin. 2013. "Violence against Women and Suicidality: Does Violence Cause Suicidal Behaviour?" In *Violence against women and mental health*. Karger Publishers, 148–58.

Diamond, Guy S., Joanna L. Herres, E. Stephanie Krauthamer Ewing, Tita O. Atte, Syreeta W. Scott, Matt B. Wintersteen, and Robert J. Gallop. 2017. "Comprehensive Screening for Suicide Risk in Primary Care." *American Journal of Preventive Medicine* 53 (1): 48–54.

Dragon, Christina N., Paul Guerino, Erin R. Ewald, and Alison M. Laffan. 2017. "Transgender Medicare Beneficiaries and Chronic Conditions: Exploring Fee-for-Service Claims Data." *LGBT Health* 4 (6): 404–11.

Dueweke, Aubrey R., Mikenna S. Marin, David J. Sparkman, and Ana J. Bridges. 2018. "Inadequacy of the PHQ-2 Depression Screener for Identifying Suicidal Primary Care Patients." *Families, Systems, & Health* 36(3): 281–88.

Ehrenfeld, Jesse M., Keanan Gabriel Gottlieb, Lauren Brittany Beach, Shelby E. Monahan, and Daniel Fabbri. 2019. "Development of a Natural Language Processing Algorithm to Identify and Evaluate Transgender Patients in Electronic Health Record Systems." *Ethnicity & Disease* 29 (Suppl. 2): 441–50.

Ewald, Erin R., Paul Guerino, Christina N. Dragon, Alison M. Laffan, Zil Goldstein, and Carl Streed. 2019. "Identifying Medicare Beneficiaries Accessing Transgender-Related Care in the Era of ICD-10." *LGBT Health* 6 (4): 166–73.

Frost, David M., Michelle Fine, María Elena Torre, and Allison Cabana. 2019. "Minority Stress, Activism, and Health in the Context of Economic Precarity: Results From a National Participatory Action Survey of Lesbian, Gay, Bisexual, Transgender, Queer, and Gender Non-Conforming Youth." *American Journal of Community Psychology* 63 (3-4): 511–26.

Grant, Jamie M., Lisa A. Mottet, Justin Tanis, Jack Harrison, Jody L. Herman, and Mara Keisling. 2011. *Injustice at Every Turn: A Report of the National Transgender Discrimination Survey*, Washington, DC: National Center for Transgender Equality and National Gay and Lesbian Task Force. https://www.transequality.org/sites/default/files/docs/resources/NTDS_Report.pdf

Hedegaard, Holly, Michael Schoenbaum, Cindy Claassen, Alex Crosby, Kristin Holland, and Scott K. Proescholdbell. 2018. "Issues in Developing a Surveillance Case Definition for Nonfatal Suicide Attempt and Intentional Self-harm Using International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) Coded Data." *Natl Health Stat Report* 108: 1–19.

HHS Press Office. 2020. *HHS Finalizes Rule on Section 1557 Protecting Civil Rights in Healthcare, Restoring the Rule of Law, and Relieving Americans of Billions in Excessive Costs*, Washington, DC: Department of Health and Human Services. https://www.hhs.gov/about/news/2020/06/12/hhs-finalizes-rule-section-1557-protecting-civil-rights-healthcare.html

James, Sandy E., and Jody Herman. 2017. *The Report of the 2015 US Transgender Survey: Executive Summary*, Washington, DC: National Center for Transgender Equality. https://ncvc.dspacedirect.org/handle/20.500.11990/1299

James, Sandy E., Jody L. Herman, Susan Rankin, Mara Keisling, Lisa Mottet, and Ma'ayan Anafi. 2016. *The Report of the 2015 U.S. Transgender Survey*, Washington, DC: National Center for Transgender Equality.

Johns, Michelle M., Richard Lowry, Jack Andrzejewski, Lisa C. Barrios, Zewditu Demissie, Timothy McManus, Catherine N. Rasberry, Leah Robin, and J. Michael Underwood. 2019. "Transgender Identity and Experiences of Violence Victimization, Substance Use, Suicide Risk, and Sexual Risk Behaviors Among High School Students - 19 States and Large Urban School Districts, 2017." *MMWR. Morbidity and Mortality Weekly Report* 68 (3): 67–71.

Kattari, Shanna K., Darren L. Whitfield, N. Eugene Walls, Lisa Langenderfer-Magruder, and Daniel Ramos. 2016. "Policing Gender Through Housing and Employment Discrimination: Comparison of Discrimination Experiences of Transgender and Cisgender LGBQ Individuals." *Journal of the Society for Social Work and Research* 7 (3): 427–47.

Korpaisarn, Sira, and Joshua D. Safer. 2018. "Gaps in Transgender Medical Education Among Healthcare Providers: A Major Barrier to Care for Transgender Persons." *Reviews in Endocrine and Metabolic Disorders* 19 (3): 271–5.

Kuper, Laura E., Noah Adams, and Brian S. Mustanski. 2018. "Exploring Cross-Sectional Predictors of Suicide Ideation, Attempt, and Risk in a Large Online Sample of Transgender and Gender Non-conforming Youth and Young Adults." *LGBT Health* 5 (7): 391–400.

Kurdyla, Victoria, Adam M. Messinger, and Milka Ramirez. 2019. "Transgender Intimate Partner Violence and Help-Seeking Patterns." *Journal of Interpersonal Violence* 1: 1–24.

Lambda Legal, and Human Rights Campaign. 2016. "Creating Equal Access to Quality Health Care for Transgender Patients: Transgender-Affirming Hospital Policies." Lambda Legal. https://www.lambdalegal.org/publications/fs_transgender-affirming-hospital-policies

Langenderfer-Magruder, Lisa, Daren L. Whitfield, N. Eugene Walls, Shanna K. Kattari, and Daniel Ramos. 2016. "Experiences of Intimate Partner Violence and Subsequent Police Reporting Among Lesbian, Gay, Bisexual, Transgender, and Queer Adults in Colorado: Comparing Rates of Cisgender and Transgender Victimization." *Journal of Interpersonal Violence* 31 (5): 855–71.

Lawrence, Sarah T., James H. Willig, Heidi M. Crane, Jiatao Ye, Inmaculada Aban, William Lober, Christa R. Nevin et al. 2010. "Routine, Self-Administered, Touch-Screen, Computer- Based Suicidal Ideation Assessment Linked to Automated Response Team Notification in an HIV Primary Care Setting." *Clinical Infectious Diseases* 50 (8): 1165–73.

Lehavot, Keren, Tracy L. Simpson, and Jillian C. Shipherd. 2016. "Factors Associated with Suicidality Among a National Sample of Transgender Veterans." *Suicide & Life-Threatening Behavior* 46 (5): 507–24.

MacCarthy, Sarah, Sari L. Reisner, n Amy Nun, Amaya Perez-Brumer, and Don Operario. 2015. "The Time Is Now: Attention Increases to Transgender Health in the United States but Scientific Knowledge Gaps Remain." *LGBT Health* 2 (4): 287–91.

Marshall, Brandon D. L., María E. Socías, Thomas Kerr, Virginia Zalazar, Omar Sued, and Inés Arístegui. 2016. "Prevalence and Correlates of Lifetime Suicide Attempts Among Transgender Persons in Argentina." *Journal of Homosexuality* 63 (7): 955–67.

McDermott, Elizabeth, Elizabeth Hughes, and Victoria Rawlings. 2018. "The Social Determinants of Lesbian, Gay, Bisexual and Transgender Youth Suicidality in England: A Mixed Methods Study." *Journal of Public Health (Oxford)* 40(3): e244–51.

McDowell, Alex, Ana M. Progovac, Benjamin L. Cook, and Sherri Rose. 2019. "Estimating the Health Status of Privately Insured Gender Minority Children and Adults." *LGBT Health* 6 (6): 289–96.

Meyer, Ilan H., Taylor N. T. Brown, Jody L. Herman, Sari L. Reisner, and Walter O. Bockting. 2017. "Demographic Characteristics and Health Status of Transgender Adults in Select US Regions: Behavioral Risk Factor Surveillance System, 2014." *American Journal of Public Health* 107 (4): 582–9.

Moody, Chérie, and Nathan Grant Smith. 2013. "Suicide Protective Factors Among Trans Adults." *Archives of Sexual Behavior* 42 (5): 739–52.

Muller, Clemma J., and Richard F. MacLehose. 2014. "Estimating Predicted Probabilities From Logistic Regression: Different Methods Correspond to Different Target Populations." *International Journal of Epidemiology* 43 (3): 962–70.

Newhouse, Maria R. 2013. "Remembering the "T" in LGBT: Recruiting and Supporting Transgender Students." *Journal of College Admission* 220: 22–7.

Nock, Matthew K., Guilherme Borges, Evelyn J. Bromet, Jordi Alonso, Matthias Angermeyer, Annette Beautrais, Ronny Bruffaerts et al. 2018. "Cross-National Prevalence and Risk Factors for Suicidal Ideation, Plans and Attempts." *British Journal of Psychiatry* 192 (2): 98–105.

Office of the Secretary: Housing and Urban Development. 2020. *Making Admission or Placement Determinations Based on Sex in facilities Under Community Planning and Development Housing Programs*, 24 CFR Part 5. Washington, DC: Department of Housing and Urban Development.

Olfson, Mark, Myrna M. Weissman, Andrew C. Leon, David V. Sheehan, and Leslie Farber. 1996. "Suicidal Ideation in Primary Care." *Journal of General Internal Medicine* 11 (8): 447–53.

Pico-Alfonso, Maria A., M. Isabel Garcia-Linares, Nuria Celda-Navarro, Concepcion Blasco-Ros, Enrique Echeburúa, and Manuela Martinez. 2006. "The Impact of Physical, Psychological, and Sexual Intimate Male Partner Violence on Women's Mental Health: Depressive Symptoms, Posttraumatic Stress Disorder, State Anxiety, and Suicide." *Journal of Women's Health* 15 (5): 599–611.

Portnoy, Galina A., Sally G. Haskell, Matthew W. King, Rachel Maskin, Megan R. Gerber, and Katherine M. Iverson. 2018. "Accuracy and Acceptability of a Screening Tool for Identifying Intimate Partner Violence Perpetration among Women Veterans: A Pre-Implementation Evaluation." *Women's Health Issues* 28 (5): 439–45.

Poteat, Tonia, Danielle German, and Deanna Kerrigan. 2013. "Managing Uncertainty: A Grounded Theory of Stigma in Transgender Health Care Encounters." *Social Science & Medicine* 84: 22–9.

Proctor, Kimberly, Samuel C. Haffer, Erin Ewald, Carla Hodge, and Cara V. James. 2016. "Identifying the Transgender Population in the Medicare Program." *Transgender Health* 1 (1): 250–65.

Progovac, Ana M., Benjamin L. Cook, Brian O. Mullin, Alex McDowell, Maria Jose Sanchez R, Ye Wang, Timothy B. Creedon, and Mark A. Schuster. 2018. "Identifying Gender Minority Patients' Health And Health Care Needs In Administrative Claims Data." *Health Affairs* 37 (3): 413–20.

Progovac, Ana M., Brian O. Mullin, Emilia Dunham, Sari L. Reisner, Alex McDowell, Maria Jose Sanchez Roman, Mason Dunn et al. 2020. "Disparities in Suicidality by Gender Identity Among Medicare Beneficiaries." *American Journal of Preventive Medicine* 58: 789–98.

Reis, Ben Y., Isaac S. Kohane, and Kenneth D. Mandl. 2009. "Longitudinal Histories as Predictors of Future Diagnoses of Domestic Abuse: Modelling Study." *BMJ* 339: b3677.

Reisner, Sari L., Ralph Vetters, M. Leclerc, Shayne Zaslow, Sarah Wolfrum, Daniel Shumer, and Matthew J. Mimiaga. 2015. "Mental Health of Transgender Youth in Care at an Adolescent Urban Community Health Center: A Matched Retrospective Cohort Study." *Journal of Adolescent Health* 56 (3): 274–9.

Reisner, Sari L., Jaclyn M. White, Judith B. Bradford, and Matthew J. Mimiaga. 2014. "Transgender Health Disparities: Comparing Full Cohort and Nested Matched-Pair Study Designs in a Community Health Center." *LGBT Health* 1 (3): 177–84.

Richards, Julie E., Ursula Whiteside, Evette J. Ludman, Chester Pabiniak, Beth Kirlin, Rianna Hidalgo, and Greg Simon. 2018. "Understanding Why Patients May Not Report Suicidal Ideation at a Health Care Visit Prior to a Suicide Attempt: A Qualitative Study." *Psychiatric Services*:appi. ps. 201800342.

Roblin, Douglas, Joshua Barzilay, Dennis Tolsma, Brandi Robinson, Laura Schild, Lee Cromwell, Hayley Braun et al. 2016. "A Novel Method for Estimating Transgender Status Using Electronic Medical Records." *Annals of Epidemiology* 26 (3): 198–203.

Seelman, Kristie L., Mathew J. P. Colón-Diaz, Rebecca H. LeCroix, Marik Xavier-Brier, and Leonardo Kattari. 2017. "Transgender Noninclusive Healthcare and Delaying Care Because of Fear: Connections to General Health and Mental Health Among Transgender Adults." *Transgender Health* 2 (1): 17–28.

Simon, Gregory E., Eric Johnson, Jean M. Lawrence, Rebecca C. Rossom, Brian Ahmedani, Frances L. Lynch, Arne Beck et al. 2018. "Predicting Suicide Attempts and Suicide Deaths Following Outpatient Visits Using Electronic Health Records." *American Journal of Psychiatry* 175 (10): 951–60.

StataCorp. 2017. *Stata Statistical Software: Release 15*, College Station, TX: StataCorp LLC. https://www.stata.com/stata15/

Stoddard, Joel, Scott F. Leibowitz, Hendry Ton, and Shane Snowdon. 2011. "Improving Medical Education About Gender-Variant Youth and Transgender Adolescents." *Child and Adolescent Psychiatric Clinics* 20 (4): 779–91.

Stone, Amy L. 2009. "More than Adding a T: American Lesbian and Gay Activists' Attitudes towards Transgender Inclusion." *Sexualities* 12 (3): 334–54.

Suen, Yiu Tung, Randolph Chun Ho Chan, and Eliz Miu Yin Wong. 2017. "Mental Health of Transgender People in Hong Kong: A Community-Driven, Large-Scale Quantitative Study Documenting Demographics and Correlates of Quality of Life and Suicidality." *Journal of Homosexuality* 65: 1–21.

Testa, Rylan J., Matthew S. Michaels, Whitney Bliss, Megan L. Rogers, Kimberly F. Balsam, and Thomas Joiner. 2017. "Suicidal Ideation in Transgender People: Gender Minority Stress and Interpersonal Theory Factors." *Journal of Abnormal Psychology* 126 (1): 125–36.

Testa, Rylan J., Laura M. Sciacca, Florence Wang, Michael L. Hendricks, Peter Goldblum, Judith Bradford, and Bruce Bongar. 2012. "Effects of Violence on Transgender People." *Professional Psychology: Research and Practice* 43 (5): 452–9.

Ting, Sarah A., Ashley F. Sullivan, Edwin D. Boudreaux, Ivan Miller, and Carlos A. Camargo, Jr. 2012. "Trends in US Emergency Department Visits for Attempted Suicide and Self-Inflicted Injury, 1993–2008." *General Hospital Psychiatry* 34 (5): 557–65.

Tucker, Raymond P., Rylan J. Testa, Tracy L. Simpson, Jillian C. Shipherd, John R. Blosnich, and Keren Lehavot. 2018. "Hormone Therapy, Gender Affirmation Surgery, and Their Association With Recent Suicidal Ideation and Depression Symptoms in Transgender Veterans." *Psychological Medicine* 48: 1–8.

Valentine, Sarah E., Sarah M. Peitzmeier, Dana S. King, Conall O'Cleirigh, Samantha M. Marquez, Cara Presley, and Jennifer Potter. 2017. "Disparities in Exposure to Intimate Partner Violence Among Transgender/Gender Nonconforming and Sexual Minority Primary Care Patients." *LGBT Health* 4 (4): 260–7.

Van Dulmen, Manfred, Andrea Mata, Shannon Claxton, Katherine Klipfel, Katherine Schinka, Monica Swahn, and Robert Bossarte. 2013. "Longitudinal Associations Between Violence and Suicidality From Adolescence into Adulthood." *Suicide and Life-Threatening Behavior* 43 (5): 523–31.

Veldhuis, Cindy B., Laurie Drabble, Ellen D. B. Riggle, Angie R. Wootton, and Tonda L. Hughes. 2018. ""I Fear for My Safety, but Want to Show Bravery for Others": Violence and Discrimination Concerns Among Transgender and Gender-Nonconforming Individuals After the 2016 Presidential Election." *Violence and Gender* 5 (1): 26–36.

Williams, Richard. 2012. "Using the Margins Command to Estimate and Interpret Adjusted Predictions and Marginal Effects." *Stata Journal* 12 (2): 308–31.

Received: 9 June 2020 | Revised: 8 March 2021 | Accepted: 21 March 2021

DOI: 10.1002/wmh3.448

INVITED ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Family doctors to connect *global concerns* due to climate change with *local actions*: State-of-the art and some proposals

Paolo Lauriola[1,2] | **Alice Serafini**[1,3] | **Mariagrazia Santamaria**[1,4] | **Stefano Guicciardi**[5,6] | **Peter K. Kurotschka**[7,8] | **Giovanni S. Leonardi**[9,10] | **Ariana Zeka**[11] | **Evelyn Segredo**[12] | **Maria C. Bassi**[13] | **Ozden Gokdemir**[14] | **Francesco de Tommasi**[15] | **Emanuele Vinci**[16] | **Roberto Romizi**[17] | **Alice McGushin**[18,19] | **Enrique Barros**[18,20] | **Alan Abelsohn**[18,21] | **Samantha Pegoraro**[1,22]

[1]Staff Tecnico-scientifico, Rete Italiana Medici Sentinella per l'Ambiente (RIMSA), Arezzo, Italy

[2]Sentinel Physician for the Environment Working Group, International Society of Doctors for the Environment ISDE, Basel, Switzerland

[3]Department of Primary Care, Local Health Authority, Modena, Italy

[4]Department of Primary Care, Local Health Authority, Foggia, Italy

[5]Health Directorate, Bologna Local Health Authority, Bologna, Italy

[6]Department of Biomedical and Neuromotor Sciences, University of Bologna, Bologna, Italy

[7]Department of Medical Science and Public Health, Faculty of Medicine and Surgery, University of Cagliari, Cagliari, Italy

[8]Department of Primary Care, Local Health Authority, Cagliari, Italy

[9]Environmental Epidemiology Group, Centre for Radiation Chemical and Environmental Hazards, Public Health England, Chilton, UK

[10]Department of Social and Environmental Health Research, London School of Hygiene and Tropical Medicine, London, UK

[11]Institute of Environment, Health and Societies, Brunel University, London, UK

[12]Family and Community Medicine, Uruguayan Society of Family and Community Medicine, Montevideo, Uruguay

[13]Medical Library, Azienda USL, IRCCS di Reggio Emilia, Reggio Emilia, Italy

[14]Faculty of Medicine, Izmir University of Economics, Balçova/Izmir, Turkey

[15]Department of Primary Care, Local Health Authority, Bari, Italy

[16]"Health and Environment" Working Group, National Medical Boards Federation, Rome, Italy

[17]Associazione Medici per l'Ambiente, ISDE-Italy, Arezzo, Italy

[18]Working Party on the Environment, World Organization of Family Doctors WONCA, Brussels, Belgium

[19]Institute for Global Health, University College London, London, UK

[20]Atenção Primária à Saúde, Universidade de Caxia do Sul, Caxias do Sul, Brasil

[21]Department of Family and Community Medicine, University of Toronto, Toronto, Canada

[22]Department of Climate and Health, Italian Climate Network, Milan, Italy

Correspondence
Paolo Lauriola, Via Cimone, 55,
41122 Modena, Italy.
Email: paolo.lauriola@gmail.com

Abstract

Climate change (CC) is the most challenging environmental health (EH) concern. Air pollution is closely linked to CC. However, many CC-health-related conditions (i.e., allergic diseases, asthma, hypertension, fluid and electrolyte disorders, child and adult obesity, type 2 diabetes, vector-borne diseases) are not usually counted, either because they do not cause death or require hospital admission/emergency triage. They are the vast majority of health care seeking generally treated by family doctors (FDs) and family pediatricians (FPs). FDs/FPs are often not aware of CC-health-impacts. Their potential role in tackling such a global challenge through their local influence on individual and collective attitudes and policies is not considered. Proper FD training could fill these gaps, raise awareness of their role, and implement EH FDs/FPs-based surveillance networks to collect, analyze, interpret, and report EH data to inform EH-related Policy. FDs and FPs, organized in sentinel physicians' networks, could play a key role in advising policymakers at the local and regional level in designing interventions adapted to climate-related issues. Such experiences are rare worldwide and not well known. We will describe and discuss them in detail to share successful local examples.

KEYWORDS

climate change, environmental epidemiology, environmental-health surveillance, primary health care, sentinel family doctors

Key points

- Climate change (CC) is presently the most challenging environmental health (EH) concern. Air pollution which is closely linked to CC, is responsible for 7 million deaths per year.
- These figures, however, underestimate the overall health impacts of CC and environmental threats. Many conditions are not usually counted, either because they do not cause death, or require hospital admission/emergency triage. They are generally treated by family doctors (FDs). Hence they should be counted either to assess citizens day-to-day quality life or to allocate resources in healthcare services properly.

- Nonetheless, FDs are often not aware of CC and EH effects impacts. As such their potential role to tackle such a global challenge through their local influence on individual and collective attitudes and policies has not been fully considered so far.

INTRODUCTION

In 2015, the United Nations adopted the 2030 Agenda for Sustainable Development to address emerging global health issues, creating 17 sustainable development goals to be achieved by 2030. Most of these global health problems are directly related to complex social and environmental issues, such as the rapid population growth, the demand for sustainable models of food production, a more responsible use of natural resources, the protection of biodiversity, efforts towards climate change (CC) mitigation, adaptation, and resilience, the transition to clean energy, as well as the need to fight poverty, end hunger, and improve universal health coverage and access to education (United Nations General Assembly, 2015). These problems can and must be addressed both at global and local level, taking into account social justice, equity, and fairness.

In the last 20 years, scientific understanding has shifted to broader and more complex models to explain natural phenomena, introducing interdisciplinary science as a promising tool for the future (Dahlgren & Whitehead, 1991; McMichael, 2001; Pearce et al., 2019; Whitmee et al., 2015). However, there have only recently been efforts to develop new paradigms which take into account complexity and an interdisciplinary approach in environmental health (EH) research and actions (Buse et al., 2018; Pongsiri et al., 2019).

In a global system with these interdependencies, the health effects due to global CC (National Geographic, 2019) will be a significant challenge in the coming years, and the WHO has estimated an additional 250,000 deaths/year between 2030 and 2050 due to its adverse health effects (Hales et al., 2014). In addition, CC is closely linked to air pollution, fossil fuel combustion being responsible for two thirds of outdoor air pollution (CCAC, 2019). Some short-lived climate pollutants (CCAC, 2021) such as black carbon and tropospheric ozone are also harmful air pollutants. These pollutants are together responsible for up to 45% of current global warming. Globally, air pollution is responsible for 7 million deaths per year, representing more than half of deaths attributable to environmental risk factors (WHO, 2021).

In addition to the health effects of CC usually quantified through the number of deaths, emergency visits, and hospitalizations, there are many other diseases which could be linked to CC in different ways and at various levels of exposure, which are not quantified because they are treated by family doctors (FDs) and family pediatricians (FPs). These include allergic diseases, asthma, hypertension, fluid and electrolyte disorders, child and adult obesity, type 2 diabetes and its complications, anxiety, depression, and other mental health issues (Lauriola et al., 2018).

Moreover, health effects vary in different regions. For example, vector-borne infectious diseases which are linked to CC (Balci et al., 2014; Randalph & Ergonul, 2008) show a robust geographical heterogeneity (even among areas very close to each other) (Aström et al., 2012; Schaffner & Mathis, 2014). In these cases, global strategies addressing CC should be implemented locally, emphasizing the role of local community-based FDs and FPs.

From a practical perspective, there is much that FDs and FPs can do to help encourage both mitigation of CC, and also to assist communities in their adaptation efforts (Blashki et al., 2012). Investing in community level projects that create healthy, sustainable, and

resilient communities is an important effort which FDs/FPs can support in their communities to tackle the health effects of CC (Brown, 2016).

Blashki et al. in 2007 described the role of FDs/FPs in the adaptation strategies to address CC health effects (Table 1):

This demonstrates that:

- FPs and FPs represent a valuable resource in the collection of data and metadata in the context of health and animal or environmental and climate sensitive diseases, as well as in informing decision-makers, leading local actions to face global concerns.
- Physicians, and in particular, FDs/FPs, hold an influential, credible, and respected role within their communities, both in terms of shaping personal attitudes and community planning and choices (Kumar, 2018).
- FDs/FPs capacity building is an essential and underdeveloped asset.

As such, it would be useful to define and communicate a common background curriculum, both in terms of content and organization, to make these efforts more effective and recognized (Blanski et al., 2012).

Two excellent examples of FDs/FPs in a community role come from Turkey. The first is a well-known zoonotic disease outbreak, Tularemia, which was managed by healthcare workers, mainly family physicians in Kayseri, Turkey, from 2010 to 2012. Balcia et al. (2014) noticed that increases in temperature and rainfall affected the development of the outbreak. The second example refers to an epidemic of Crimean-Congo hemorrhagic fever (CCHF). Until 2002, CCHF was uncommon in Turkey (Randolph et al., 2008). Ground-dwelling birds are thought to be the source of the outbreaks (Leblebicioglu, 2010; Şekercioğlu, 2013; Vatansever et al., 2007). Following such outbreaks, 10,219 new cases were reported between 2002 and 2016. Karakecili et al. (2018) claim that the mortality rates were lower than previously. Healthcare worker, and in particular, FDs, were trained to deal with CCHF, and they are now leading the management of the cases (Blanski et al., 2012; Haines & Ebi, 2019).

More generally, in relation to CC and health, the importance of Primary Care Providers has been well documented (Green et al., 2001; Walker et al., 2011; Warby & Veidis, 2019; Xie et al., 2018).

In the COVID-19 emergency, great attention has been paid to the relationship between environment, animal and human health, as highlighted by the One Health approach (Amuasi et al., 2020; Rabinowitz et al., 2018). It has been estimated that, globally, about one billion

TABLE 1 Primary health care climate change adaptation strategies

- Public education and raise of awareness
- Day-by-day involvement in local/regional/national strategies to tackle antimicrobial resistance within a One-Health approach
- Early alert systems: Impending weather extremes, infectious disease outbreaks
- Disaster preparedness, including increasing the health system's "surge" capacity to respond to emergencies
- Enhanced infectious disease control programs
  - Food safety, vaccine programs, case detection, and treatment
- Improved surveillance
  - Vector control (focal diseases)
  - Risk indicators (e.g., aeroallergen concentration)
  - Health outcomes (e.g., infectious diseases outbreaks, rural suicides, and seasonal asthma peaks)
- Appropriate health workforce training, including mid-career development (e.g., updated understanding of climatic influences on health, training in public health)

Source: Blashki et al. (2007), adapted.

cases of illness and millions of deaths occur every year from zoonosis (Karesh et al., 2012). Available evidence for COVID-19 suggests that SARS-CoV-2 itself has a zoonotic source (Ahmad & Hui, 2020; Andersen et al., 2020; Bonilla-Aldana et al., 2020) although not yet identified. Some 60% of emerging infectious diseases reported globally are zoonoses (Bonilla-Aldana et al., 2020; K. F. Smith et al., 2014) with over 30 new human pathogens having been detected in the last three decades, 75% of which have originated in animals (K. F. Smith et al., 2014; UNEP, 2020). Also, habitat destruction, including deforestation, is contributing to more infectious diseases in humans (Maller et al., 2002; WHO, 2002; WWF, 2010). Ecosystem health, wildlife health, and human health are interconnected, and there is a need to develop a coordinated strategy of research and action to focus on the impact of CC on zoonotic and parasitic infections (Hueffer et al., 2013). Local health impact evidence can be a powerful way for shaping local public opinion towards a mandate of CC mitigation, which also calls for the implementation of policies and investment in competencies and resources (Rocklöv et al., 2014).

One Health gained momentum as a response to the steadily increasing drumbeat of emerging zoonotic disease outbreaks in recent decades, including the West Nile virus, severe acute respiratory syndrome (SARS), Nipah and Hendra viruses, Ebola, avian influenza, H1N1 2009 pandemic influenza, and more recently Ebola in West Africa, Zika, and Yellow fever (Amuasi et al., 2020).

One of the lessons learned from the COVID-19 emergency has been that professionals, including FDs and FPs, naturally join together in groups to promote understanding and practical initiatives to face impeding hazards (Lauriola et al., 2021). An example is provided in Appendix 1 (Murgia et al., 2020).

However, there is a knowledge deficit among family doctors, and clinicians in general, concerning the connection between health and the environment(s) in which their patients are working and living. This is particularly true in the case of CC because the temporal and spatial resolution of the risk has led to a relative skepticism.

Here, we propose some solutions to the problems described above. First, we suggest that "a sentinel general practice network—or sentinel network of general practitioners—would provide a system that keeps a watchful eye on a sample of the population by supplying regular and standardized reports on the incidence and the main epidemiological characteristics of specific diseases and of procedures in primary health care" (van Casteren, 1993). More recently, sentinel FDs provide data to a central database via electronic medical records, providing meaningful epidemiological information.

An historical, anecdotal overview of Sentinel Physicians is provided in Appendix.

OBJECTIVES

The aim of our study was to perform a literature review of examples of Sentinel Physicians Network globally, to get an understanding of:

- *Why* and *how* Sentinel Physicians for the Environment Networks (SPENs) could help in coping with global threats (in particular, CC) and local threats such as waste, energy, industrial pollution, together with policymakers, polluters, and citizens.
- *How* local and country-wide specific experiences have contributed toward actions regarding global concerns.

This information would be helpful in:

- Strengthening networks of physicians and epidemiologists on EH surveillance.

- Promoting a "community" of experts and institutions in this field.
- Sharing such experiences throughout low and middle-income countries (LMICs). This point is particularly important owing to the specific physical, socioeconomic and health conditions of LMIC countries in relation to CC pressure, and also to the understanding that primary care could act as a crucial organizational cornerstone (or crossroad) in developing healthy and sustainable development (Stenberg et al., 2019).

MATERIALS AND METHODS

We carried out a bibliographic search in Medline (Pubmed), Embase, Cinahl, Scopus, and Web of Science to retrieve all articles that reported data on CC and FDs/FPs.

In particular, we developed three different strategies to analyze in-depth:

- The state of the art of Public Health Surveillance on CC.
- FDs/FPs' awareness and training/education on CC.
- Sentinel networks of physicians on CC.

Search terms have been constructed following the PICO model to build a full-fledged search strategy. As databases differ in terms of search operations and MeSH words, we tailored our primary search strategy according to the requirements of an individual database. Full keywords used in different databases are documented in Appendix 2.

A hand search of potentially relevant articles was executed using the reference lists of related studies retrieved.

All studies identified through the search in electronic databases and reference lists of relevant are imported in a reference management software such as EndNote.

The retrieved articles were de-duplicated.

The screening process were completed by authors independently to reduce bias (name of reviewers: Paolo Lauriola, Mariagrazia Santamaria, Samantha Pegoraro, Stefano Guicciardi, Alice Serafini, and Peter K. Kurotschka).

RESULTS

Family doctors and pediatricians' involvement in CC and health

Figure 1 shows the article dealing with family doctors and paediatricians' involvement in climate change and health. Generally, the focus on the health effects of CC is increasing, and many authors are trying to engage FDs/FPs and urge their professional involvement (Allard, 2002; Abelsohn et al., 2013; Lawson, 2019; Lodge, 2015, Parise, 2018; Parker et al., 2019; Phipps et al., 2011; Sankoff, 2015; S. Smith, Elliot, Hajat, Bone, Smith, et al., 2016; Tait et al., 2018; Vogel, 2019; Wellbery, 2019). Most of these articles demonstrate firm evidence that patients trust their FDs/FPs, both for their individual care and more widely as a profession (Abelsohn et al., 2013). There is an impressive and broad agreement on the role of FDs/FPs in influencing the awareness of patients and communities. FD/FP "can promote a willingness to reflect on aspects of quality of life other than one's health problems" (Guggenheim, 2016).

Nevertheless, physicians are not confident in their knowledge about the topic of CC and health (Valois et al., 2016). Owing to some philosophical, political, organizational and professional constraints FDs/FPs and clinicians as whole do not feel themselves as key actors in such issues (Boyer et al., 2019) especially in the field of CC (Belkin, 2020; Solomon &

LaRocque, 2019). Therefore, a significant opportunity exists for FDs/FPs to educate themselves and subsequently their patients about how CC can affect health on an individual and community level. As highly trusted professionals, physicians are uniquely placed to educate their patients about the health consequences of a warming planet and to encourage public health and community efforts in this regard. Further research is needed on specific links between CC, health and primary health care; for example, on how to prevent or reduce climate sensitive impacts and on how to integrate this environmental risk factor it into patient care (Boland & Temte, 2019) (Figure 2).

Two examples of FDs/FPs involvement are emphasized (i) in the field of child health care, advocacy for family planning starts with FD/FPs educating all patients of child-bearing age and extends up to advocating for funding and a real change from government officials at all levels, (ii) another is in disaster management across all its phases, (CDC, 2021; Lauriola et al., 2019) strengthening disaster management before, during a disaster and in the years that follow. FD/FPs would be involved in epidemiological activities (rapid need assessment, surveillance, tracking registries, and evaluation studies comparing strategies of interventions) as well as their more traditional role in outpatient health care (physical and mental).

Particular attention has been paid in the case of CC-driven disasters, underlining the opportunities for FDs/FPs to facilitate the enhancement of disaster preparedness among their patient communities. An example from Australia, shows how FD/FPs were well placed to identify vulnerable patients and refer them to services to assist them in enhancing their disaster resilience (Burns et al., 2019).

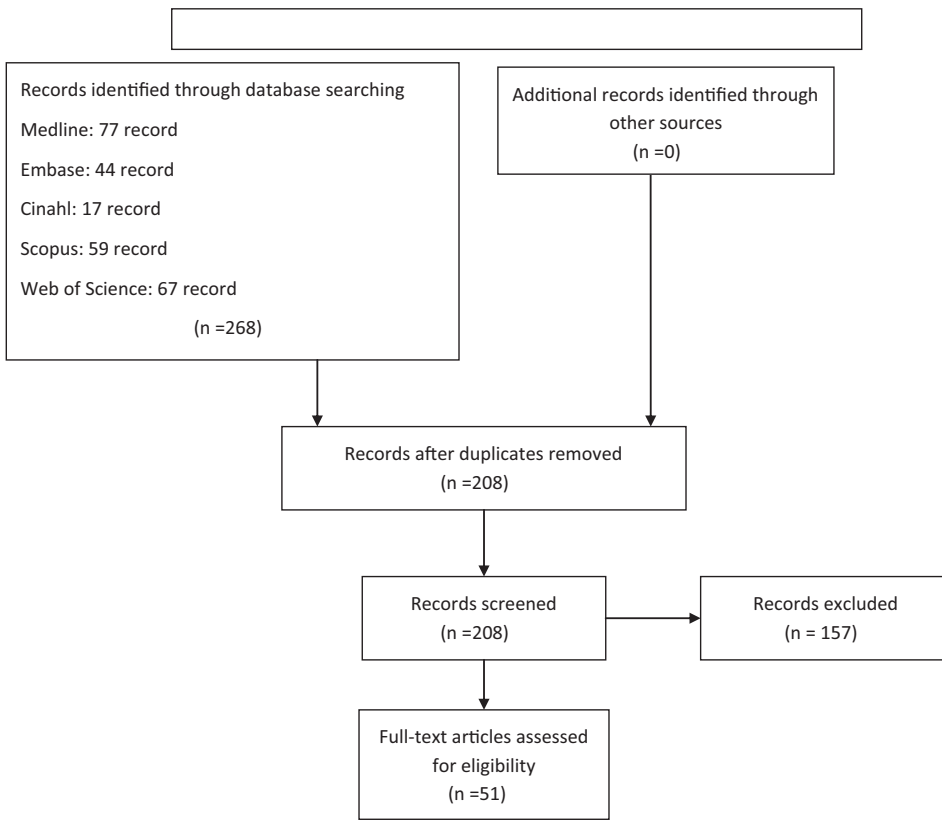


FIGURE 1 Flow Chart: Family doctors and paediatricians' involvement in climate change and health (From Moher et al., 2009)

Some of the articles reviewed focused on vulnerable patient populations, such as groups more prone to CC-related health effects. These vulnerable groups include children (Buka & Shea, 2019), the elderly, and patients in poor physical and mental health, with multiple comorbidities, taking certain medications, and those socially isolated (Haque et al., 2013).

This review found that even when FDs had been involved in collecting data, they generally did not play an active role in evaluating the data and planning further research or next steps (Michelozzi et al., 2010; Smith, Elliot, Hajat, Bone, Bates, et al., 2016). However, some groups of GPs have conducted and published studies (Cheng et al., 2008).

For example, an initiative has been launched in Italy to connect family doctors with surveillance systems, so that they can communicate climate health risks to the population and support advocacy actions (Lauriola et al., 2019). The Italian Sentinel Physicians for the Environment Network (in Italian RIMSA) is an initiative, that was initiated in 2017, as part of the preparatory process of the G7 health experts working group, and funded by the Italian Ministry of Health. A cycle of courses was conducted to train trainers among Italian FDs/FPs to respond with local actions to global environmental and health concerns, supported by ISDE Italy and the National Federation of Physician Colleges (FNOMCeO).

FDs' and pediatricians' educational needs assessment on CC

Figure 3 and Table 2 show the articles dealing with Family doctors' educational needs assessment and training/education on CC.

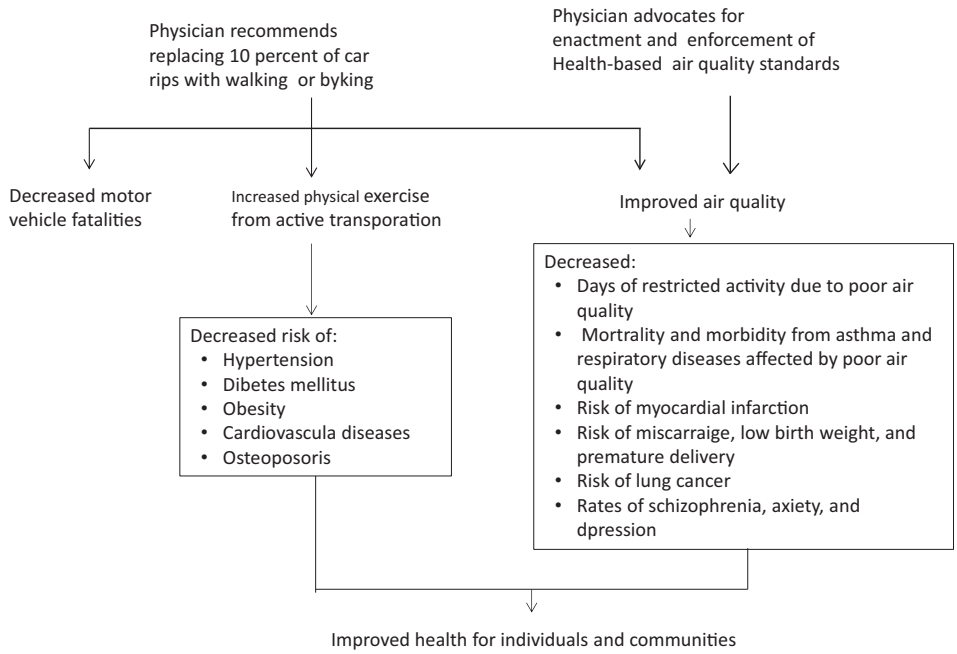


FIGURE 2 Health benefits due to physician advocacy at the patient and community levels. *Source*: Parker (2011), modified

Four out of 167 articles were selected for inclusion in Table 3. There was a large numbers of articles addressing these issues, but the vast majority were commentaries, opinions and reviews. We were able to find only a few original research studies: Two reported educational interventions targeting specifically FDs, and two investigated the family doctors' educational needs related to CC and EH. One of the studies (Fogarty et al., 2008) that reported an intervention included a baseline and follow-up survey assessment of awareness and behaviors.

Family Doctors and Paediatricians' surveillance networks

Figure 4 and Table 3 show articles dealing with FD networks engaged in the Health effects of CC.

We included articles involving veterinarians and the general public (Lieskea & Lloydb, 2018). This was one of the very few examples of a surveillance network dealing with the health effects of CC effects that we retrieved. It is also important because it highlights the One-Health approach, and it both collected and analyzed data regarding locally based EH surveillance in relation to CC.

DISCUSSION OF THE RESULTS

The most striking issue which emerged from our review is the scarcity of FDs'/FPs' involvement in programs dealing with CC and health, either at global or local level.

FDs' and pediatricians' educational need assessment on CC

Most of the reports retrieved dealt with physician's perceptions and educational needs on CC and health. There is a clear discrepancy between CC concerns and needs on the one hand, and physician's lack of preparedness on the other hand. To address such a gap, a significant educational strategy needs to be implemented.

In addition, some studies underline the need for practitioners to be equipped to cope with an increased demand for mental health services and populations who are increasingly struggling with socioeconomic disadvantage, family disruption and loss (Purcell & McGirr, 2014).

Incentives will need to be provided to engage general practice clinics in adopting environmentally sustainable practices (Fogarty et al., 2008). Walsh (2018) demonstrated the beneficial effect of a web-based e-learning platforms that can reduce the carbon footprint.

FDs' and pediatricians' surveillance network

We found that the best-developed examples of FDs'/FPs sentinel networks are in the field of vector-borne diseases (VBD). As previously mentioned, VBDs show a strong geographical lack of uniformity. They are described by the term “focal diseases” (Aström et al., 2012; Schaffner & Mathis, 2014). This illustrates that global strategies addressing CC should be implemented locally. COVID-19 pandemic showed how important it is (Lauriola et al., 2021).

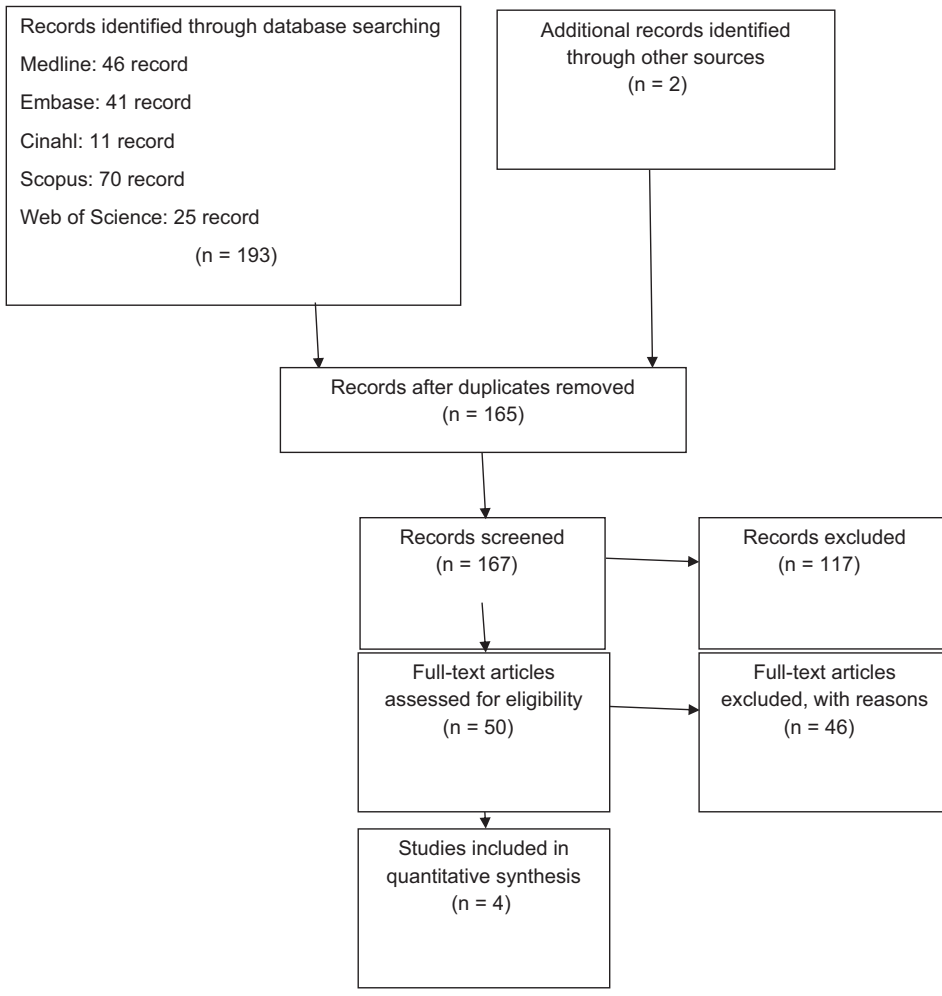


FIGURE 3 Flow Chart: Family doctors and pediatricians' educational need assessment on climate change (From Moher et al., 2009)

Soebiyanto et al. (2015) working in European and middle eastern countries, demonstrated that FDs can be very positively integrated into a system investigating the relationship between weather condition and influenza spread. Other interesting examples of Sentinel Physicians for the Environment networks are from Mozambique (Gudo et al., 2016) and Madagascar (Florian et al., 2017) as described in Table 4.

CONCLUSIONS AND PERSPECTIVES

Following our very preliminary wide literature search in field of Sentinel Doctors Network (Lauriola et al., 2018), finding such a complex and heterogeneous body of literature legitimated the need to focus on FDs/FPs addressing EH threats and in particular CC health threats across the world. According to Munn et al., (2018), we carried a scoping review as a

TABLE 2 Family doctors (FDs) and pediatricians' (FPs') awareness and training/education on climate change (CC)

Article's title	Type of activity	Who promoted/ headed the educational intervention or needs assessment	Target	Topic	Duration	Teaching/ Learning plaform or technique or survey platform	Re-sponse rate (if survey)	Results
The Green Clinic pilot: Educational intervention for environmentally sustainable general practice (Fogarty et al., 2008)	Baseline assessment survey + Educational intervention + follow-up survey	Australian Conserva-tion Foundation and Doctors for the Environment Australia.	20 FDs	Presentations on current environmental issues, the roles of health care professionals, and a discussion of the 10 "Greening your clinic" tips: Energy use, water use and waste management.	6 months	Educational face-to-face intervention	NM	There were self-reported improvements in the areas of water, energy use and waste minimization.
Teaching home environmental health to resident physicians (Zickafoose et al., 2011)	Educational intervention	U.S. Department of Housing and Urban Develop-ment (HUD)	95 (FDs, FPs Ped, soc. work., stu-dents)	Housing-related Environmental Health hazards	3 years	Educational intervention (basic theoretical introduction to home health hazards + home environmental health principles) + in-home intervention tutored by certified Healthy Home practitioner	NM	100% rated the program as a "useful experience" or better (61% "very useful experience") and a majority (79%) indicated that the experience had changed their clinical practice.

(Continues)

TABLE 2 (Continued)

Article's title	Type of activity	Who promoted/ headed the educational intervention or needs assessment	Target	Topic	Duration	Teaching/ Learning plaform or technique or survey platform	Re-sponse rate (if survey)	Results
Preparing rural general practitioners and health services for climate change and extreme weather (Purcell & McGirr, 2014)	General survey	University department	FDs (rural areas)	Health impact of CC; Health impact of CC on vulnerable populations; preparedness of rural health service to CC Health impact;	NM	Online survey	27%	"(1) The majority of FDs recognize the reality of CC, its health impact and its anthropogenic nature, but some of them did not; (2) many GPs were uncertain as to the capacity of their health service to respond to a range of extreme weather."
The health impacts of climate change: a continuing medical education needs assessment framework (Valois et al. 2016)	Educational needs assessment for continuing medical education (CME)	University Department (Founded by Green Fund)	35 FDs, CME specia-lists	(1) FDs key beliefs and factors required to FD's satisfaction related to participating in a CME activity related to CC; (2) CC learning needs regarding: a-general knowledge about CC	NM	Qualitative interview and quantitative online survey	67%	(1) All the participants believed that FDs have little knowledge about the health impacts of CC and that CME (2) interactive training (3) each of the proposed training theme was identified as an educational need.

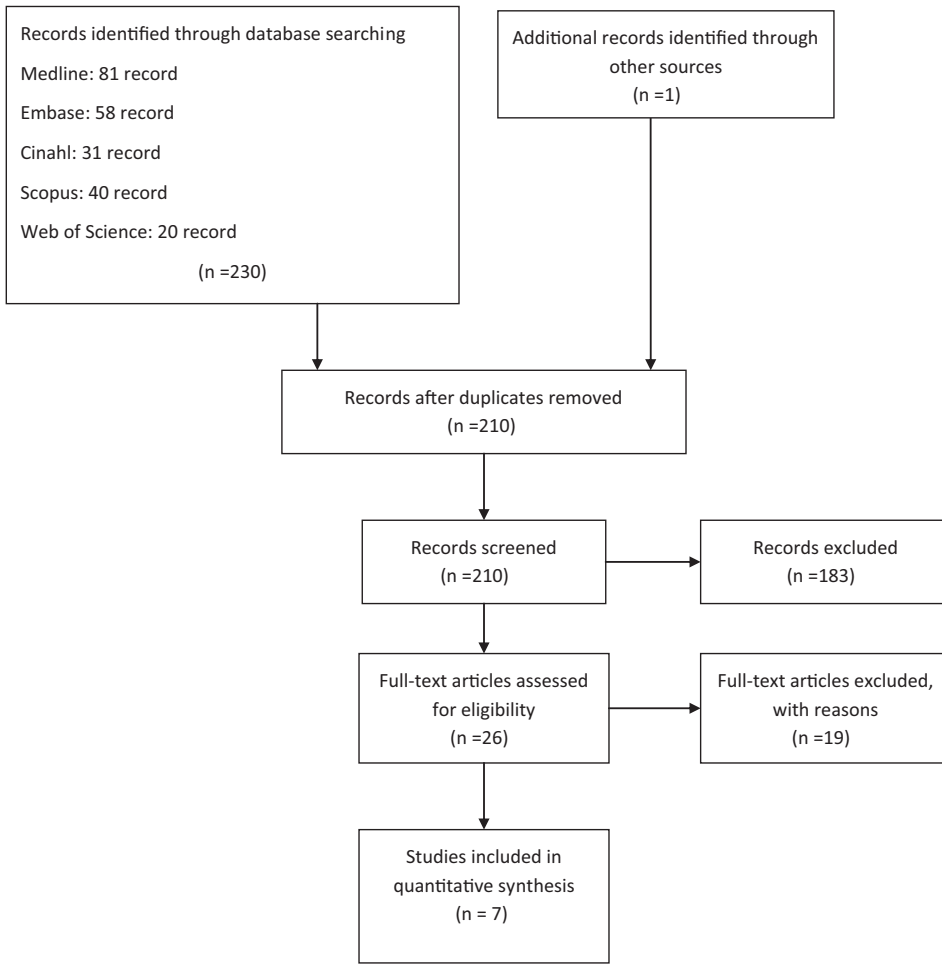


FIGURE 4 Flow Chart: Family Doctors and Pediatricians' Surveillance Networks. From Moher et al. (2009)

precursor to a systematic review and this can be used to confirm the relevance and describe in more detail the features of such a promising opportunity.

The approaches in Germany and South Korea demonstrated the benefits of involving FDs and primary health care services in the public health responses to COVID-19 at the local and global level (Fischhoff, 2020). Success depends on collaboration between FDs/FPs and local and national public health organizations, allowing primary care services to contribute to the public health response, especially in terms of case identification and contact tracing at the community level (Lauriola et al., 2021). Some important examples illustrating this come from China (Harlan et al., 2020).

The scoping review shows that, even before the COVID-19 experience, FDs' investigation in relation to the environment of their community most frequently dealt with VBD. Many VBDs are strongly linked to CC, and they can be adequately addressed by adopting a "one-health" approach, which is now universally accepted as a useful approach in addressing emergencies such as COVID-19 pandemic.

TABLE 3 Family doctors and pediatricians' surveillance networks

Article's title	Who promoted/ headed the network	Aiming at	Data collected. How?	Results in terms of public health actions (laws, communication)	How long is it working?
Are environmental medicine problems relevant in Switzerland? (Hussa et al., 2004)	Swiss Sentinel Surveillance network	To quantify the number of environmental consultations	Questionnaire		
Tick-related diseases in Switzerland, 2008 to 2011 (Altpeter et al., 2013)	"Sentinella: Swiss Sentinel Surveillance	To describe the incidence and its determinants (e.g., year, age, sex, and residency) of tick bites, Lyme borreliosis, and tick-borne encephalitis	The mandatory surveillance database of tick-borne encephalitis links laboratory and clinical information. Tick-borne encephalitis cases were included according to defined criteria (see article)	Public health supporting research	2008–
Associations between meteorological parameters and influenza activity in Berlin (Germany), Ljubljana (Slovenia), Castile and León (Spain), and Israeli districts (Soebiyanto et al., 2015)	"NASA Applied Sciences Public Health program and CDC	To assess the associations between meteorological parameters and influenza activity in Berlin (Germany), Ljubljana (Slovenia), Castile and León (Spain), and Israeli districts	They investigated the link between meteorological parameters and influenza activity in nine subnational areas with temperate and subtropical climates: Berlin (Germany), Ljubljana (Slovenia), Castile and León (Spain), and all six districts in Israel.	They estimated weekly influenza-associated influenza-like-illness or acute respiratory infection incidence to represent influenza activity using data from each country's sentinel surveillance during 2000–2011 (Spain) and 2006–2011 (all others). Meteorological data was obtained from ground stations, satellite and assimilated data. Two generalized additive models (GAM) were developed, with one using specific humidity as a covariate and another using minimum temperature. Precipitation and solar radiation were included as additional covariates in both models.	2015

TABLE 3 (Continued)

Article's title	Who promoted/ headed the network	Aiming at	Data collected. How?	Results in terms of public health actions (laws, communication)	How long is it working?
The use of syndromic surveillance to monitor the incidence of arthropod bites requiring health care in England, 2000–2013: A retrospective ecological study (Newitt et al., 2016)	PHE	To use Syndromic surveillance to enable the early identification of th impact of potential human and veterinary public health threats that require effective public health action	National real-time syndromic surveillance systems monitoring general practitioner (GP) consultations (in-hours and out-of-hours), emergency department (ED) attendances and telephone calls to remote advice services	Public health supporting research	
Mozambique experience in implementing One Health Surveillance as an innovative tool to understand the risk of spillover of emerging and zoonotic infections between wildlife and humans (Gudo et al., 2016)	Ministry of Health	Not mentioned	(i) Surveillance of zoonotic diseases in febrile patients attended at the local district hospital, (ii) surveillance of zoonotic diseases in cattle, pigs, poultry and micro mammals (bats and rodents), and (iii) entomologic investigation mostly in mosquitoes and ticks.	Not mentioned	2016–?
Analysing trends and forecasting malaria epidemics in Madagascar using a sentinel surveillance network: A web-based application (Florian et al., 2017)	The Institut Pasteur de Madagascar (IPM) and the Malagasy Ministry of Health (MoH)	(i) To assess the benefits of a Malaria Earky Waerning System (MEWS) including not only early detection but also forecasting based on a sentinel surveillance system, (ii) to maximize the potential of the sentinel surveillance system by innovative but simple explorations of	This study describes a system using various environmental and meteorological data with the support of new technologies to improve the performance of a sentinel Malaria-related data from 21 sentinel sites collected by Short Message Service which are automatically analyzed to detect and forecast malaria trends and malaria outbreak	The system assesses data as soon as they are made available and disseminates the information by means of the Internet and smartphone to all involved health professionals to help in the rapid interpretation and subsequent action to control any suspected malaria outbreak.	2007–

(Continues)

TABLE 3 (Continued)

Article's title	Who promoted/ headed the network	Aiming at	Data collected. How?	Results in terms of public health actions (laws, communication)	How long is it working?
		population health data, and (iii) to provide practical examples and suggestions for use in other systems or settings	alerts with automated feedback reports		
Combining public participatory surveillance and occupancy modelling to predict the distributional response of Ixodes scapularis to climate change (Lieskea & Lloyd, 2018)	Mount Allison University, Canada	To develop occupancy modeling of adult ticks that successfully overwintered, obtained through passive surveillance	Members of participating veterinary clinics and the general public, submitted specimens to Mount Allison University	Implementation of an occupancy modeling, which permits the differentiation of probability of detection from probability from probability of occurrence and allows the prediction of tick distribution in areas that might otherwise be poorly surveyed. Such evidence would facilitate the selection of sites for more intensive field-based monitoring and public risk communication.	2014–2016

TABLE 4 Professional profile of Sentinel Physicians for the Environment

Epidemiological duties

- To be able to extrapolate some significant signals of an environmentally driven threat from what the patient is referring to
- To collect information for a case history which can make plausible the relation between an environmental condition (dwelling, occupation, habits, hygienic conditions, and cultural history) and a health effect
- To gather evidence of exposure to a consistent risk factor
- To investigate the health problem by choosing the most appropriate and suitable human biomarker preferably by giving more importance to pre-morbidity ones
- To gather evidence of the disease
- To accurately report the environmentally driven health issue to the institutional referent in an appropriate manner
- To investigate if the problem could involve any other member of the community.

Advocacy duties

- To adopt the precautionary principle and responsibility dealing with environmental health threats
- To influence and support the decisional authority
- To promote collaboration actions among associations, movements, citizens' committees, political parties, and institutions in charge of environmental health protection and promotion.
- To represent a sort of clearinghouse among population and institutions to mediate conflicts related to environment and health.
- To inform the local authorities about possible environmental problems that could represent risks for their patients' health
- To collaborate and pool with other disciplines/institutions representatives, experts, and consultants effectively and proactively
- To publish experiences in the field of environmental health threats, mainly those about the community where the physician operates
- To educate his/her patients and their own family
  - o To promote a healthy lifestyle behavior (open-air physical activity, looking after indoor air quality, avoiding overuse of detergents and pesticides…)
  - o To be aware of and to recognize the potential risk factors pervading indoor and outdoor environments and to advise patients how to reduce their exposition
  - o To save natural resources as a whole

In addition, some of the most interesting experiences have been carried out in LMICs. One reason is surely because the biggest challenges relating to environmental and CC are being felt in LMIC, and more by the poorest communities globally.

We suggest that capacity building efforts in CC in particular, and in EH issues as a whole, must be addressed differently across different communities, with a particular focus in those communities that face most of environmental and CC challenges.

Our initial preliminary review (Lauriola et al., 2018) pointed out that most experiences dealing with FDs/FPs sentinel networks focused on clinical and organizational issues. Only a handful of studies (15 over 6691) were related to EH, suggesting that only sporadic experience, based on some specific circumstances, has been acquired. These findings showed that knowledge and recognition of EH issues might not be common among physicians.

This study confirms that the experiences are sporadic even though many researchers/experts admit that they could be essential, as in the case of COVID-19.

The main reasons are:

1. The features of environmentally driven phenomena such as health effects are very complex in terms of how they can be interpreted, with both direct and complex indirect pathways linking health risk and protective factors and the environment.
2. Difficulties in collaborating with other organizations:

a. Healthcare authorities and environmental/meteorological agencies which do not support complementary data collection and interpretation;
b. Other organizations which might have different motivations such as industries, transit agencies, and trade unions.

3. The essential role of a General Practice Network is to couple the epidemiological research and data with interventions by FDs/FPs in their community either at the individual or collective level, including from global threats such as CC.

As such, to face such hurdles, it is essential to guarantee:

- Specific, useful, and motivating training of FDs/FPs in these fields, with the goal of creating a professional profile based on epidemiological and advocacy duties (as it is detailed in Tab. 5).
- Sound science by providing to FDs support in research and data.
- Clear and effective communication strategies among FDs/FPs, their patients, their communities, and policymakers.

It is also important to recognize that FDs can identify other issues such as mental/psychological health, and malnutrition, occurring as a result of indirect impacts of CC (violence, conflict, security, disasters, and food security). This discussion should enlarge the role of FDs, to extend to global health issues, in particular in those most vulnerable communities who will suffer from both direct and indirect impacts of CC.

There are other tragic global conditions, for example, malnutrition, waterborne diseases, and infectious diseases which should be considered not only for their direct health effects but also for the social aftermath such as increasing poverty, inequality and migrations (Hales et al., 2014; Schütte et al., 2018; Watts et al., 2017). All these conditions are not adequately assessed in developing countries through current standard statistics and should be duly considered in the Planetary Health perspective. All these concerns are inextricably linked to CC.

In the training of FDs/FPs and their integration into surveillance and implementation systems, it would be prudent to prioritize the most pressing issues, assess the feasibility of interventions, implement using to a phased approach.

In sum family practitioners, with additional training, can and should play an expanded role in selected areas (such as communicable disease control and disaster management). But it may be overly ambitious to expect the inclusion of multiple other conditions such as obesity and hypertension, where family practitioners are focused on behavioral changes, including for nutrition and physical activity.

To summarize two points emerged from our investigation:

1. The important role of FDs/FPs, based on their credibility and respect, in influencing individual and collective attitudes is globally recognized;
2. Whenever FDs/FPs are involved in epidemiological research, in particular in environmental issues, their role does not extend beyond data collection; a missed opportunity!

The authors suggest that FDs/FPs essential role in connecting global concerns with local actions could be much more effective if they are trained to be effectively involved in the research and interventions regarding the EH of the communities where they live and work.

FUNDING

All authors are funded by their institutions to write and contribute to this article. All authors affirm not having entered into an agreement with the funder that may have limited their ability to complete the research as planned and all authors indicate that they have had full control of all primary data.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

None declared.

REFERENCES

Abelsohn, A., Rachlis, V., & Vakil, C. (2013). Climate change: Should family physicians and family medicine organizations pay attention? *Canadian Family Physician = Médecin de Famille Canadien*, *59*(5), 462–466.

Ahmad, T., & Hui, J. (2020). One Health approach and coronavirus disease 2019. *Human Vaccines & Immunotherapeutics*, *16*(4), 931–932. https://doi.org/10.1080/21645515.2020.1732168

Allard, G. D. (2002). The 'farm to plate' approach to food safety—Everyone's business. *The Canadian Journal of Infectious Diseases = Journal Canadien des Maladies Infectieuses*, *13*(3), 185–190.

Altpeter, E., Zimmermann, H., Oberreich, J., Péter, O., Dvořák, C., & Swiss Sentinel Surveillance Network. (2013). Tick related diseases in Switzerland, 2008 to 2011. *Swiss Medical Weekly*, *143*, w13725. https://doi.org/10.4414/smw.2013.13725

Amuasi, J. H., Walzer, C., Heymann, D., Carabin, H., Huong, L. T., Haines, A., & Winkler, A. S. (2020). Calling for a COVID-19 One Health Research coalition. *The Lancet*, *395*, 10236–11544. https://doi.org/10.1016/S0140-6736(20)31028-X

Andersen, K. G., Rambaut, A., Lipkin, W. I., Holmes, E. C., & Garry, R. F. (2020). The proximal origin of SARS-CoV-2. *Nature Medicine (New York, NY)*, *26*, 450–452. https://doi.org/10.1038/s41591-020-0820-9

Anikeeva, O., Cornell, V., Steenkamp, M., & Arbon, P. (2016). Opportunities for general practitioners to enhance disaster preparedness among vulnerable patients. *Australian Journal of Primary Health*, *22*, 283–287. https://doi.org/10.1071/PY15156

Aström, C., Rocklöv, J., Hales, S., Béguin, A., Louis, V., & Sauerborn, R. (2012). Potential distribution of dengue fever under scenarios of climate change and economic development. *EcoHealth*, *9*, 448–454.

Balci, E., Borlu, A., Kilic, A. U., Demiraslan, H., Oksuzkaya, A., & Doganay, M. (2014). Tularemia outbreaks in Kayseri, Turkey: An evaluation of the effect of climate change and climate variability on tularemia outbreaks. *Journal of Infection and Public Health*, *7*, 125–132.

Belkin, G. (2020). Leadership for the social climate. *New England Journal of Medicine*, *382*(21), 1975–1977.

Blashki, G., Abelsohn, A., Woollard, R., Arya, N., Parkes, M. W., Kendal, P., Bell, E., & Bell, R. W. (2012). General practitioners' responses to global climate change—Lessons from clinical experience and the clinical method. *Asia Pacific Family Medicine*, *11*(1), 6. https://doi.org/10.1186/1447-056X-11-6

Blashki, G., McMichael, T., & Karoly, J. D. (2007). Climate change and primary health care. *Australian Family Physician*, *36*(12), 986–989.

Boland, M. T., & Temte, L. J. (2019). Family medicine patient and physician attitudes toward climate change and health in Wisconsin. *Wilderness & Environmental Medicine*, *30*(4), 386–393.

Bonilla-Aldana, D. K., Dhama, K., & Rodriguez-Morales, J. A. (2020). Revisiting the One Health approach in the context of COVID-19: A look into the ecology of this emerging disease. *Advances in Animal and Veterinary Sciences 8*(3), 234–236.

Boyer, E., Lazarus, C., Messina-Gourlot, C., & Salomon, J. (2019). Health professionals are the cornerstone of public health security. *The Lancet Public Health*, *4*(6), e276–e277. https://doi.org/10.1016/S2468-2667(19)30088-X

Brown, L. (2016). Preparing for the public health challenges of climate change, perspectives from local public health. *Journal of Public Health Management and Practice*, *22*(1), 102–104.

Buka, I., & Shea, M. K. (2019). Global climate change and health in Canadian children. *Paediatrics & Child Health*, *24*(8), 557–558. https://doi.org/10.1093/pch/pxz157

Burns, P., Douglas, K., & Hu, W. (2019). Primary care in disasters: Opportunity to address a hidden burden of health care. *Medical Journal of Australia*, *210*(7), 297–299. https://doi.org/10.5694/mja2.50067

Buse, C., G., Oestreicher, J. S., Ellis, N. R., Patrick, R., Brisbois, B., Jenkins, A. P., McKellar, K., Kingsley, J., Gislason, M., Galway, L., McFarlane, R. A., Walker, J., Frumkin, H., & Parkes, M. (2018). Public health guide

to field developments linking ecosystems, environments and health in the Anthropocene. *Journal of Epidemiology and Community Health*, *72*(5), 420–425. https://doi.org/10.1136/jech-2017-210082

CCAC. (2019). UN urges governments to act on climate and air pollution for health's sake. https://www.ccacoalition.org/en/news/un-urges-governments-act-climate-and-air-pollution-health%27s-sake-0

CCAC. (2021). What are short-lived climate pollutants? https://www.ccacoalition.org/en/content/short-lived-climate-pollutants-slcps

CDC. (2021). Disaster epidemiology. https://www.cdc.gov/nceh/hsb/disaster/epidemiology.htm

Cheng, G. Y. J., Lee, M.-K., Kung, K., Lam, A., & Li, P. K. T. (2008). A mysterious eruption in winter within the local community. *The Hong Kong Practitioner*, *30*(4), 223–230. https://www.hkcfp.org.hk/Upload/HK_Practitioner/2008/hkp2008vol30dec/case_report

Dahlgren, G., & Whitehead, M. (1991). *Policies and strategies to promote social equity in health*. Institute for Futures.

Fischhoff, B. (2020). Making decisions in a COVID-19 world. *Journal of American Medical Association*, *324*(2), 139–140. https://doi.org/10.1001/jama.2020.10178

Florian, G., Randrianasolo, L., Randriamampionona, L., Rakotomanana, F., Randrianarivelojosia, M., Ratsitorahina, M., Brou, T. Y., Herbreteau, V., Mangeas, M., Zigiumugabe, S., Hedje, J., Rogier, C., & Piola, P. (2017). Analysing trends and forecasting malaria epidemics in Madagascar using a sentinelsurveillance network: A web-based application. *Malaria Journal*, *16*(1), 72. https://doi.org/10.1186/s12936-017-1728-9

Fogarty, A., Blashki, G., Morrell, E., & Horton, G. (2008). The GreenClinic pilot: Educational intervention for environmentally sustainable general practice. *Australian Journal of General Practice*, *37*(8), 681–683.

Green, A. L., Fryer, E. G., Jr., Yawn, P. B., Lanier, D., & Dovey, S. M. (2001). The ecology of medical care revisited. *New England Journal of Medicine*, *345*, 1211–1212. https://doi.org/10.1056/NEJM200110183451614

Gudo, E. S., Fafetine, J., Alho, P., & Muianga, A. F. (2016). Mozambique experience in implementing One Health Surveillance as an innovative tool to understand the risk of spillover of emerging and zoonotic infections between wildlife and humans 17th International Congress on Infectious Diseases. *International Journal of Infectious Diseases*, *45S*(1), 468.

Guggenheim, R. (2016). Out of patients. The health threat of climate change: Working in partnership with patients. *British Journal of General Practice*, *66*(644), 149. https://doi.org/10.3399/bjgp16X684097

Haines, A., & Ebi, K. (2019). The imperative for climate action to protect health. *New England Journal of Medicine*, *380*, 263–273. https://doi.org/10.1056/NEJMra1807873

Hales, S., Kovats, S., Lloyd, S., & Campbell-Lendrum, D. (2014). *Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s*. World Health Organization.

Haque, M. A., Budi, A., Azam Malik, A., Suzanne Yamamoto, S., Louis, V. R., & Sauerborn, R. (2013). Health coping strategies of the people vulnerable to climate change in a resource-poor rural setting in Bangladesh. *BMC Public Health*, *13*, 565. http://www.biomedcentral.com/1471-2458/13/565

Harlan, X. L., Krumholz, H. M., Yip, W., Cheng, K. K., De Maeseneer, J., Meng, Q., Mossialos, E., Li, C., Lu, J., Su, M., Zhang, Q., Xu, D. R., Li, L., Normand, S. L. T., Peto, R., Li, J., Wang, Z., Yan, H., Gao, R., … Hu, S. (2020). Quality of primary health care in China: Challenges and recommendations. *The Lancet*, *395*, 1802–1812.

Hueffer, K., Parkinson, J. A., Gerlach, R., & Berner, J. (2013). Zoonotic infections in Alaska: Disease prevalence, potential impact of climate change and recommended actions for earlier disease detection, research, prevention and control. *International Journal of Circumpolar Health*, *72*(1), 19562. https://doi.org/10.3402/ijch.v72i0.19562

Hussa, A., Küchenhoffb, J., Bircherc, A., Niederer, M, Tremp, J., Waeber, R, Braun-Fahrländer, C., & Swiss Sentinel Surveillance Network. (2004). Are environmental medicine problems relevant in Switzerland? *Swiss Medical Weekly*, *134*(33–34), 500–507. https://www.smw.ch

Karakecili, F., Cikman, A., Aydin, M., Binay, U. D., Kesik, O. A., & Ozcicek, F. (2018). Evaluation of epidemiological, clinical, and laboratory characteristics and mortality rate of patients with Crimean–Congo hemorrhagic fever in the northeast region of Turkey. *Journal of Vector Borne Diseases*, *55*, 215–221.

Karesh, W. B., Dobson, A., Lloyd-Smith, J. O., Lubroth, J., Dixon, M. A., Bennett, M., Aldrich, S., Harrington, T., Formenty, P., Loh, E. H., Machalaba, C. C., Thomas, M. J., & Heymann, D. L. (2012). Ecology of zoonoses: Natural and unnatural histories. *The Lancet*, *380*, 1936–1945.

Kumar, A. (2018). *Doctors as active advocates for clean air*. Paper presented at the 1st WHO Air Pollution Conference, Geneva, Switzerland. https://www.who.int/airpollution/events/conference/CAPH1_Plenary_session_VII.1_LCF_Arvind_Kumar.pdf?ua=1

Lauriola, P., Leonardi, G., Bayleyeg, T. M., Schnall, A. H., Di Ciaula, A., Malilay, J., Santamaria, S., Louca, S., & Behbod, B. (2019). Natural disaster—Environmental health preparedness. In J. Nriagu (Ed.), *Encyclopedia of environmental health* (pp. 563–573). Elsevier. https://www.sciencedirect.com/science/article/pii/B9780124095489111406?via%3Dihub

Lauriola, P., Martín-Olmedo, P., Leonardi, G. S., Bouland, C., Verheij, R., Dückers, M., van Tongeren, M., Laghi, F., van den Hazel, P., Gokdemir, O., Segredo, E., Etzel, R. A., Abelsohn, A., Bianchi, F., Romizi, R., Miserotti, G., Romizi, F., Bortolotti, P., Vinci, E., … Zeka, A. (2021). On the importance of primary and community health care in relation to global health and environmental threats: Lessons from the COVID-19 crisis. *BMJ Global Health*, *6*, e004111. https://doi.org/10.1136/bmjgh-2020-004111

Lauriola, P., Pegoraro, S., Serafini, A., Murgia, V., Di Ciaula, A., De Tommasi, F., Rossci, A., Santamaria, M., Toffol, G., Bianchi, F., Romizi, R., Vinci, E., Behbod, B., Zeka, A., Verheij, R., Leonardi, G., & Agius, R. (2018). The role of general practices for monitoring and protecting the environment and health. Results and proposals of the italian project aimed at creating an "Italian Network of Sentinel Physicians for the Environment" (RIMSA) within an international perspective. *Journal of Family Medicine & Community Health*, *5*(5), 1160. http://jscimedcentral.com/FamilyMedicine/familymedicine-5-1160.pdf

Lauriola, P., Serafini, A., Santamaria, M. G., Pegoraro, S., Romizi, F., Di Ciaula, A., Terzano, B., deTommasi, F., Cordiano, V., Guicciardi, S., Bernardi, M., Leonardi, G., Romizi, R., Vinci, E., & Bianchi, F. (2019). Sentinel practitioners for the environment and their role in connecting up global concerns due to climate change with local actions: Thoughts and proposals. *Epidemiologia E Prevenzione*, *43*(2–3), 129–130. https://doi.org/10.19191/EP19.2-3.P129.05

Lawson, E. (2019). Meeting the climate change challenge. *British Journal of General Practice*, *69*(684), 343. https://doi.org/10.3399/bjgp19X704333

Leblebicioglu, H. (2010). Crimean-Congo haemorrhagic fever in Eurasia. *International Journal of Antimicrobial Agents*, *36*, S43–S46.

Lieskea, D. J., & Lloyd, V. K. (2018). Combining public participatory surveillance and occupancy modelling to predict the distributional response of Ixodes scapularis to climate change. *Ticks and Tick-Borne Diseases*, *9*, 695–705.

Lodge, A. (2015). Anthropogenic climate change is here Family physicians must respond to the crisis. *Canadian Family Physician = Médecin de Famille Canadien*, *61*(7), 582–583.

Maller, C., Townsend, M., & Brown, P. (2002). *Healthy parks healthy people. The health benefits of contact with nature in a park context: A review of current literature*. Deakin University and Parks Victoria, Melbourne.

McMichael, T. (2001). *Human frontiers, environments and disease: Past patterns, uncertain future*. Cambridge University Press.

Mehta, A. (2009). Physicians' contribution to climate change. *Canadian Medical Association Journal/Journal de l'Association Medicale Canadienne*, *180*(11), 1176. https://doi.org/10.1503/cmaj.090769

Michelozzi, P., de' Donato, F. K., Bargagli, A. M., D'Ippoliti, D., deSario, M., Marino, C., Schifano, P., Cappai, G., Leone, M., Kirchmayer, U., Ventura, M., di Gennaro, M., Leonardi, M., Oleari, F., deMartino, A., & Perucci, C. A. (2010). Surveillance of summer mortality and preparedness to reduce the health impact of heat waves in Italy. *International Journal of Environmental Research and Public Health*, *7*(5), 2256–2273. https://doi.org/10.3390/ijerph7052256

Moher, D., Liberati, A., Tetzlaff, J., Altman, G. D., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLOS Medicine*, *6*(6), e1000097. https://doi.org/10.1371/journal.pmed1000097

Munn, Z., Peters, M., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, *18*, 143. https://doi.org/10.1186/s12874-018-0611-x.

Murgia, V., Romizi, F., Romizi, R., deWaal, P., Bianchi, F., deTommasi, F., Calgaro, M., Pegoraro, S., Santamaria, M. G., Serafini, A., Vinci, E., & Leonardi, G. (2020). Family doctors, environment and COVID-19 in Italy: Experiences, suggestions and proposals. *British Medical Journal*, *368*, m627. https://www.bmj.com/content/368/bmj.m627/rr-37

National Geographic. (2019). Climate Change. https://www.nationalgeographic.org/encyclopedia/climate-change

Newitt, S., Elliot, A. J., Morbey, R., Durnall, H., Pietzsch, M. E., Medlock, J. M., Leach, S., & Smith, G. E. (2016). The use of syndromic surveillance to monitor the incidence of arthropod bites requiring healthcare in England 2000–2013: A retrospective ecological study. *Epidemiology & Infection*, *144*(11), 2251–2259. https://doi.org/10.1017/S0950268816000686

Parise, I. (2018). A brief review of global climate change and the public health consequences. *The Royal Australian College of General Practitioners*, *47*(7), 452.

Parker, L. C. (2011). Slowing global warming: Benefits for patients and the planet. *American Family Physician*, *84*(3), 271–278.

Parker, L. C., Wellbery, E. C., & Mueller, M. (2019). The changing climate: Managing health impacts. *American Family Physician*, *100*(10), 618–626.

Pearce, N., Vandenbroucke, P. J., & Lawlor, A. D. (2019). Causal inference in environmental epidemiology: Old and new approaches. *Epidemiology*, *30*(3), 311–316. https://doi.org/10.1097/EDE.0000000000000987

Phipps, R., Randerson, R., & Blashki, G. (2011). The climate change challenge for general practice in New Zealand. *New Zealand Medical Journal*, *124*(1333), 47–54.

Pongsiri, M. J., Bickersteth, S., Colón, C., DeFries, R., Dhaliwal, M., Georgeson, L., Haines, A., Linou, N., Murray, V., Naeem, S., Small, R., & Ungvari, J. (2019). Planetary health: From concept to decisive action. *The Lancet Planetary Health*, *3*, e402–e406.

Purcell, R., & McGirr, J. (2014). Preparing rural general practitioners and health services for climate change and extreme weather. *Australian Journal of Rural Health*, *22*(1), 8–14.

Rabinowitz, P. M., Pappaioanou, M., Bardosh, K. L., & Conti, L. (2018). A planetary vision for one health. *BMJ Global Health*, *3*, e001137. https://doi.org/10.1136/bmjgh-2018-001137

Randolph, S., & Ergönül, Ö. (2008). Crimean-Congo hemorrhagic fever: Exceptional epidemic of viral hemorrhagic fever in Turkey. *Future Virology*, *3*(4), 303–306.

Rocklöv, J., Bao Giang, K., H., Ebi, K., Nilsson, M., Sahlen, K. G., Weinehall, L., & van Minh (2014). Local research evidence for public health interventions against climate change in Vietnam. *Global Health Action*, *7*(1), 26552. https://doi.org/10.3402/gha.v7.26552

Sankoff, J. (2015). Heat illnesses: A hot topic in the setting of global climate change. *Australian Family Physician*, *44*(1–2), 22–26.

Schaffner, F., & Mathis, A. (2014). Dengue and dengue vectors in the WHO European region: Past, present, and scenarios for the future. *The Lancet Infectious Diseases*, *14*, 1271–1280.

Schütte, S., Gemenne, F., Zaman, M., Flahault, A., & Depoux, A. (2018). Connecting planetary health, climate change, and migration. *The Lancet*, *2*(2), e58–e59. https://doi.org/10.1016/S2542-5196(18)30004-4

Şekercioğlu, Ç. H. (2013). Guineafowl, ticks and Crimean-Congo hemorrhagic fever in Turkey: The perfect storm? *Trends in Parasitology*, *29*(1), 1–2.

Smith, K. F., Goldberg, M., Rosenthal, S., Carlson, L., Chen, J., Chen, C., & Ramachandran, S. (2014). Global rise in human infectious disease outbreaks. *Journal of the Royal Society Interface*, *11*(101), 20140950. https://doi.org/10.1098/rsif.2014.0950

Smith, S., Elliot, A., Hajat, S., Bone, A., Bates, C., Smith, G., & Kovats, S. (2016). The impact of heatwaves on community morbidity and healthcare usage: A retrospective observational study using real-time syndromic surveillance. *International Journal of Environmental Research and Public Health*, *13*(1), 132. https://doi.org/10.3390/ijerph13010132.html

Smith, S., Elliot, A. J., Hajat, S., Bone, A., Smith, G. E., & Kovats, S. (2016). Estimating the burden of heat illness in England during the 2013 summer heatwave using syndromic surveillance. *Journal of Epidemiology and Community Health*, *70*, 459–465. https://doi.org/10.1136/jech-2015-206079

Soebiyanto, R. P., Gross, D., Jorgensen, P., Buda, S., Bromberg, M., Kaufman, Z., Prosenc, K., Socan, M., Vega Alonso, T., Widdowson, M. A., & Kiang, R. K. (2015). Associations between meteorological parameters and influenza activity in Berlin (Germany), Ljubljana (Slovenia), Castile and León (Spain) and Israeli districts. *PLOS One*, *10*(8), e0134701. https://doi.org/10.1371/journal.pone.0134701

Solomon, G. C., & LaRocque, C. R. (2019). Climate change. A health emergency. *New England Journal of Medicine*, *380*, 209–211. https://doi.org/10.1056/NEJMp181706

Stenberg, K., Hanssen, O., Bertram, M., Brindley, C., Meshreky, A., Barkley, S., & Tan-Torres Edejer, T. (2019). Guide posts for investment in primary health care and projected resource needs in 67 low-income and middle-income countries: A modelling study. *The Lancet*, *7*(11), e1500–e1510. https://doi.org/10.1016/S2214-109X(19)30416-4

Tait, W. P., Allan, S., & Katelaris, L. A. (2018). Preventing heat-related disease in general practice. *Australian Journal of General Practitioners*, *47*(12), 851–854.

United Nations Environment Programme. (2020). Six nature facts related to coronaviruses, 08 APR. https://www.unenvironment.org/news-and-stories/story/six-nature-facts-related-coronaviruses

United Nations General Assembly. (2015). Resolution adopted by the General Assembly, Transforming our world: The 2030 Agenda for Sustainable Development.

Valois, P., Blouin, P., Ouellet, C., Renaud, J. S., Bélanger, D., & Gosselin, P. (2016). The health impacts of climate change: A continuing medical education needs assessment framework. *Journal of Continuing Education in the Health Professions*, *36*(3), 218–225. https://doi.org/10.1097/CEH.0000000000000084

van Casteren, V. (1993). Eurosentinel. In: N. G. Fracchia, & M. Theofilatou (Eds.), *Health services research. Commission of the European Communities* (pp. 253–262). Directorate-General for Science, Research, and Development. IOS Press.

Vatansever, Z., Uzun, R., Estrada-Pena, A., & Ergonul, O. (2007). Crimean-Congo hemorrhagic fever in Turkey. In: O. Ergonul, & C. A. Whitehouse (Eds.), *Crimean-Congo hemorrhagic fever* (pp. 59–74). Springer.

Vogel, L. (2019). Global physician groups call on professionals to address environmental health threats. *Canadian Medical Association Journal/Journal de l'Association Medicale Canadienne*, *191*(12), E346. https://doi.org/10.1503/cmaj.109-5728

Walker, R., Hassall, J., Chaplin, S., Congues, J., Bajayo, R., & Mason, W. (2011). Health promotion interventions to address climate change using a primary health care approach: A literature review. *Health Promotion Journal of Australia*, *22*(4), 6–12.

Walsh, K. (2018). E-learning in medical education: The potential environmental impact. *Education for Primary*, *29*(2), 104–106. https://doi.org/10.1080/14739879.2017.1389619

Warby, T., & Veidis, E. (2019). Declaration calling for family doctors of the world to act on planetary health, WONCA, the PHA, and the Clinicians for Planetary Health Working Group. https://www.wonca.net/site/DefaultSite/filesystem/documents/Groups/Environment/2019%20Planetary%20health.pdf

Watts, N., Amann, M., Ayeb-Karlsson, S., Belesova, K., Bouley, T., Boykoff, M., Byass, P., Cai, W, Campbell-Lendrum, D., Chambers, J., Cox, P. M., Daly, M., Dasandi, N. M, Davies, M., Depledge, M., Depoux, A., Dominguez-Salas, P., Drummond, P., Ekins, P., … Costello, A. (2017). The Lancet Countdown on health and climate change: From 25 years of inaction to a global transformation for public health. *The Lancet*, *391*, 581–630. https://doi.org/10.1016/S0140-6736(17)32464-9

Wellbery, E. C. (2019). Climate change health impacts: A role for the family physician. *American Family Physician*, *100*(10), 602–603.

Whitmee, S., Haines, A., Beyrer, C., Boltz, F., Capon, A. G., de Souza Dias, B. F., Ezeh, A., Frumkin, H., Gong, P., Head, P., Horton, R., Mace, G. M., Marten, R., Myers, S. S., Nishtar, S., Osofsky, S. A., Pattanayak, S. K., Pongsiri, M. J., Romanelli, C., … Yach, D. (2015). Safeguarding human health in the Anthropocene epoch: Report of The Rockefeller Foundation-Lancet Commission on planetary health. *The Lancet. 386*, 1973–2028. https://doi.org/10.1016/S0140-6736(15)60901-1

World Health Organisation (WHO). (2002). *The world health report 2002: Reducing risks, promoting healthy life*.

World Health Organisation (WHO). (2021). Air pollution. http://www.who.int/airpollution/en/

World Wide Fund for Nature (WWF). (2010). Human health linked directly to forest health. https://wwf.panda.org/?unewsid=191323

Xie, E., de Barros, E. F., Abelsohn, A., Stein, A. T., & Haines, A. (2018). Challenges and opportunities in planetary health for primary care providers. *The Lancet Planetary Health*, *2*(5), 185–187.

Zickafoose, S. J., Greenberg, S., & Dearborn, G. D. (2011). Teaching home environmental health to resident physicians. *Public Health Reports*, *126*(Suppl 1), 7–13. https://doi.org/10.1177/00333549111260S103

AUTHOR BIOGRAPHIES

Paolo Lauriola, MD, is the scientific coordinator of the *Rete Italiana Medici Sentinella per l'Ambiente (RIMSA),* and the coordinator of the Sentinel Physician for the Environment working group of the International Society of Doctors for the Environment (ISDE-Int'l).

Alice Serafini, MD, is a General Practitioner at the Local Health Authority Modena, Italy, and a member of the Giotto's Steering Committee.

Mariagrazia Santamaria, MD, is a General Practitioner at the Local Health Authority, Foggia, Italy, and the President of the "Health and Environment" working group of the Medical Order of Foggia's Province.

Stefano Guicciardi, MD, is a member of the Health Directorate staff at the Bologna Local Health Authority, Bologna, Italy and a PhD candidate at the University of Bologna.

Peter K. Kurotschka, MD, is a General Practitioner at the Local Health Authority, Cagliari, Italy and a researcher of the Department of Medical Sciences and Public Health, Faculty of Medicine and Surgery, University of Cagliari, Italy.

Giovanni S. Leonardi, MD, MSc, FFPH, is the head of the Environmental Epidemiology Group of Public Health England, UK and Honorary Associate Professor at London School of Hygiene and Tropical Medicine, UK.

Ariana Zeka, MD, MSc, ScD, is Associate professor of Environmental Epidemiology and Population Health College of Health and Life Sciences Brunel University London, UK.

Evelyn Segredo, MD, is a General Practitioner at Montevideo, Uruguay, member of the Uruguayan Society of Family and Community Medicine, and co-founder of the Scientific and Technological Development Programme in Iberoamerica.

Maria C. Bassi, is an Information Specialist at the Medical Library of the Azienda USL—IRCCS di Reggio Emilia, Italy.

Ozden Gokdemir, MD, is a Family Physician at Izmir in Turkey, and a consultant of the Izmir University of Economics, Faculty of Medicine, Balçova/Izmir, Turkey.

Francesco de Tommasi, MD, is a General Practitioner, at the Local Health Authority, Bari, Italy.

Emanuele Vinci, MD, is the coordinator of the "Health and Environment" Working Group, National Medical Orders Federation, Italy.

Roberto Romizi, MD, is the President of the International Society of Doctors for the Environment, ISDE-Italy and a General Practitioner at the Local health Authority of Arezzo, Italy.

Alice McGushin, MBBS, MScPH, is a member of the WONCA, Working Party on the Environment and the Programme Manager at the Lancet Countdown on Health and Climate Change, Institute for Global Health, University College, London.

Enrique Barros, MD, is the Chair of the WONCA, Working Party on the Environment, General Practitioner at the Clínica da Família Teewald in rural community of Santa Maria do Herval and Professor at the Universidade de Caxia do Sul, Brasil.

Alan Abelsohn, MBChB, FCFP, is a member of the WONCA, Working Party on the Environment and an Associate Professor in the Department of Family and Community Medicine and Dalla Lana School of Public Health, University of Toronto, Canada.

Samantha Pegoraro, MD, is the Climate and Health coordinator of the Italian Climate Network, Milan, Italy. She worked as a consultant in the Department of Environment, Climate Change and Health of the World Health Organization (WHO). She is actually resident doctor in psychiatry at the Hôpitaux Universitaires de Genève, Switzerland, and MPH candidate at the London School of Hygiene and Tropical Medicine.

SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

How to cite this article: Lauriola, P., Serafini, A., Santamaria, M., Guicciardi, S., Kurotschka, P. K., Leonardi, G. S., Zeka, A., Segredo, E., Bassi, M. C., Gokdemir, O., de Tommasi, F., Vinci, E., Romizi, R., McGushin, A., Barros, E., Abelsohn, A., & Pegoraro, S. (2021). Family doctors to connect *global concerns* due to climate change with *local actions*: State-of-the art and some proposals. *World Medical & Health Policy*. 13, 199–223. https://doi.org/10.1002/wmh3.448

Received: 22 October 2020 | Revised: 14 February 2021 | Accepted: 26 March 2021

DOI: 10.1002/wmh3.435

ORIGINAL ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Death by political party: The relationship between COVID-19 deaths and political party affiliation in the United States

Jingjing Gao[1] | **Benjamin J. Radford**[2]

[1]Department of Public Policy, University of North Carolina at Charlotte, Charlotte, North Carolina, USA

[2]Department of Political Science and Public Administration, University of North Carolina at Charlotte, Charlotte, North Carolina, USA

Correspondence
Jingjing Gao, Department of Public Policy, University of North Carolina at Charlotte, 1605 University Walk Cir, Charlotte, NC 28213, USA.
Email: Jgao9@uncc.edu

Abstract

This study explored social factors that are associated with the US deaths caused by COVID-19 after the declaration of economic reopening on May 1, 2020 by President Donald Trump. We seek to understand how county-level support for Trump interacted with social distancing policies to impact COVID-19 death rates. Overall, controlling for several potential confounders, counties with higher levels of Trump support do not necessarily experience greater mortality rates due to COVID-19. The predicted weekly death counts per county tended to increase over time with the implementation of several key health policies. However, the difference in COVID-19 outcomes between counties with low and high levels of Trump support grew after several weeks of the policy implementation as counties with higher levels of Trump support suffered relatively higher death rates. Counties with higher levels of Trump support exhibited lower percentages of mobile staying at home and higher percentages of people working part time or full time than otherwise comparable counties with lower levels of Trump support. The relative negative performance of Trump-supporting counties is robust after controlling for these measures of policy compliance. Counties with high percentages of older (aged 65 and above) persons tended to have greater death rates, as did more populous counties in general. This study indicates that policymakers should consider the risks inherent in controlling public health crises due to divisions in political ideology and confirms that vulnerable communities are at particularly high risk in public health crises.

Key Points

- Counties with higher levels of Trump support did not necessarily experience greater mortality rates due to COVID-19.
- The predicted weekly death counts per county tend to increase over time with the implementation of several key health policies.
- The difference in COVID-19 outcomes between counties with low and high levels of Trump support grew after several weeks of the policy implementation as counties with higher levels of Trump support suffered relatively higher death rates.
- Counties with higher levels of Trump support exhibited lower percentages of devices staying at home and higher percentages of people working part time or full time than otherwise comparable counties with lower levels of Trump support.

KEYWORDS

COVID-19, health policies, political affiliation, social distancing activities

INTRODUCTION

The 2019 coronavirus (severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2) is a contagious virus associated with respiratory illness and severe pneumonia and is commonly called COVID-19. According to data from the World Health Organization, as of January 18, 2021, the COVID-19 pandemic had resulted in 93,611,355 confirmed cases and 2,022,405 confirmed deaths globally.[1] The virus first emerged in China before spreading to South Korea, Italy, and some European countries that experienced outbreaks in early 2020. On January 19, 2020, the first known COVID-19 case in the United States was that of a 35-year-old man who went to an urgent care clinic in Snohomish County, Washington, with cough and fever (Holshue et al., 2020). By March 29th, 2021, the United States had recorded 29,921,599 confirmed cases and 543,870 confirmed deaths due to COVID-19. Scholars proposed using social and behavioral science to support the pandemic response (Van Bavel et al., 2020). For instance, Mayer (2020) criticizes President Trump's strategies for managing the health crisis, including his downplaying of the seriousness of the disease early in the pandemic. Mayer considers this mismanagement to be among the worst crisis responses in American history. This study responds by analyzing the roles of several social factors, including political polarization, in mitigating this pandemic in the United States.

Combating the coronavirus pandemic has burdened US economy. On March 27, 2020, President Trump signed an economic relief package of over $2 trillion, the Coronavirus Aid, Relief, and Economic Security (CARES) ACT.[2] Furthermore, starting in April 2020, several political leaders proposed relaxing previously imposed public health measures to relieve the burden on the economy,[3] while health professionals continued to warn against "reopening" the economy.[4] This sent a mixed signal to state and local governments, as well as to the public, about how they should react to the pandemic.

We hypothesize that the mixed messages contributed, in varying degrees, to the public's adherence to public health measures and that this resulted in differential COVID-19 casualty

rates. Specifically, we seek to understand how social factors, including the distribution of political affiliations, social distancing activities,[5] and the duration of implemented public health policies influenced the number of deaths associated with COVID-19 at the county level in the United States. We find evidence that political ideology interacts with public health policies in such a way that counties with higher levels of Trump support suffer worse COVID-19 outcomes than comparable counties with lower levels of Trump support. In other words, public health policies appear to be less effective in certain counties than others as a result of locally dominant political ideologies. Furthermore, we present evidence that this may be due to poor compliance with public health policies in those particular counties.

BACKGROUND

COVID-19 patients generally present with fever and cough (Carlos et al., 2020; N. Chen, Zhou, et al., 2020; Chung et al., 2020; Shi et al., 2020; Song et al., 2020; D. Wang, Hu, et al., 2020; W. Wang, Tang, et al., 2020) and, in the early stages of the pandemic, were often diagnosed by computerized tomography (CT) scan and by analysis of their travel histories (Chung et al., 2020; Fang et al., 2020; Kim et al., 2020; Wilson & Chen, 2020). Specialized tests for detecting the virus were developed within several months. The estimated incubation period for COVID-19 ranges from 2.1 to 11.1 days with a mean of 6.4 days. On January 23, 2020, the World Health Organization (WHO) reported 581 confirmed cases and only 10 cases outside of China (World Health Organization, 2020). However, COVID-19 has high transmissibility and was, therefore, able to quickly spread globally despite travel precautions (Riou & Althaus, 2020).

With respect to the treatment of COVID-19, there are some drug treatment options and suggestions from doctors (Z.-M. Chen, Fu, et al., 2020; Jin et al., 2020; Lin & Li, 2020; Lu, 2020). However, these treatments exhibit limited efficacy among high-risk groups. Therefore, prior to the development and widespread distribution of vaccines in 2021, policymakers and healthcare practitioners emphasized policies aimed at slowing the spread of COVID-19 due to the limited treatment options, the seriousness of symptoms, and the high transmissibility rate. Quarantine is a common method that governments have adopted worldwide (Carlos et al., 2020). Scholars suggest that cultural tightness and government efficiency play significant roles in controlling health crises (Gelfand et al., 2020). For instance, China adopted the most extensive quarantine in recent history to combat COVID-19. In some communities (Yiyang county, Luoyang City, Henan Province), only one person from a family was allowed to go out every day, with their temperature being taken before doing so. Additionally, grocery stores would test patrons' temperatures before admittance. Temperatures of all family members were reported to their local communities daily at the peak of the pandemic. However, some countries adopted quite different policies with respect to controlling the pandemic. In the United States, a policy of social distancing depended heavily on each individual's self-precautions and was largely unenforced by the government. The reliance on self-enforcement of preventative measures common in the United States means political ideology could play a role in the adoption of public health policies and recommendations.

Political affiliation

Political ideology plays an important role in how individuals form attitudes (Van Holm et al., 2020; Zaller, 1992) and process information (Lodge & Taber, 2013). Political ideology may even influence individuals' health behaviors. For example, Republicans have been found to be less likely to get the H1N1 vaccine in comparison with Democrats (Mesch &

Schwirian, 2015). Survey research also finds that Democrats are more likely to adopt several health-protective behaviors, more likely to worry, and more likely to support social distancing policies (Kushner Gadarian et al., 2021). Republicans appear to be less concerned about COVID-19, practice social distancing less, follow the social distancing orders after the state-wide policy enactment less and are less likely to shift their consumption toward e-commerce (Allcott et al., 2020; Gadarian et al., 2020; Gollwitzer et al., 2020; Painter & Qiu, 2020). Democrats, on the other hand, are more likely to exercise protective actions against COVID-19 like taking fewer trips, staying home more, maintaining safe distances, and touching their own faces less frequently (Van Holm et al., 2020). Governors' recommendations for residents to stay home did significantly more to reduce mobility in Democratic-leaning counties (Grossman et al., 2020).

As a polarizing Republican president, Donald Trump provides a benchmark for policy preference among Republicans but not Democrats, which may lead to differences in responding to policies and consequently may influence the spread of the COVID-19. The president publicly disagreed with health experts about what policies should be applied to manage COVID-19.[6] On March 23, Trump claimed that America would reopen the economy against the warnings of health experts.[7] By April 16, President Trump issued guidelines to enable states to reopen; governors could open their economies at either the state level or county-by-county.[8] Republican governors and governors from states with more Trump supporters were slower to adopt social distancing policies (Adolph et al., 2020). Political affiliation may have played a role in people's pandemic behaviors and consequently influenced subsequent death rates. In September 2020, President Trump even publicly admitted that he downplayed COVID-19 at the initial stages to reduce the panic.[9]

Relatedly, Painter and Qiu (2020) found that Republicans were more likely to assign credibility to the advice of Trump in comparison to other state officials. Trump voters search less for information on COVID-19 and engage in less social distancing behavior (SDB) (Barrios & Hochberg, 2020). Counties that voted for Trump in the 2016 election exhibited 16% less physical distancing than counties that voted for Hillary Clinton and pro-Trump voting has been found to be indirectly associated with a higher growth rate in COVID-19 infections and fatalities (Gollwitzer et al., 2020). Due to the expected differential adherence to public health protocols, we hypothesize that the dominant political affiliation in a county will predict higher or lower COVID-19 death rates:

Hypothesis H_1 *(Political Affiliation): Counties with higher levels of Trump support will experience greater weekly COVID-19 death rates.*

Policy duration

In the United States, a variety of policies were implemented at the state level or the county level including shelter-in-place orders (SIPOs),[10] closures of restaurants/bars/entertainment-related businesses, bans on large events, and closures of public schools. The effectiveness of these policies varied widely; SIPOs and closures of nonessential businesses worked toward curtailing COVID-19 while the prohibition of large events and closure of public schools did not show signs of slowing down COVID-19 (C. Courtemanche et al., 2020; C. J. Courtemanche et al., 2020; Dave et al., 2020, 2021). Statewide SIPOs had the strongest effect, accounting for a 37% decrease in confirmed cases 15 days after implementation (Abouk & Heydari, 2020). Additionally, the impact of a social distancing policy has a significant cumulative effect (Dave et al., 2021). For instance, the daily growth rates were reduced by 5.4 percentage points after 1–5 days of government-imposed social distancing measures and 9.1 percentage points after 16–20 days (C. Courtemanche

et al., 2020). We therefore expect that counties with long-lasting social distancing policies will experience relatively lower coronavirus death rates.

Hypothesis H_2 *(Policy Duration): The longer certain COVID-19 policies were in effect in a county, the fewer COVID-19 deaths the county will experience per week*.

Hypothesis H_{2a} *The longer the implementation of a SIPO, the fewer deaths per week a county will experience*.

Hypothesis H_{2b} *The longer the implementation of a public-school closure, the fewer deaths per week a county will experience*.

Hypothesis H_{2c} *The longer the implementation of a dine-in restaurant closure, the fewer deaths per week a county will experience*.

Hypothesis H_{2d} *The longer the implementation of an entertainment facility and gym closure, the fewer deaths per week a county will experience*.

Additionally, political ideology may moderate the effect of policy duration on death count per county. Therefore, we hypothesize that there is an interaction effect between political ideology and policy duration on the deaths caused by COVID-19:

Hypothesis H_{2e} *The proportion of Trump supporters per county will mitigate the effect of policy duration on suppressing COVID-19 deaths*.

Put another way, as the duration of a health policy in a county increases, the number of deaths per county will increase more rapidly in the counties with higher levels of Trump support than in counties with lower levels of Trump support.

SDB: Working mode

Tang et al. (2020) found that the best method to stop the spread of the COVID-19 is persistent and strict self-isolation. However, not all individuals are able to fully self-isolate, particularly for those in certain jobs. To account for this, we measured three working types during the pandemic: staying at home completely, working outside the home part time, and working outside the home full time. Working from home corresponds to strict adherence to self-isolation while working outside the home part time corresponds to a moderate level of self-isolation and working outside the home full time corresponds to nonadherence to social distancing.

Hypothesis H_{3a} *(Working modes): Counties with more people working from home tend to have fewer weekly COVID-19 deaths*.

Hypothesis H_{3b} *(Working modes): Counties with more people working part-time from home tend to have fewer weekly COVID-19 deaths*.

Hypothesis H_{3c} *(Working modes): Counties with more people working full time tend to have more weekly COVID-19 deaths*.

Control variables

Population density has been shown to play an important role in understanding influenza mortality. In denser areas, the mortality rate has been found to be significantly higher in comparison to less dense areas (Chandra et al., 2013). Related to COVID-19, rural counties with low population density appear to have gained very little from social distancing policies,

especially statewide orders, which suggests that more nuanced policies that account for the heterogeneity of counties are needed to defeat the pandemic (Dave et al., 2020).

The risk of death among COVID-19 infected individuals is between 0.3% and 0.6% (Nishiura et al., 2020). According to scientists (D. Wang, Hu, et al., 2020; W. Wang, Tang, et al., 2020), older individuals with COVID-19 have a higher mortality rate than do other age groups. We therefore control for the size of the population 65 years of age or older within a county. We use 65 as a cutoff because people aged 65 and above qualify for Medicare; other age groups do not. Low income exacerbates the risk of death due to higher proportions of certain health issues, such as smoking (Krueger & Chang, 2008), heart disease (Lotufo et al., 2013; Redmond et al., 2013), and cancer (Najem et al., 1985; Singh & Jemal, 2017; Tolkkinen et al., 2018) among low-income populations. Furthermore, poverty may exacerbate negative pandemic outcomes as low-income individuals have diminished access to high-quality health care.[11] Additionally, scholars suggest that people of color in America potentially suffer more from this pandemic because of their pre-existing disadvantages in health, social, and economic status (Cooper & Williams, 2020).[12] Because population size, age, income, and race are likely correlated with local pandemic outcomes, and these variables are likely correlated with the levels of Trump support per county, we control for all four.

METHODS

Data

There are a variety of data sources available for COVID-19 including those provided by WHO, CDC, and Johns Hopkins University. Here, the count of COVID-19 deaths per county is provided by Johns Hopkins University's CSSE COVID-19 Tracking Project[13] and Dashboard.[14] As for the county political affiliation information, this paper uses data on the 2016 US Presidential Election from the MIT Election Data Science Lab (Data & Lab, 2018).[15] Population, race, and income data are obtained from the U.S. Census.[16] To measure SDB, we use the Social Distancing Metrics[17] data provided by SAFEGRAPH, which includes information about people's working modes based on mobile device telemetry.

Measures

To measure aggregate political preferences at county level, we compute the level of Trump support per county from the 2016 presidential campaign as the number of total votes for Trump divided by the total number of votes per county. We base this calculation on the assumption that the vast majority of the votes in any given county were for candidates in the two major parties; we essentially ignore the influence of all third party candidates. We also assume that Trump support did not change substantially between 2016 and 2020. In measuring the duration of health policies, we count the length in days since a policy's first implementation; policies of interests include the closing of public schools, the closing of restaurants, the closing of entertainment facilities and gyms, and SIPOs.[18]

In terms of the social distancing activities, we measure the proportion of people who stayed at home completely, the proportion of people who worked part time, and the proportion of people who worked full time relative to the overall county population. These represent the three types of working routines. In SAFEGRAPH, home is defined as the "common nighttime location for the device over a 6-week period where nighttime is 6 pm–7 am," and the device count is measured by the "number of devices seen in our panel during the date range whose home is in this census block group." The data do not include

"any census block groups where the count <5."[19] Descriptive statistics are provided in Table 1.

Data analysis

This study uses a zero-inflated negative binomial model. The time frame of this study is from April 6 to May 25. We also present supplementary pooled ordinary least square, random effects, and fixed effects models in Table A1.[20] The dependent variable is the death count per week per county. Since May 1 was the day that many states chose to reopen their economies, we focus on SDBs from April 6 to May 11 as key independent variable. For instance, the SDB in the first week will be represented by the aggregate device movement (i.e., working type) on April 6. The lengths of policies are also calculated from April 6. The dependent variable is the count of virus-related deaths lagged by 2 weeks. The first model mainly examines the relationships between SDBs, aggregate political preference, and the number of deaths 2 weeks later. The model formula for the zero-inflation component (omitting the log link function) is given by

$$\begin{aligned}\text{No deaths} = {} & \beta_0 + \beta_1 \ln(\text{total population}) + \beta_2 \ln(\text{population density}) \\ & + \beta_3 \ln(\text{per capita income}) + \epsilon.\end{aligned}$$

The formula for the negative binomial count component of our model, again omitting the link function, is given by

$$\begin{aligned}\text{Death count} = {} & \beta_0 + \beta_1(\text{race}) + \beta_2(\text{Asian}) + \beta_3(\text{pop 65 proportion}) \\ & + \beta_4 \ln(\text{total population}) + \beta_5 \ln(\text{population density}) \\ & + \beta_6 \ln(\text{per capita income}) + \beta_7(\text{public school closure days}) \\ & + \beta_8(\text{restaurant dine in closure days}) \\ & + \beta_9(\text{entertainment and gym closure days}) \\ & + \beta_{10}(\text{stay at home policy days}) \\ & + \beta_{11}(\text{completely home devices per capita}) \\ & + \beta_{12}(\text{part} - \text{time devices per capita}) + \beta_{13}(\text{full} - \text{time devices per capita}) \\ & + \beta_{14}(\text{Trump supporter proportion}) + \beta_{15}(\text{Trump supporter proportion} \\ & \times \text{stay at home policy days}) + \epsilon.\end{aligned}$$

We run the above-specified model four times, once each for all possible interactions between Trump support rate and the four selected policies. We focus primarily on the above model (shown in Table 2 as Model 3) and provide the others in Appendix A.

RESULTS

Figure 1 shows that the total number of devices detected by SAFEGRAPH from counties with low Trump supporter levels (≤0.25) is about 0.9 million more than the total number of devices from high Trump supporter level (≥0.75) counties. This gap narrows at the beginning of April. Figure 2 shows that the total number of devices staying at home from the low Trump support level counties is about 0.3 million more than the high Trump support level counties.

TABLE 1 Within and between variations[a] for COVID-19 panel data

Variable		Mean	*SD*	Min	Max	Observations
FIPS (Federal Information Processing Standers)	Overall			1001	78,030	$N = 19{,}410$
	Between			1001	78,030	$n = 3235$
	Within					$T = 6$
Time	Overall			406	511	$N = 19{,}410$
	Between					$n = 3235$
	Within			406	511	$T = 6$
Death number	Overall	3.77	41.51	0.00	3780.00	$N = 18{,}760$
	Between		35.47	0.00	1710.17	$n = 3140$
	Within		21.46	−1210.39	2073.61	$T = 5.97452$
Total population	Overall	99,714.99	320,957.10	0.00	10,100,000	$N = 19{,}356$
	Between		320,998.60	0.00	10,100,000	$n = 3226$
	Within		0	99,714.99	99,714.99	$T = 6$
Percentage of population aged 65 and above	Overall	0.19	0.05	0.06	1.66	$N = 19{,}302$
	Between		0.05	0.06	1.66	$n = 3217$
	Within		0	0.19	0.19	$T = 6$
Total income	Overall	2,960,000,000	10,200,000,000	0	295,000,000,000	$N = 19{,}356$
	Between		10,200,000,000	0	295,000,000,000	$n = 3226$
	Within		0	2,960,000,000	2,960,000,000	$T = 6$
Per capita income	Overall	24,693.09	6356.11	5662.83	66,518.36	$N = 19302$
	Between		6356.93	5662.83	66,518.36	$n = 3217$
	Within		0.00	24,693.09	24,693.09	$T = 6$

(Continues)

TABLE 1 (Continued)

Variable		Mean	*SD*	Min	Max	Observations
Trump support rate	Overall	0.63	0.16	0.04	0.96	$N = 18{,}684$
	Between		0.16	0.04	0.96	$n = 3114$
	Within		0.00	0.63	0.63	$T = 6$
Days after closing public schools	Overall	31.46	10.01	4.00	50.00	$N = 19{,}308$
	Between		3.42	16.83	34.83	$n = 3218$
	Within		9.41	18.63	46.63	$T = 6$
Days after closing restaurant dine-in	Overall	34.82	12.69	2.00	60.00	$N = 19{,}308$
	Between		4.25	19.50	42.50	$n = 3218$
	Within		11.96	17.32	52.32	$T = 6$
Days after closing entertainment facilities and gym	Overall	33.71	13.20	0.00	60.00	$N = 18{,}918$
	Between		5.59	17.50	42.50	$n = 3153$
	Within		11.96	16.21	51.21	$T = 6$
Days of SIPO	Overall	26.02	12.95	0.00	55.00	$N = 15{,}906$
	Between		4.99	16.67	37.50	$n = 2651$
	Within		11.95	8.52	43.52	$T = 6$
Total device number	Overall	5707.01	15,194.00	8.00	356,315.00	$N = 19{,}335$
	Between		15,183.43	8.00	345,984.30	$n = 3225$
	Within		476.24	−9328.32	18,563.85	$T = 5.99535$
Completely home device number	Overall	2300.43	6845.23	1.00	185,938.00	$N = 19{,}335$
	Between		6822.47	3.33	164,263.20	$n = 3225$
	Within		539.51	−9205.74	23,975.26	$T = 5.99535$

TABLE 1 (Continued)

Variable		Mean	*SD*	Min	Max	Observations
Part-time working device number	Overall	331.31	806.91	1.00	28,482.00	$N = 19{,}335$
	Between		798.85	1.00	19,973.33	$n = 3225$
	Within		112.63	−3635.03	8839.97	$T = 5.99535$
Full-time working device number	Overall	204.12	546.14	1.00	22,867.00	$N = 19{,}335$
	Between		539.75	1.00	15,293.17	$n = 3225$
	Within		82.56	−2848.05	7777.95	$T = 5.99535$

[a]Time-invariant variables (*total_population*, *pop65percentage*-ratio of population aged 65 and above, *total_ income*, *per_capita_income*, *rate*) have positive between variation and zero within variation. Death caused by COVID-19 has relatively higher between variation (35.47) than within variation (21.46).

TABLE 2 Deaths due to COVID-19 political ideology, social distancing behavior (2 weeks lag)

Variables (DV = Death number per county per week)	(1) ZINB_mode1	(1a) ZINB_model1 inflate	(2) ZINB_model2	(2a) ZINB_model2 inflate	(3) ZINB_model3	(3a) ZINB_model3 inflate
Percentage of people of color without Asian	2.962***		3.898***		4.560***	
	(0.169)		(0.213)		(0.221)	
Percentage of Asian population	3.124*		−1.964*		−2.094*	
	(1.221)		(0.995)		(0.895)	
Percentage of population aged 65 and above			5.989***		6.594***	
			(0.834)		(0.860)	
Total population (log)	1.189***	−0.220	0.973***	−0.619***	0.894***	−0.717**
	(0.0307)	(0.135)	(0.0413)	(0.172)	(0.0489)	(0.225)
Population density (log)		−0.998***	0.0928*	−0.750***	0.0731	−0.655*
		(0.151)	(0.0429)	(0.195)	(0.0542)	(0.265)
Per-capita-income (log)		2.089***	1.337***	3.224***	0.956***	2.985***
		(0.553)	(0.157)	(0.453)	(0.180)	(0.518)
Days after closing public schools			−0.0682***		−0.0665***	
			(0.00894)		(0.00941)	
Days after closing restaurant dine-in			−0.0198*		−0.00241	
			(0.00983)		(0.0102)	
Days after closing entertainment facilities and gyms			0.0392***		0.0336***	
			(0.00649)		(0.00652)	
Days of SIPO			0.0253**		0.0145	
			(0.00946)		(0.00930)	

TABLE 2 (Continued)

Variables (DV = Death number per county per week)	(1) ZINB_mode1	(1a) ZINB_model1 inflate	(2) ZINB_model2	(2a) ZINB_model2 inflate	(3) ZINB_model3	(3a) ZINB_model3 inflate
Completely home device percentage					4.156***	
					(0.843)	
Part-time working device percentage					–3.054	
					(3.069)	
Full-time working device percentage					–10.49*	
					(4.262)	
Trump support rate			0.0813		0.702	
			(0.344)		(0.383)	
Days of SIPO × Trump support rate	0.0104***		0.0174		0.0281*	
	(0.00297)		(0.0107)		(0.0109)	
Constant	–13.56***	–16.53**	–25.57***	–24.19***	–22.57***	–21.05***
	(0.377)	(5.562)	(1.654)	(4.796)	(1.900)	(5.804)
Observations	10,012	10,012	10,012	10,012	10,012	10,012

Note: Robust standard errors are given in parentheses.
***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

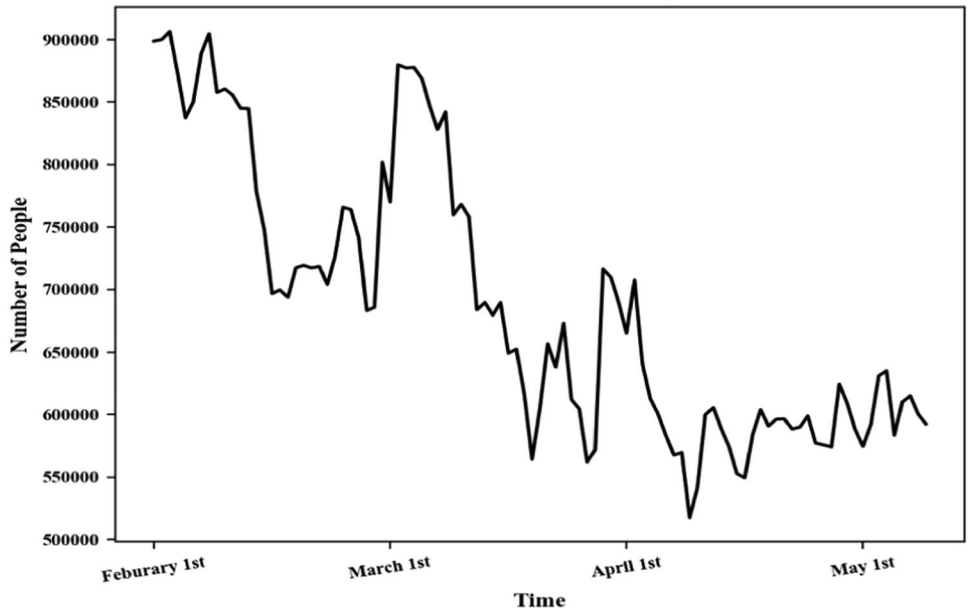


FIGURE 1 The difference of total devices between Democratic and Republican counties. This graph represents the total number of devices from counties with a low Trump support levels (≤0.25) minus the total number of devices from counties with high Trump support levels (≥0.75)

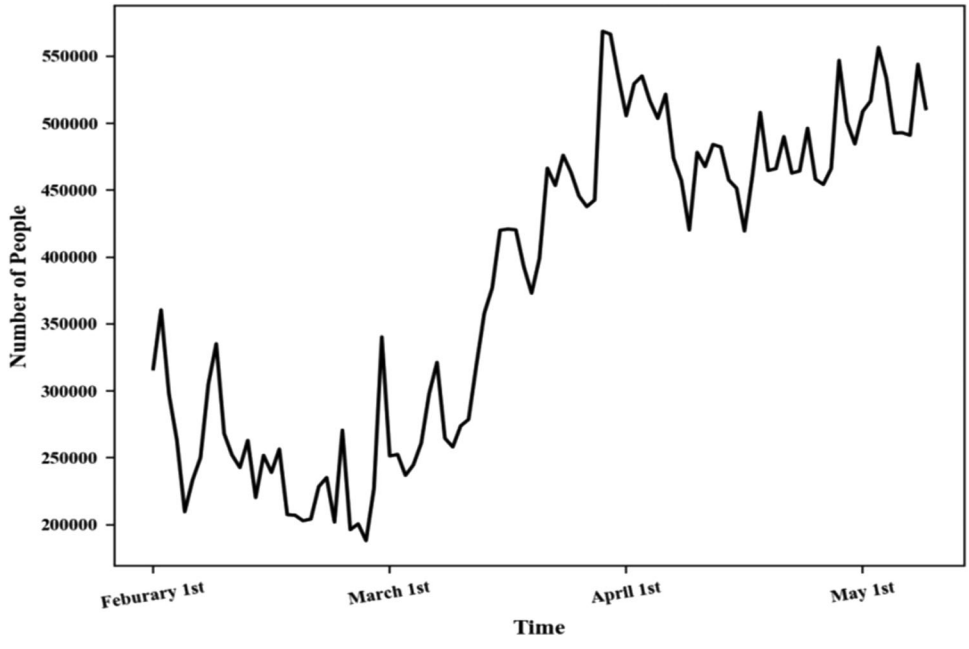


FIGURE 2 The difference of people completely staying at home between Democratic counties and Republican counties. This graph represents the total number of devices staying at home completely from counties with a low Trump support levels (≤0.25) counties minus the total number of devices staying at home completely from counties with high Trump support levels (≥0.75)

However, this gap increases until April 1st by which point the low Trump support level counties have 0.55 million more devices staying at home than the high Trump support level counties. This trend suggests that social distancing policies are adhered to more effectively in Democratic counties than in Republican counties.

Figures 3 and 4 show that the total number of devices out of the home part time and full time on February 1 from low Trump support level counties is 80,000 more than from high Trump support level counties. However, these gaps decrease until mid-April. By mid-March, the number of devices belonging to persons working outside the home part time is greater in high Trump support level counties and the gap for full-time work outside the home work has narrowed to just 10,000 devices.

Figures 1 through 4 suggest aggregate differences in how individuals in high Trump support level counties and low Trump support level counties responded to the pandemic between February and May. In particular, they point to decreases in the number of devices associated with outside-the-home working styles in low Trump support level counties relative to high Trump support level counties. With this in mind, we turn now to the results of our regression analysis that will allow us to isolate the relationship between political ideology and county-level COVID-19 outcomes.

We focus our attention on the fully specified Model 3 in Table 2. While the coefficient for the level of Trump support is positive, it is not significant; we find no evidence for a relationship between supporter rate and county-level COVID-19 death rates (H_1) after controlling for demographics, policy implementation, and working mode. However, the interaction effect between the level of Trump support per county and the duration of implementation of a SIPO is positive and statistically significant. Figure 5 depicts the average predicted deaths per county for three levels of Trump support (0.0, 0.5, and 1.0) at given days of implementation of a SIPO. The line representing a county with a Trump supporter

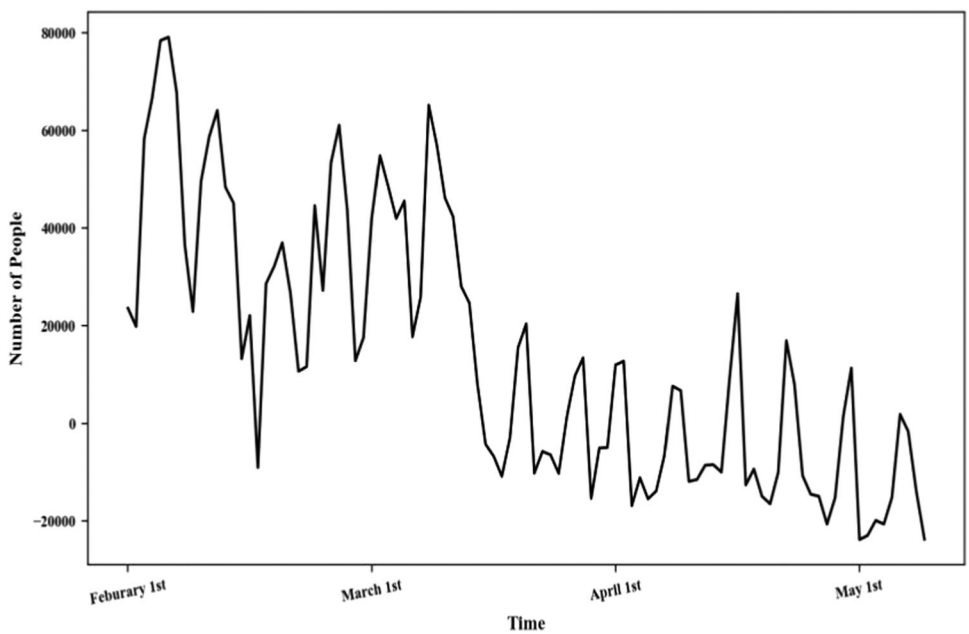


FIGURE 3 The difference of people working part time between Democratic counties and Republican counties. This graph represents the total number of devices working part time from counties with a low Trump support level (≤0.25) minus the total number of devices working part time from counties with high Trump support levels (≥0.75)

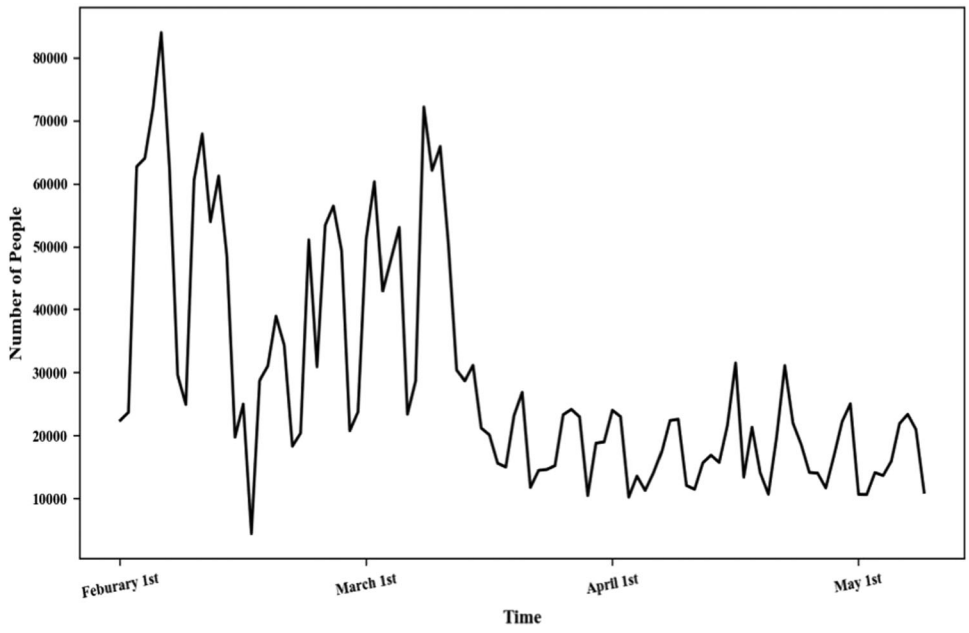


FIGURE 4 The difference of people working full time between Democratic counties and Republican counties. This graph represents the total number of devices working full time from counties with a low Trump support levels (≤0.25) minus the total number of devices working full time from counties with high Trump support levels (≥0.75)

rate of 0.0 is nearly flat; this reflects the insignificant and near-zero coefficient associated with the duration of a SIPO. However, the line representing a hypothetical county with a Trump supporter rate of 1.0 curves steeply upward over the duration of the SIPO, reflecting the positive coefficient found for that interaction. At the beginning of the implementation of a SIPO, the high Trump support counties have similar predicted death counts as the medium

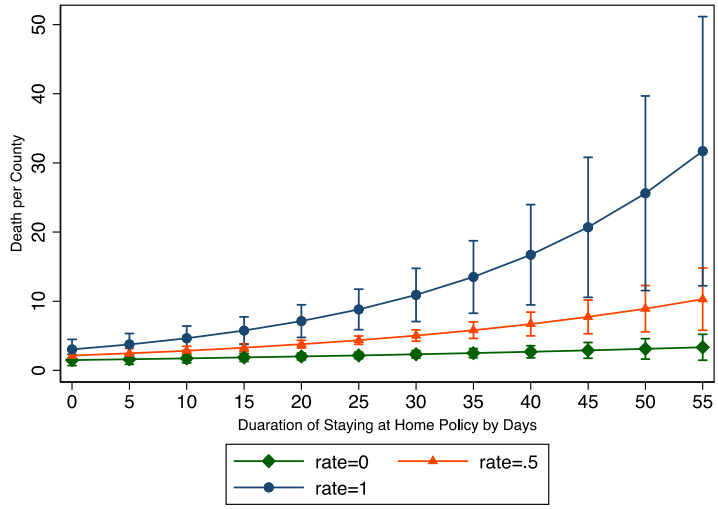


FIGURE 5 Interaction effect of Trump supporter level and the duration of SIPO. Based on Table 2 (zero-inflated negative binomial). Testing Hypothesis $H_1$and H_2. Shaded region = 95% confidence interval

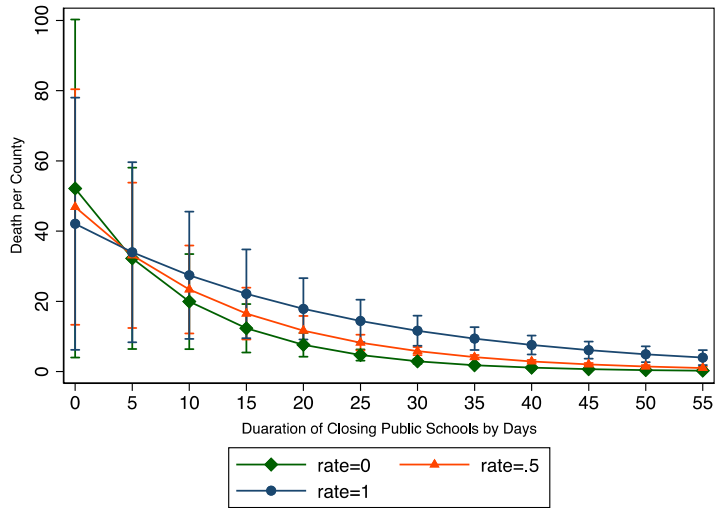


FIGURE 6 Interaction effect of Trump support level and the duration of public schools closure policy

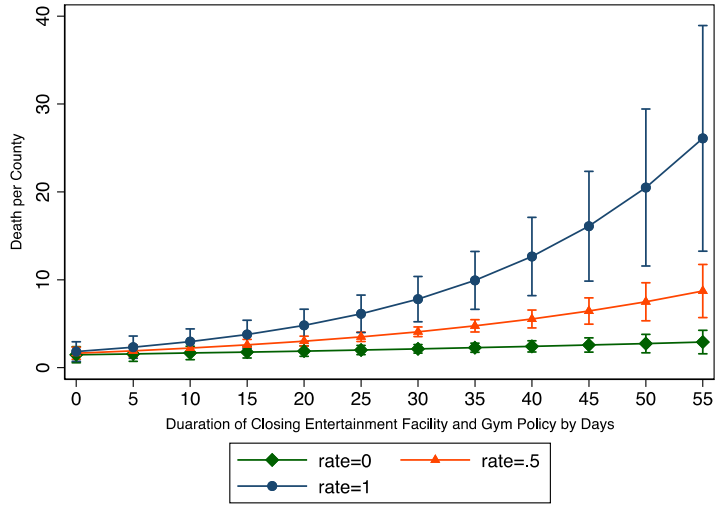


FIGURE 7 Interaction effect of Trump support level and the duration of entertainment facility and gym closure policy

and low Trump support counties. As the durations of SIPOs increase, the predicted COVID-19 death counts in all hypothetical counties also increase; however, the differences between these three groups become very pronounced after 3 weeks of a SIPO. In other words, even controlling for observed compliance via SDB data, we find that SIPOs are nonetheless apparently less effective in counties with high levels of Trump support. In particular, for a hypothetical county with zero Trump supporters, the coefficient associated with SIPOs is very near zero (0.015), controlling for compliance. For a hypothetical county that is 100% Trump supporters, the coefficient for SIPOs is just above 0.04. Additionally, the interaction effects between the level of Trump support and two other policies (the prohibition on restaurant dine-in and the closing of entertainment facilities and gyms) exhibit similar trends, as shown in Figures 7 and 8.[21] Figure 8 illustrates the differential relationship

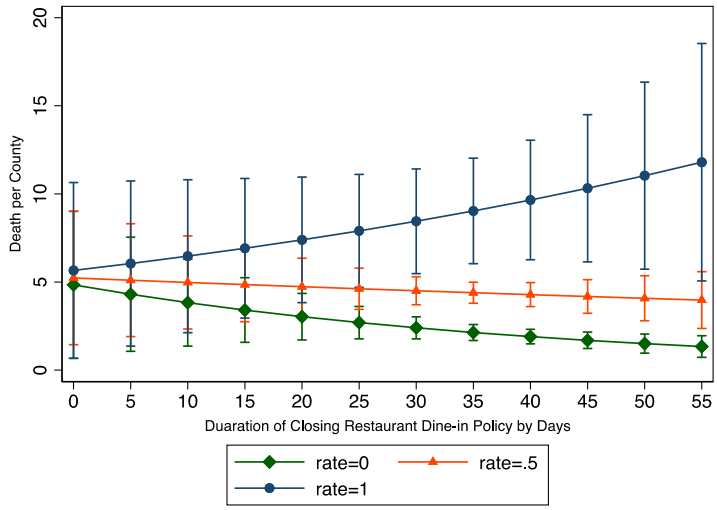


FIGURE 8 Interaction effect of Trump support level and the duration of restaurant dine-in closure policy

between restaurant dine-in prohibitions and predicted COVID-19 deaths for counties of differing aggregate political ideologies. For counties with very low levels of Trump support, restaurant policies resulted in decreases in the average death count over time while the opposite is true for counties with high levels of Trump support.

The only policy that does not follow the patterns as described above is public school closures (Figure 6). This is also the only policy for which the associated model coefficient is negative and significant. We suspect that the insignificant interaction effect here may be due to mandatory enforcement of this policy by state and local governments; while the other policies require individuals or small business owners to comply to assure efficacy, it is difficult to imagine how individuals would fail to comply with public school closures. These findings are generally in agreement with our expectations as outlined in H_{2e}: Trump supporter level mitigates the effectiveness of public health policies. Why these policies generally appear to be less effective in Trump-supporting counties is worth closer attention.

The inclusion of SAFEGRAPH data on working modes (home, part time, and fully outside the home) should at least partially control for noncompliance with these policies. Nonetheless, we find that Trump-supporting counties fare worse than their non-Trump-supporting counterparts over the course of public health policy implementation. We suspect this is due to forms of noncompliance that are not fully captured by the working mode covariates; these may include improper mask usage or failure to social distance in nonprofessional settings (e.g., parties or social gatherings).

We find little support for H_{2a} through H_{2d}: duration of school closure is the only policy that is associated with a statistically significant decrease in COVID-19 deaths. However, we caution against interpreting this finding directly: policy implementation is likely a function of both the current coronavirus case count in a county as well as a county's overall risk. Therefore, positive coefficients on policies (such as that associated with the closure of gyms and entertainment venues) may be due to the late implementation of those policies after increases in coronavirus cases had already become near-unavoidable. Furthermore, the counterfactual number of cases in counties without those policies is not clear.

Similarly, we fail to reject the null hypotheses for H_{3a} through H_{3c}, our working mode hypotheses. In fact, Model 3 indicates that the proportion of devices (relative to population) staying completely at home is associated with an increase in the predicted

number of COVID-19 deaths and that the reverse is true for the proportion of devices working outside the home full time. As with the findings for H_2, we suspect this may be due to reverse causality: compliance is higher in areas with greater coronavirus risk (Figures 5–8).

Table 3 shows that high Trump support counties have, on average, significantly more people working full time or part time outside-the-home and fewer people staying at home than comparable low Trump support counties. We demonstrate this in a series of four linear models of working mode (represented as a proportion of the total population) regressed on predictors of working mode including the level of Trump support. Models 2 through 4 in Table 3 show that level of Trump support correlates with working mode behaviors that are contrary to public health guidance, even when controlling for the duration for which that guidance has been in place. This indicates that individuals in counties with high levels of Trump support show less compliance with these health policies. This finding reinforces our suspicion that the positive interaction effects found between policy implementation duration and level of Trump support are likely the result of poor compliance with public health guidance.

TABLE 3 Social distancing behaviors, political ideology, and health policies

Variables	(1) Percentage of devices stay at home	(2) Percentage of devices stay at home	(3) Percentage of devices working part time	(4) Percentage of devices working full time
Trump support rate	–0.175***	–0.136***	0.0373***	0.00557***
	(0.00403)	(0.00305)	(0.000905)	(0.000548)
Death number per county per week	0.000153*	4.13e–05	–8.78e–06	–3.71e–06
	(7.06e-05)	(3.67e–05)	(6.44e–06)	(2.28e–06)
Per-capita-income (log)		0.139***	–0.0180***	–0.00413***
		(0.00224)	(0.000643)	(0.000372)
Days after closing public schools		0.000546***	0.000293***	0.000490***
		(0.000118)	(4.24e–05)	(2.52e–05)
Days after closing restaurant dine-in		–0.00347***	0.000584***	–0.000222***
		(0.000122)	(4.35e–05)	(2.59e–05)
Days after closing entertainment facilities and gyms		–0.000385***	0.000170***	–0.000131***
		(8.37e–05)	(2.78e–05)	(1.66e–05)
Days of SIPO		0.00212***	–0.000629***	0.000122***
		(0.000103)	(3.48e–05)	(1.90e–05)
Constant	0.449***	–0.916***	0.207***	0.0699***
	(0.00279)	(0.0233)	(0.00674)	(0.00392)
Observations	18,604	15,675	15,675	15,675
R^2	0.189	0.494	0.268	0.086

Note: Robust standard errors are given in parentheses.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

Finally, we note that the percentage of people of color (not including Asian persons) per county is positively associated with the number of COVID-19 deaths per county. This provides evidence that communities of color suffer more from COVID-19 than do communities with fewer people of color.

DISCUSSION AND POLICY IMPLICATIONS

We find that political ideology plays a role in health outcomes during major public health crises. By interacting ideology with measures of public health policy, we demonstrate that disparate public health outcomes during the coronavirus pandemic are likely due in part to differences across ideological lines in the practical implementation of public health policies. After controlling for a number of determinants of COVID-19 death counts, we find that ideology, operationalized as county-level Trump support, is not predictive of increased COVID-19 mortality on its own. However, predicted rates of COVID-19-related deaths in counties with high levels Trump support increase along with the duration of implementation of several COVID-19 policies (restaurant closures, gym and entertainment facility closures, and SIPOs). We hope these findings encourage policymakers and opinion leaders to consider the risks associated with mixed messaging during future health crises. Encouraging noncompliance with public health directives along ideological lines leads to suboptimal public health outcomes and, in the case of the coronavirus pandemic, unnecessarily high death rates. Policymakers should balance the cost of sacrificing individual freedoms against the grave health outcomes suffered disproportionately by vulnerable groups.

However, we also urge caution when interpreting our findings in the context of policy recommendations. Our study covered only a small time period (April 6 through May 25, 2020) and our conclusions may not generalize well beyond this period. As researchers learned more about the virus and the public increasingly saw its effects first-hand, both public health guidance and compliance may have adjusted accordingly.

Concerning SDB, we find that the number of people who work part time or full time outside the home is positively associated with the level of Trump support at the county level. Additionally, the number of people who work from home is negatively associated with the level of Trump support. This suggests that mixed health signals from experts and politicians may influence individuals' compliance with public health directives, even during major crises. Mixed signals from politicians may potentially cause people to underestimate the seriousness of a health crisis.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest. This research was not supported by any grants or outside sources. No patient data or personally identifiable information were used in this study.

ETHICS STATEMENT

All data and code needed to reproduce the study will be made publicly available on the author's website at the time of publication.

ENDNOTES

[1]https://www.who.int/emergencies/diseases/novel-coronavirus-2019

[2]https://home.treasury.gov/policy-issues/cares

[3]As Covid-19 continues to spread across the United States, President Donald Trump has given governors guidance on reopening state economies in the coming months (April 17, 2020). https://www.bbc.com/news/world-us-canada-52314866

[4]Tennessee doctors say it is not safe to reopen the economy without rapid testing, proper PPE (April 24, 2020). https://fox17.com/news/local/tennessee-doctors-say-its-not-safe-to-reopen-economy-with-rapid-testing-proper-ppe

[5]This paper uses working modes, full time, part time, or never at home, to represent social distancing activities.

[6]https://www.nytimes.com/2020/03/23/business/trump-coronavirus-economy.html

[7]https://www.nytimes.com/2020/03/23/business/trump-coronavirus-economy.html

[8]https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-beginning-next-phase-fight-coronavirus-guidelines-opening-america/

[9]https://www.washingtonpost.com/politics/trump-reaction-woodward-interview-coronavirus/2020/09/09/fc21e67e-f2ca-11ea-b796-2dd09962649c_story.html

[10]Also known as a stay-at-home order.

[11]For instance, CNN documented one COVID-19 patient was worried about treatment costs even despite his serious health condition: https://www.cnn.com/2020/04/11/health/nurse-last-words-coronavirus-patient-trnd/index.html.

[12]We thank a helpful reviewer for the suggestion to distinguish the Asian population from other racial minorities in our analyses. The opposite signs on the coefficients associated with these covariates justify this decision. Therefore, the race variable represents the proportion of the population that is neither white nor of Asian descent.

[13]https://github.com/CSSEGISandData/COVID-19

[14]https://coronavirus.jhu.edu/map.html

[15] MIT Election Data and Science Lab, 2018, "County Presidential Election Returns 2000-2016," https://doi.org/10.7910/DVN/VOQCHQ, Harvard Dataverse, V6, UNF:6:ZZe1xuZ5H2l4NUiSRcRf8Q==[fileUNF].

[16]https://data.census.gov/cedsci/

[17]https://docs.safegraph.com/docs/social-distancing-metrics

[18]https://github.com/JieYingWu/COVID-19_US_County-level_Summaries/blob/master/raw_data/national/public_implementations_fips.csv

[19]We use the SAFEGRAPH variable *completely_home_device_count* to represent persons who work entirely from home. This variable is described as "out of the device count, the number of devices that did not leave the geohash-7 in which their home is located during the period." The variable *part_time_work_behavior_devices* represents "the number of devices that spent one period of between 3 and 6 hours at one location other than their geohash-7 home during the period of 8 am - 6pm in local time. This does not include any device that spent 6 or more hours at a location other than home." Lastly, the variable *full_time_work_behavior_devices* represents "the number of devices that spent greater than 6 hours at a location other than their home geohash-7 during the period of 8 am - 6pm in local time."

[20]While we include all four model specifications for completeness, we contend that the zero-inflated negative binomial model best reflects our understanding of the data generating process: one process governs the existence of COVID-19 in a county while another process, represented by a negative binomial distribute, models the number of cases conditional on the existence of at least one case.

[21]The full models that include these interaction effects are included in Appendix A.

REFERENCES

Abouk, R., & Heydari, B. (2020). *The immediate effect of covid-19 policies on social distancing behavior in the United States*. Available from SSRN.

Adolph, C., Amano, K., Bang-Jensen, B., Fullman, N., & Wilkerson, J. (2020). Pandemic politics: Timing state-level social distancing responses to COVID-19. *medRxiv*.

Allcott, H., Boxell, L., Conway, J., Gentzkow, M., Thaler, M., & Yang, D. (2020). Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic. *Journal of Public Economics*, *191*, 104254. https://doi.org/10.1016/j.jpubeco.2020.104254

Barrios, J. M., & Hochberg, Y. (2020). *Risk perception through the lens of politics in the time of the covid-19 pandemic* (No. w27008). National Bureau of Economic Research. https://www.nber.org/system/files/working_papers/w27008/w27008.pdf

Bell, A., & Jones, K. (2015). Explaining fixed effects: Random effects modeling of time-series cross-sectional and panel data. *Political Science Research and Methods*, *3*(1), 133–153.

Carlos, W. G., Dela Cruz, C. S., Cao, B., Pasnick, S., & Jamil, S. (2020). Novel Wuhan (2019-nCoV) coronavirus. *American Journal of Respiratory and Critical Care Medicine*, *201*(4), P7–P8.

Chandra, S., Kassens-Noor, E., Kuljanin, G., & Vertalka, J. (2013). A geographic analysis of population density thresholds in the influenza pandemic of 1918–19. *International Journal of Health Geographics*, *12*(1), 9.

Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X., & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: A descriptive study. *The Lancet*, *395*(10223), 507–513.

Chen, Z.-M., Fu, J.-F., Shu, Q., Chen, Y.-H., Hua, C.-Z., Li, F.-B., Lin, R., Tang, L. F., Wang, T. L., Wang, W., Wang, Y. S., Xu, W. Z., Yang, Z. H., Ye, S., Yuan, T. M., Zhang, C. M., & Zhang, Y. Y. (2020). Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus. *World Journal of Pediatrics*, *16*, 1–7.

Chung, M., Bernheim, A., Mei, X., Zhang, N., Huang, M., Zeng, X., Cui, J., Xu, W., Yang, Y., Fayad, Z. A., Jacobi, A., Li, K., Li, S., & Shan, H. (2020). CT imaging features of 2019 novel coronavirus (2019-nCoV). *Radiology*, *295*, 202–207.

Cooper, L. A., & Williams, D. R. (2020). Excess deaths from COVID-19, community bereavement, and restorative justice for communities of color. *Journal of the American Medical Association*, *324*(15), 1491–1492.

Courtemanche, C., Garuccio, J., Le, A., Pinkston, J., & Yelowitz, A. (2020). Strong social distancing measures in the United States reduced the COVID-19 growth rate. *Health Affairs*, *39*(7), 1237–1246. https://doi.org/10.1377/hlthaff.2020.00608

Courtemanche, C. J., Garuccio, J., Le, A., Pinkston, J. C., & Yelowitz, A. (2020). Did social-distancing measures in Kentucky help to flatten the COVID-19 curve?

Data & Lab. (2018). County presidential election returns 2000–2016. Harvard Dataverse.

Dave, D., Friedson, A., Matsuzawa, K., Sabia, J. J., & Safford, S. (2020). JUE Insight: Were urban cowboys enough to control COVID-19? Local shelter-in-place orders and coronavirus case growth. *Journal of Urban Economics*, 103294. https://doi.org/10.1016/j.jue.2020.103294

Dave, D., Friedson, A. I., Matsuzawa, K., & Sabia, J. J. (2021). When do shelter-in-place orders fight COVID-19 best? Policy heterogeneity across states and adoption time. *Economic Inquiry*, *59*(1), 29–52. https://doi.org/10.1111/ecin.12944

Fang, Y., Zhang, H., Xu, Y., Xie, J., Pang, P., & Ji, W. (2020). CT manifestations of two cases of 2019 novel coronavirus (2019-nCoV) pneumonia. *Radiology*, *295*, 208–209.

Gadarian, S. K., Goodman, S. W., & Pepinsky, T. B. (2020, March 27). *Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic*. SSRN (preprint).

Gelfand, M., Jackson, J., Pan, X., Nau, D., Dagher, M., Lange, P. v., & Chiu, C. Y. (2020). The importance of cultural tightness and government efficiency for understanding COVID-19 growth and death rates. *PsyArXiv*. https://psyarxiv.com/m7f8a/

Gollwitzer, A., Martel, C., Brady, W. J., Knowles, E. D., & Van Bavel, J. (2020). *Partisan differences in physical distancing predict infections and mortality during the coronavirus pandemic*. Available from SSRN 3609392.

Grossman, G., Kim, S., Rexer, J., & Thirumurthy, H. (2020). *Political partisanship influences behavioral responses to governors' recommendations for COVID-19 prevention in the United States*. Available from SSRN 3578695.

Holshue, M. L., DeBolt, C., Lindquist, S., Lofy, K. H., Wiesman, J., Bruce, H., Spitters, C., Ericson, K., Wilkerson, S., Tural, A., Diaz, G., Cohn, A., Fox, L., Patel, A., Gerber, S. I., Kim, L., Tong, S., Lu, X., Lindstrom, S., … Pillai, S. K. (2020). First case of 2019 novel coronavirus in the United States. *New England Journal of Medicine*, *382*, 929–936.

Jin, Y.-H., Cai, L., Cheng, Z.-S., Cheng, H., Deng, T., Fan, Y.-P., Fang, C., Huang, D., Huang, L. Q., Huang, Q., Han, Y., Hu, B., Hu, F., Li, B. H., Li, Y. R., Liang, K., Lin, L. K., Luo, L. S., Ma, J., … Wang, X. H. (2020). A rapid advice guideline for the diagnosis and treatment of 2019 novel coronavirus (2019-nCoV) infected pneumonia (standard version). *Military Medical Research*, *7*(1), 4.

Kim, J. Y., Choe, P. G., Oh, Y., Oh, K. J., Kim, J., Park, S. J., Park, J. H., Na, H. K., & Oh, M. (2020). The first case of 2019 novel coronavirus pneumonia imported into Korea from Wuhan, China: implication for infection prevention and control measures. *Journal of Korean Medical Science*, *35*(5).

Krueger, P. M., & Chang, V. W. (2008). Being poor and coping with stress: Health behaviors and the risk of death. *American Journal of Public Health*, *98*(5), 889–896.

Kushner Gadarian, S., Goodman, S. W., & Pepinsky, T. B. (2021). Partisanship, health behavior, and policy attitudes in the early stages of the COVID-19 pandemic. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3562796

Lin, L., & Li, T. (2020). Interpretation of "guidelines for the diagnosis and treatment of novel coronavirus (2019-ncov) infection by the national health commission (trial version 5)". *Zhonghua Yi Xue Za Zhi*, *100*, E001.

Lodge, M., & Taber, C. S. (2013). *The rationalizing voter*. Cambridge University Press.

Lotufo, P. A., Fernandes, T. G., Bando, D. H., Alencar, A. P., & Benseñor, I. M. (2013). Income and heart disease mortality trends in Sao Paulo, Brazil, 1996 to 2010. *International Journal of Cardiology*, *167*(6), 2820–2823.

Lu, H. (2020). Drug treatment options for the 2019-new coronavirus (2019-nCoV). *Bioscience Trends*, *14*, 69–71.

Mayer, J. D. (2020). The contemporary presidency: Two presidents, two crises: Bush Wrestles with 9/11, Trump Fumbles COVID-19. *Presidential Studies Quarterly*, *50*(3), 629–649.
Mesch, G. S., & Schwirian, K. P. (2015). Confidence in government and vaccination willingness in the USA. *Health Promotion International*, *30*(2), 213–221.
Najem, G. R., Louria, D. B., Lavenhar, M. A., & Feuerman, M. (1985). Clusters of cancer mortality in New Jersey municipalities; with special reference to chemical toxic waste disposal sites and per capita income. *International Journal of Epidemiology*, *14*(4), 528–537.
Nishiura, H., Kobayashi, T., Yang, Y., Hayashi, K., Miyama, T., Kinoshita, R., … Suzuki, A. (2020). *The rate of underascertainment of novel coronavirus (2019-nCoV) infection: Estimation using Japanese passengers data on evacuation flights*. Multidisciplinary Digital Publishing Institute.
Painter, M., & Qiu, T. (2020). *Political beliefs affect compliance with covid-19 social distancing orders*. Available from SSRN 3569098.
Redmond, N., Richman, J., Gamboa, C. M., Albert, M. A., Sims, M., Durant, R. W., Glasser, S. P., & Safford, M. M. (2013). Perceived stress is associated with incident coronary heart disease and all-cause mortality in low-but not high-income participants in the reasons for geographic and racial differences in stroke study. *Journal of the American Heart Association*, *2*(6), e000447.
Riou, J., & Althaus, C. L. (2020). Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. *Eurosurveillance*, *25*(4), 2000058.
Shi, H., Han, X., & Zheng, C. (2020). Evolution of CT manifestations in a patient recovered from 2019 novel coronavirus (2019-nCoV) pneumonia in Wuhan, China. *Radiology*, *295*, 20.
Singh, G. K., & Jemal, A. (2017). Socioeconomic and racial/ethnic disparities in cancer mortality, incidence, and survival in the United States, 1950–2014: Over six decades of changing patterns and widening inequalities. *Journal of Environmental and Public Health*, *2017*, 1–19.
Song, F., Shi, N., Shan, F., Zhang, Z., Shen, J., Lu, H., Ling, Y., Jiang, Y., & Shi, Y. (2020). Emerging 2019 novel coronavirus (2019-nCoV) pneumonia. *Radiology*, *295*, 210–217.
Tang, B., Bragazzi, N. L., Li, Q., Tang, S., Xiao, Y., & Wu, J. (2020). An updated estimation of the risk of transmission of the novel coronavirus (2019-nCov). *Infectious Disease Modelling*, *5*, 248–255.
Tolkkinen, A., Madanat-Harjuoja, L., Taskinen, M., Rantanen, M., Malila, N., & Pitkäniemi, J. (2018). Impact of parental socioeconomic factors on childhood cancer mortality: A population-based registry study. *Acta Oncologica*, *57*(11), 1547–1555.
Van Bavel, J. J., Baicker, K., Boggio, P. S., Capraro, V., Cichocka, A., Cikara, M., … Druckman, J. N. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, *4*, 460–471.
Van Holm, E., Monaghan, J., Shahar, D. C., Messina, J., & Surprenant, C. (2020). *The impact of political ideology on concern and behavior during Covid-19*. Available from SSRN 3573224.
Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., Wang, B., Xiang, H., Cheng, Z., Xiong, Y., Zhao, Y., Li, Y., Wang, X., & Peng, Z. (2020). Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. *Journal of the American Medical Association*, *323*, 1061.
Wang, W., Tang, J., & Wei, F. (2020). Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. *Journal of Medical Virology*, *92*, 441–447.
Wilson, M. E., & Chen, L. H. (2020). Travellers give wings to novel coronavirus (2019-nCoV). *Journal of Travel Medicine*, *27*.
World Health Organization (WHO). (2020). *Novel coronavirus (2019-nCoV)* (Situation Report). https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200207-sitrep-18-ncov.pdf?sfvrsn=fa644293_2
Zaller, J. R. (1992). *The nature and origins of mass opinion*. Cambridge University Press.

AUTHOR BIOGRAPHIES

Jingjing Gao is a Doctoral Candidate in the Public Policy Doctoral Program at the University of North Carolina at Charlotte.

Benjamin J. Radford, **PhD**, is an Assistant Professor of Political Science and Public Administration, core faculty of the Public Policy Program, and an affiliate member of the School of Data Science at the University of North Carolina at Charlotte.

How to cite this article: Gao, J., & Radford, B. J. (2021). Death by political party: The relationship between COVID-19 deaths and political party affiliation in the United States. *World Medical & Health Policy*. 13, 224–249. https://doi.org/10.1002/wmh3.435

APPENDIX A

TABLE A1 Time series analysis of political ideology and deaths of COVID-19 with 2 weeks lag

Variables (DV = death per county per week)	(1) Pooled OLS regression	(2) Random effects	(3) County fixed effects
Total population (log)	2.136***	0.633	
	(0.613)	(1.302)	
Population density (log)	2.179***	3.889***	
	(0.492)	(1.048)	
Percentage of population aged 65 and above	41.80***	51.23*	
	(9.636)	(20.03)	
Per capita income (log)	13.60***	23.26***	
	(2.397)	(4.791)	
Days after closing public schools	−0.361*	−0.165	−0.0271
	(0.140)	(0.145)	(0.162)
Days after closing restaurant dine-in	0.0758	0.00151	3.428
	(0.155)	(0.279)	(4.956)
Days after closing entertainment facilities and gym	−0.0977	−0.135	
	(0.108)	(0.234)	
Completely home device percentage	11.21	5.684	3.262
	(10.41)	(9.708)	(10.71)
Part-time working device percentage	9.162	10.60	5.049
	(32.41)	(27.89)	(29.68)
Full-time working device percentage	−66.89	−33.75	−26.92
	(51.36)	(42.78)	(45.04)
Trump support rate	−22.35***	−38.54***	
	(5.682)	(7.373)	
Days of SIPO	0.134	−0.210	−3.929
	(0.174)	(0.267)	(4.965)

TABLE A1 (Continued)

Variables (DV = death per county per week)	(1) Pooled OLS regression	(2) Random effects	(3) County fixed effects
Trump support rate × Days of SIPO	0.192	0.685***	0.762***
	(0.201)	(0.130)	(0.132)
Constant	−154.6***	−235.5***	−27.18
	(23.28)	(48.08)	(47.08)
Observations	10,017		
R^2	0.0534		
Number of counties with FIPS (Federal Information Processing Standers)		2,625	2,625
R^2—within		0.0052	0.0054
R^2—between		0.0640	0.0075
R^2—overall		0.0525	0.00068
$Sigma_u$ (α)		45.90	53.61
$Sigma_e$		24.98	24.97
Rho		0.77	0.82

Note: Robust standard errors are given in parentheses.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

[a]The Hausman test shows a significant difference ($p < 0.001$) between the coefficient for the fixed effects and the random effects model, so this study uses fixed effects for time-variant variables. However, the random effects model has multiple advantages, such as incorporating time-invariant variables (Bell & Jones, 2015), so we add a random effects model as a reference for explaining time-invariant variables' effects on death.

TABLE A2 Interaction effects for Figures 6–8

Variables (DV = Death number per county per week)	(1) ZINB_ Figure 6	(1a) ZINB_ Figure 6 inflate	(2) ZINB_ Figure 7	(2a) ZINB_ Figure 7 inflate	(3) ZINB_ Figure 8	(3a) ZINB_ Figure 8 inflate
Percentage of people of color without Asian	4.616***		4.548***		4.581***	
	–0.222		–0.222		–0.22	
Percentage of Asian	–2.291**		–2.133*		–2.203*	
	–0.885		–0.89		–0.886	
Percentage of population aged 65 and above	6.517***		6.535***		6.599***	
	–0.853		–0.858		–0.858	
Total population (log)	0.893***	–0.709***	0.893***	–0.705***	0.895***	–0.708***
	–0.047	–0.21	–0.0468	–0.208	–0.0478	–0.215
Population density (log)	0.0646	–0.663**	0.0688	–0.666**	0.0652	–0.663**
	–0.0515	–0.249	–0.0518	–0.245	–0.0524	–0.255
Per-capita-income (log)	0.959***	2.980***	0.952***	2.995***	0.954***	2.981***
	–0.177	–0.507	–0.177	–0.503	–0.178	–0.51
Days after closing public schools	–0.0962***		–0.0652***		–0.0658***	
	–0.0129		–0.00931		–0.00937	
Days after closing restaurant dine-in	–0.00182		–0.003		–0.0233*	
	–0.0102		–0.0102		–0.0116	
Days after closing entertainment facilities and gym	0.0334***		0.0124		0.0330***	
	–0.00649		–0.00903		–0.0065	
Days of SIPO	0.0301***		0.0311***		0.0309***	
	–0.00663		–0.00663		–0.00663	
Completely home device percentage	4.237***		4.207***		4.205***	
	–0.83		–0.837		–0.837	
Part-time working device percentage	–3.46		–3.217		–3.377	
	–3.052		–3.055		–3.06	
Full-time working device percentage	–10.88*		–10.48*		–10.50*	
	–4.235		–4.252		–4.249	
Trump support rate	–0.214		0.218		0.157	
	–0.537		–0.461		–0.493	
Days after closing public schools × Trump support rate	0.0533***					
	–0.0148					

TABLE A2 (Continued)

Variables (DV = Death number per county per week)	(1) ZINB_ Figure 6	(1a) ZINB_ Figure 6 inflate	(2) ZINB_ Figure 7	(2a) ZINB_ Figure 7 inflate	(3) ZINB_ Figure 8	(3a) ZINB_ Figure 8 inflate
Days after closing entertainment facilities and gym × Trump support rate			0.0359**			
			−0.011			
Days after closing restaurant dine-in × Trump support rate					0.0367**	
					−0.0117	
Constant	−22.04***	−21.05***	−22.23***	−21.22***	−22.23***	−21.06***
	−1.867	−5.612	−1.873	−5.54	−1.883	−5.667
Observations	10,012	10,012	10,012	10,012	10,012	10,012

Note: Robust standard errors are given in parentheses.

***$p < 0.001$; **$p < 0.01$; *$p < 0.05$.

World Medical and Health Policy

Hospital Accreditation: A Solution for Iranian Challenges or a Challenge for the Hospitals?

Peivand Bastani, Najmeh Bordbar, Fatemeh Golestanmanesh, Zahra Kavosi, Kimia Pourmohammadi, Sara Kashefian-Naeeini, and Ramin Ravangard

As accreditation is of great significance for hospitals, this study aimed to explain the accreditation challenges of Iranian hospitals through a content analysis approach. A qualitative and thematic analysis study was conducted through the content analysis method in 2018. Nineteen semi-structured interviews were conducted with experts and the data were saturated. To increase the accuracy and precision of the study, Guba and Lincoln's four criteria including credibility, dependability, conformability, and transferability were used. MAX QDA$_{10}$ was used for data analysis via the five-step framework analysis approach. The findings identified 5 main themes and 29 subthemes. The main themes included macro and policymaking issues, evaluators' issues, structures, and processes, executive issues, and accreditation measures. All of them contain related subthemes that indicate the national challenges of implementing hospital accreditation in the country. Iranian hospitals need to implement major changes in applying accreditation as a quality assurance mechanism. In other words, it seems necessary for policymakers affiliated with the Ministry of Health and Medical Education to revise accreditation measures according to hospital needs and try to clarify the structure and executive process of the accreditation. Moreover, improving and standardizing the evaluators' skills is recommended.

KEY WORDS: content analysis, hospital accreditation, Iran

Introduction

Hospitals and health-care services are vital components of every human society, toward which many financial and social resources are devoted (Hall, DeFrances, Williams, Golosinskiy, & Schwartzman, 2010). In addition, the quality of health services and hospitals is important for many stakeholders, including governments, nongovernmental organizations providing health care and social welfare, and patient-centered organizations (Tsai, Joynt, Orav, Gawande, & Jha, 2013). Therefore, countries are using different approaches to ensure the quality and improvement of health-care standards. Accreditation is one of the most effective mechanisms used to evaluate the performance and improve the safety and quality of health services (The Joint Commission, 2019). Evidence shows that within the past 50 years, hospital accreditation has been one of the most widely used strategies to improve the quality and functioning of health-care systems in more than 70 countries (Bogh et al., 2016).

doi: 10.1002/wmh3.400

Accreditation is a systematic assessment by an independent external organization to confirm the existence of pre-defined standards in the structure, process, and outcomes with the aim of stimulating the culture of continuous improvement in the quality of medical and hospital care and protecting people's health (Fortes, de Mattos, de Faria, & Baptista, 2011). Furthermore, accreditation is an effective program for improving the quality of care, patient safety, service provider satisfaction, and improving financial performance and professional development (Al Tehewy, Salem, Habil, El, & Okda, 2009; El-Jardali, Jamal, Dimassi, Ammar, & Tchaghchaghian, 2008; Hayati, Azimatun, Rozita, Ezat, & Rizal, 2010; Jaafaripooyan, Agrizzi, & Akbari-Haghighi, 2011).

In this regard, evidence shows that countries, based on the best interests of their health systems, can benefit from accreditation standards to maintain the primary principles of universal health care, justice, quality, efficiency, and sustainability (Brubakk, Vist, Bukholm, Barach, & Tjomsland, 2015). The history of using standards for the external evaluation of health-care organizations dates back to 1917 by the American College of Surgeons. The use of these standards led to the establishment of the Joint Commission for Hospital Accreditation in the United States in 1951. During the 1980s and 1990s, the Accreditation Program was expanded worldwide, and today most health and medical organizations are using accreditation standards, especially in developed countries (Schyve, 2000).

In Iran, there have been plans for assessing health-care centers for many years, but a structured form, called the Hospital Accreditation Program, was introduced by the Ministry of Health and Medical Education and made mandatory for all the public and private hospitals in January 2012 (Mosadeghrad, 2016). This program was based on groups of standards, criteria, and indicators to make hospitals move toward good clinical practice, and medical and professional guidelines. Against this initial aim, after 3 years of implementing the program, many criticisms were stated by hospital managers, evaluators, and experts that led to revise the program in four phases of situation analysis, planning, implementation, and evaluation in 2015 (Mosadeghrad, 2016).

In spite of these revisions, Iranian evidence shows that Hospital Accreditation Program suffers from many weak points in its implementation such as poor hospital managers' commitment, lack of physicians' involvement, inadequate resources, the existence of too many accreditations standards and criteria, and no well-trained evaluators with little motivation (Yousefinezhadi, Mosadeghrad, Arab, Ramezani, & Akbari Sari, 2017). Another piece of evidence shows that in most cases, the implementation of the accreditation program encounters several problems, including increased staff workload and employees' resistance to accreditation (Ng, Leung, Johnston, & Cowling, 2013), excessive dependence of the accreditation program on assessment judgments and high costs (Jaafaripooyan, 2014), the large number of measures and the time-consuming nature of accreditation process (Aryankhesal, 2016), the same weight of the measures and lack of clarity in the measures (Mosadeghrad, Akbari-Sari, & Yousefinezhadi, 2018), and the lack of staff motivation and group work (Mahmoodian et al., 2016). Hence, given the importance of accreditation for hospitals, and according to the contra-

dictory aspects to this concept, this study aimed to explore the accreditation challenges of Iranian hospitals.

Methods

The present study involved qualitative and thematic analysis research conducted through the content analysis method in 2018. Content analysis is a general term for analytical methods in which the content quality of the data is interpreted and explained through an in-depth or internal manner (Hsieh and Shannon, 2005).

Sample

In the present study, semi-structured interviews aimed at determining the initial framework and explaining the accreditation challenges of Iranian hospitals were carried out with six managers and authorities in charge of accreditation at universities, eight managers and authorities of hospitals, and five experts in quality improvement departments of hospitals. The interviewees were selected through purposeful sampling. Purposeful sampling is one of the most common sampling methods in qualitative studies in which the participant groups are selected based on pre-specified criteria related to research questions (Marshall, 1996). It should be noted that all 19 selected samples participated in the study and in the interviews. In this study, the sampling continued until data saturation was finally achieved through 19 semi-structured interviews. The selection criteria encompassed having at least a bachelor's degree, a minimal five-year experience and executive activities in the field of accreditation, having at least two years of management experience, being able to speak well, and having the willingness to participate and cooperate in the interviews. Taking into account the participants' opinions and making the necessary prearrangements, at this stage we interviewed them preferably in their workplaces. At the beginning of the interviews, some general explanations were orally given about the study and its objectives, as well as measures are taken to keep their information confidential. Most of the interviews lasted at least 50 minutes, and all the interviews were conducted by a single interviewer. The interviews were recorded with the permission of the participants and were then transcribed word to word shortly after their completion. The instruction for the semi-structured interviews was prepared using some studies and the perspectives of a number of faculty members. Verbal informed consent was obtained from all participants participating in the present study.

Measure

The final reviewed version of the instruction included five main open-ended questions and a number of sub-questions. These main questions were as follows: "how do you evaluate the condition of hospital accreditation in the country," "in your opinion, what are the main challenges of hospital accreditation in the country," "what do you think about the policy-making and implementing

challenges," "how about other challenges, for example, challenges in infrastructure, inter-sector relationships, regulations or executive mechanisms" and "what do you think about the present standards, indicators and criteria." The face validity of the interview instruction was approved through four initial interviews with the university accreditation managers and authorities, and a portion of the analyzed data were used in the final stage.

To increase the accuracy and precision of the study, Guba and Lincoln's four criteria including credibility, dependability, conformability, and transferability, which were among the criteria for reliability confirmation in qualitative studies, were used (Guba & Lincoln, 1994). Credibility is a comprehensive complicated concept that indicates if the investigated topic is really studied or not. It addresses the "fit" between respondents' views and the researcher's representation of them (Nowell, Norris, White, & Moules, 2017). To achieve data credibility in this study, we used continuous data comparison, data summarization and categorization without data damage, sampling for interviewing with maximum diversity, and time integration, such as doing in-depth interviews at the times and locations suggested by the participants and the possibility of giving feedback to the data, full and continuous involvement of the researcher in the data, and comparative and continuous analyses. Conformability is the second criterion that shows if the interpretations and findings are clearly derived from the data, ensuring this criterion requires demonstrating how conclusions and interpretations have been reached by the researcher (Nowell et al., 2017). For conformability of the present study, the contents of some of the interviews and extracted codes were handed to a number of faculty members who were familiar with the method of analyzing qualitative research and did not participate in the study. They were asked to verify the accuracy of the data encoding process. To achieve dependability as the third criteria, the researchers should ensure the logical, traceable, and clear documentation of the research process (Nowell et al., 2017). In this regard, all the process of the data collection, data coding, and data interpretation was documented via creating a clear audit trail. Transferability as the last criteria implies the generalizability of inquiry in a case to case transfer. In this regard, researchers should provide thick descriptions of the data (Nowell et al., 2017). To create the data transferability power, a complete description of the issue as well as the participants' characteristics, the data collection and data analysis methods, and some examples of the participants' statements were provided so that it would be possible for others to track the research route.

Reporting and Analysis

To analyze the data, a five-stage framework analysis method was used so that in the first stage, the audio files from the sessions were listened to by the researcher several times and the scripts were repeatedly read to become familiarized with the data. To identify a thematic framework, the repetitive ideas in the familiarization process were formed into groups of similar ideas or themes in the second stage. The third stage was indexing, in which the units or clusters of the data related to a

particular theme were identified. Following the indexing stage, the data were summarized in a table of themes based on the thematic framework. Finally, in the fifth stage, the data were ultimately combined, and maps and interpretations were used to define the concepts, show the relationship between the concepts, characterize the nature of the phenomenon, and provide explanations and suggestions (Gale, Heath, Cameron, Rashid, & Redwood, 2013). Furthermore, to ensure dependability, two members of the research team analyzed the contents individually and discussed the issues to reach an agreement. The data analysis was also done using the MAX QDA 10 software. To this end, at the end of this stage, the accreditation challenges of the hospitals in the country were identified.

Results

Among the 19 interviewees, there were 13 (68.42 percent) female and 6 (31.58 percent) male ones, and their mean age was 53.25 ± 6.3 years. The findings of the interview analysis led to the identification of 5 main themes and 29 subthemes as described in Table 1. The main themes included macro and policymaking issues, evaluators' issues, structures and processes, executive issues, and accreditation measures. We explain each of them as follows:

Macro and Policymaking Issues

Accreditation macro challenges and policymaking incorporated five subthemes as follows: non-alignment of educational and medical accreditation policies, waste of resources and spending additional expenses, lack of a healthy and independent third organization, ignoring the process owners and accreditation stakeholders, and disparate and contradictory regulations and supervisions by different deputies. In this regard, the interviewees believed that educational accreditation policies were not in line with the policies of medical accreditation.

One of the participants stated:

> *Unfortunately, our medical and educational deputies aren't consistent and don't have the same policies, so, when they pay attention to education, treatment is abandoned, when they consider treatment, education is ignored* (P_{17}).[1]

Another participant said:

> *Regarding hospital accreditation, we should do something to highlight the grading of educational accreditation in medical accreditation* (P_{16}).

The interviewees believed that there was a waste of resources and extra expenses were spent in accreditation.

[1]P stands for a participant.

Table 1. Accreditation Challenges of Hospitals in the Country

Main Theme	Subtheme
Macro and policymaking issues	Non-alignment of educational and medical accreditation policies
	Waste of resources and spending additional expenses
	Lack of a healthy and independent third organization
	Ignoring the process owners and accreditation stakeholders
	Disparate and contradictory regulations and supervisions by different deputies
Evaluators' issues	Shortage of evaluators to assign to different provinces
	Costs of travel and residence of evaluators in different provinces
	Evaluators' lack of motivation due to inappropriate payments
	Irrelevancy of evaluators' expertise with the areas of evaluation
	Involvement of a large number of people and the impact of their personal tastes on evaluations
	Impact of the mood and position of evaluators and evaluatees on evaluation quality
	Irregular and tight schedules of evaluations
Structures and processes	Ignoring the infrastructures (space, finance, equipment, and human force) in accreditation
	Nonstandard and old hospital buildings
	Failure to create healthy competition between hospitals
	Inconsistency of the strategic plan of hospitals with the accreditation program
	Instrumental use of accreditation to raise hospital rank and increase tariffs
Executive issues	Increased workload and dissatisfaction of hospital staff
	Increased attention of the staff to documentation, and lack of attention to main tasks
	Staff resistance against accreditation due to its compulsory nature
	Physicians' lack of involvement in accreditation due to the lack of financial gains
	Time-consuming nature of accreditation process
Accreditation measures	Interference and parallel work among the areas of responsibility of some measures
	Ambiguity and unclearness of some measures
	Using the same measures in evaluating different hospitals
	Weakness of the measures in some areas
	The same weight of the measures
	Inappropriate structure of scoring the measures
	Failure to review the measures in line with the changes in the social, economic, and political conditions of society

In this regard, one interviewee stated that:

> *While there are not enough facilities the same as infrastructures, beds, medical equipment, physicians and so on in the hospitals of the remote and deprived areas, the Ministry of Health and Medical education obligates all the hospitals to implement accreditation and evaluate them annually. It can impose an extra cost to such these hospitals for training of their staff, documentation of the accreditation pre requisites and readiness for responsiveness to the surveyors* (P_4).

The interviewees believed that currently, there was not a healthy and independent third company to carry out the accreditation process. One participant stated that:

> *We need an institution or organization to act independently, develop evaluators autonomously, train independently, and even dispatch evaluators on its own* (P_{10}).

Similarly, another participant said:

> *The structure of the third organization, their type of expertise, not having stakeholders, and in fact, not having political factions, are of overriding importance. That's why we couldn't establish a healthy third company* (P_4).

In their opinion, process owners and stakeholders were not taken notice of in accreditation. One of the participants stated that:

> *We write down a lot of accreditation measures but they are infeasible and should be ignored; this shows that in the formulation of accreditation measures, the people who must be involved aren't included, while those whose presence is somewhat unnecessary are involved, and this brings about duality* (P_{18}).

The interviewees believed that disparate and contradictory instructions and regulations were imposed on hospitals by different deputies. One participant stated that:

> *At times, this kind of disparate supervision misleads the hospitals; for example, each of them apply a different taste to the hospital* (P_7).

Besides, a participant asserted:

> *The appearance of various groups is one of our problems. There are sometimes contradictions between these measures, accreditation comments and evaluations and case evaluations* (P_6).

Evaluators' Issues

Evaluators' issues included seven subthemes as follows: a shortage of evaluators to be assigned to different provinces, costs of travel and residence of evaluators in various provinces, evaluators' lack of motivation due to inappropriate payments, the irrelevancy of evaluators' expertise with the areas of evaluation, the involvement of a large number of people and the impact of their personal tastes on evaluations, the effect of the mood and position of evaluators and evaluatees on judgment and evaluation quality, and irregular and tight schedules of evaluations. Some interviewees believed that there was a shortage of evaluators to be allocated to different provinces. A participant stated that:

> *They had predicted a specific number of evaluators to register at the ministry, but there weren't that many applicants in that field. Anyway, one of the country's challenges is that some provinces don't have evaluators at all* (P_4).

The interviewees thought that the travel and residence of the evaluators in different provinces were costly. One affirmed that:

> *Now that we're facing economic problems and should reduce expenses, their costly travel and residence is a real challenge* (P_{10}).

However, one of the interviewees believed, inappropriate payments to evaluators would cause them to lose motivation and reduce in number. In this regard, it was said that:

> *Since there is no specific motive for evaluators, it makes a big challenges and can make them lose motivation and diminish their number over time* (P_{10}).

The interviewees believed that the appointment of the evaluators was not related to their expertise. One participant declared:

> *One specialist sees the hospital and everything else from a doctor's point of view, while a nursing expert sees everything from the standpoint of a nurse* (P_{11}).

Similarly, another participant stated that:

> *The first and second generations were more precise, because, for example, one who evaluated the units was doing it related to his/her own expertise, but it wasn't the same in the third generation* (P_7).

Most of the interviewees believed that evaluators' personal taste influenced their evaluations. A participant stated that:

> *Hospitals toil, spend lots of energy, instruct and implement very much, then an evaluator comes and thinks everything should be done in the same way as it is in her/his own city, but that's not right, because the nature of the measure must be considered* (P_{14}).

As the interviewees said, evaluators' moods and conditions were effective in judging and evaluating quality. One interviewee emphasized that:

> *A tired evaluator may not evaluate well; or the evaluation by one who goes to a hospital environment where, let's say, something bad has just happened, for example, somebody has died and his/her relatives are making lots of noise, shriek and fight, will be affected by the situation* (P_2).

The interviewees believed that the schedules for evaluations were irregular and tight. A participant said:

> *There is no specific program; the goal is unclear, and we don't know when accreditation will get started* (P_8).

Structures and Processes

Structural and process challenges included the five following subthemes: ignoring the infrastructure of space, finance, equipment and workforce in accreditation; nonstandard and old hospital buildings; failure to create healthy competition between hospitals; inconsistency of the strategic plan of hospitals with the accreditation program; and instrumental use of accreditation to raise hospital rank and increase tariffs. Most of the interviewees believed that the infrastructure of space, finance, equipment and workforce was not taken into account in accreditation. One of the participants stated that:

> *We don't have the standards of our infrastructures, such as human force, space structure, and equipment in accreditation at all* (P_{16}).

In addition, another participant said:

> *Our nurses are exhausted, our system is worn out, we're all disappointed, all without motivation, there are some things wrong, one of which I think is a shortage of human forces* (P_{15}).

The interviewees thought that hospital buildings were old and nonstandard. A participant stated:

> *It's really good to plan for having a social isolation room and a psychological isolation one in each section of the new hospitals which will be built, but it's very hard for old hospitals which don't even have vacant rooms* (P_{14}).

Another participant also contended:

> *Some standards aren't applied because our hospital is old. For example, our hoteling standards aren't perfect; so, we can't make some departments in there* (P_{19}).

Interviewees believed that the competition between hospitals was not appropriate. One of them claimed:

> *Well, if you encourage competitions over numbers and indices, one of the paths that will open is data-making path, and many hospitals may be heading towards providing wrong data to universities in order to show their own statistics better than what they really are* (P_1).

Some interviewees thought that the strategic plans of hospitals were not consistent with accreditation. In this regard, a participant stated:

> *This very strategic plan is real when it's done at the university; it's real when it's done in the ministry* (P_{17}).

A number of the interviewees believed that accreditation was used as a tool to raise the rank of hospitals and increase the tariffs. It was said:

> *A hospital is now in trouble; it doesn't have money; we do it and ask them to consider its accreditation so high that we can increase the tariffs and allocate more money to the hospital* (P_2).

Executive Issues

The executive issues included the following subthemes: increased workload and dissatisfaction of hospital staff, increased attention of the staff to documentation, and lack of attention to main tasks, staff resistance against accreditation due to being compulsory, physicians' lack of involvement in accreditation due to the lack of financial gains and time-consuming nature of accreditation process. Some of the interviewees believed that increased workload was causing dissatisfaction among hospital staff. One of the participants expressed:

> *We have too much expectation of our personnel though they are insufficient in number; they're usually working double shift; we ask them for excellent accreditation; they're also questioned regularly; these altogether have made them lose motivation. We're all under pressure* (P_{15}).

A majority of the interviewees believed that the issue of accreditation and the increased attention of the staff to documentation had caused the main tasks not to be properly taken into consideration. One participant stated that:

> *Although accreditation was very good and they wanted it to exist, it had made the nurses away from bedside. They were going toward filing and documenting which made them further from bedside. They spent more time on writing than on dealing with the patients* (P_{14}).

Similarly, another participant maintained:

> *We give each nurse 8 patients and 2 to 3 intubates; so we'll be over-expectant to ask them do everything standardly, take care of the patients, have good relationships with all the patients, and provide us with excellent documentation and write down everything in detail* (P_{15}).

The interviewees believed that the compulsory accreditation program would cause the staff to resist it. A participant stated that:

> *In an organization where accreditation came from a macro level, i.e. the ministry, and was considered compulsory, there would be usually resistance against it* (P_2).

According to most of the interviewees, doctors were not mainly involved in accreditation nor did they cooperate in its implementation. As one of the participants stated:

Unfortunately many doctors did not get involved in accreditation perhaps because they did not receive any gains (financial gains or promotion) (P_6).

A number of interviewees believed that the accreditation program was a time-consuming process. Accordingly, a participant said:

In fact, it was a very lengthy process, and, for example, it took three complete working days and we were involved three working days in the hospital (P_4).

Accreditation Measures

The problems of accreditation measures included seven subthemes as follows: interference and parallel work within the areas of responsibility of some measures, ambiguity, and unclearness of some measures, using the same measures in evaluating different hospitals, weakness of the measures in some areas, the same weight of the measures; inappropriate structure in scoring the measures, and failure to review the measures in line with the changes in the social, economic and political conditions of the society. Some interviewees believed that there were interference and parallel work in the responsibility areas of some measures. In this regard, a participant pointed out that there was another issue, called parallel work. According to him:

They sometimes had task interference which greatly caused tension in the organization: tension between human resources and nursing offices, between environmental health and infection control, or between environmental health and occupational health (P_1).

A number of the interviewees believed that some measures were ambiguous and unclear. One of the participants confirmed:

You have to think a lot to know what the measure means. You need to read it several times although they all have recommendations and stars. When we read it to different people, they may have different impressions. It's not so clear and explicit (P_{41}).

In addition, another participant stated that:

The accreditation manual itself needed explanations. They had provided it for some measures to a great deal and supplied some explanations, but some measures were still vague and unclear (P_2).

According to a majority of the interviewees, a number of similar and general measures and checklists were used to evaluate different hospitals. As one participant underlined,

> *Hospitals differ from one another and they cannot be assessed with the same measures. Single specialty and general hospitals vary a lot. Even an educational hospital was different from a medical hospital* (P_6).

Another participant contended:

> *As they use the same checklist and the same instruction to evaluate hospitals, they can't easily distinguish between the hospitals that are inherently different, like general and private hospitals, or non-educational and educational ones* (P_2).

As most of the interviewees pointed out, accreditation measures have weaknesses in some areas. One of the participants declared:

> *In general, the measures of the IT syllabus definitely need to be revised. They're outdated! The ones related to maintenance and repair, especially those related to supply, are of poor quality, too. The maintenance area has become a bit better, but it's still far from the standards* (P_1).

Furthermore, a participant stated:

> *Accreditation is still financially weak and defective; that is, a hospital might have worked even well, but maybe it goes bankrupt! Lots of our public hospitals have a negative balance of course* (P_2).

Some of the interviewees thought that the weight and importance of the measures ought not to be the same. A participant affirmed:

> *Some measures are much more important for hospitals, i.e., they're more important in specific types of hospitals. Therefore, this measure should be scored higher. Its score shouldn't be the same as the one which was obtained in, for example, another hospital with a different specialty* (P_6).

Additionally, a participant stated:

> *"f they want to change the weight of the measures, they should do it proportionate to the hospital. For example, if we have a financial measure in a private hospital, the weight of the financial measures will certainly increase much more than that of a public hospital* (P_2).

Some interviewees believed that the scoring method was unsuitable. In this regard, a participant pronounced:

> *At present, the scores given to the measures are currently zero and one, and this inevitably will bring about scoring problems* (P_{11}).

According to the interviewees, the measures needed to be revised in accordance with the changing social, economic and political conditions of the community. One of the participants stated: I

It's necessary to review the measures every few years because social conditions, types of community diseases, and economic policies of the country are all changing over time (P_6).

Discussion

The results showed that the accreditation challenges of Iranian hospitals can be stated in five main categories as follows: macro and policymaking issues, evaluators' issues, structures and processes, executive issues, and accreditation measures.

Macro and Policymaking Issues

Among macro and policymaking issues, the waste of resources and spending additional expenses is highlighted. Other Iranian pieces of evidence show that the national accreditation program uses up a considerable amount of resources (Mahmoodian et al., 2016; Yousefinezhadi et al., 2017). Similarly, another piece of evidence indicates that the cost of accreditation for hospitals is also a key constraint and consumes the resources that can be used for medical services (Øvretveit & Gustafson, 2002). It seems that this evidence like the present findings points to the costs of implementing accreditation but it should not be forgotten that after a successful implementation of hospital accreditation, the total cost can be reduced by continuous quality improvement over a long period of time. In this regard, even the evidence of Australia as a developed country intensively shows that running an accreditation system requires financial support (Hinchcliff et al., 2013).

Lack of an independent third organization for implementing the accreditation, ignoring the process owners and accreditation stakeholders, and contradictory regulations and supervisions by different deputies are among other challenges related to macro and policymaking issues. In Iran, the Ministry of Health and Medical Education is responsible for hospital accreditation. As is obvious the ministry is naturally considered as the steward of the health system and in this regard, it has the responsibility for setting the rules and regulations as well as policymaking. But Iranian evidence shows that the ministry has the responsibility of health service provision and hospital accreditation as well (Aryankhesal, 2016). As it is clear, the Ministry of Health and Medical Education cannot be considered as an independent agency with a fair view especially in regard to the public hospitals. Hence, the reduced rank and credibility of hospitals will reduce the tariffs and, as a result, decrease the income of hospitals in the country, and will impose a huge financial burden on the government. Thus, the role of the Ministry of Health and Medical Education as the owner of public hospitals and the organization that evaluates and validates hospitals will create a conflict of interest. This will in turn reduce the quality of hospital accreditation programs. In this regard, the existence of a third, healthy and independent organization seems essential. In Kenya and Tanzania, the National Hospital Insurance Fund (NHIF) runs the hospital accred-

itation program, and one of the problems in Uganda is the implementation of the accreditation program by its Ministry of Health (Lane et al., 2014).

Executive Issues

Increased attention of the staff to documentation is one of the challenges that was considered as an executive issue. According to the results, the Iranian accreditation standards are documentation-oriented. This problem, along with the lack of professional evaluators especially in the technical aspects and the irrelevance of evaluators' specialties to the areas under evaluation, may necessitate more attention to the review of documents instead of the observation of work processes and the evaluation of outcomes.

Increased workload and dissatisfaction of hospital staff were among other hospital executive issues. Generally, new programs are associated with an increased workload, and providing documentation and evaluation activities is also time-consuming. Therefore, it is necessary to take heed of the factors that increase the staff's motivation and participation, in addition to managing fair division of their tasks. The Brazilian nurses' views on accreditation also showed that they did not have enough time to carry out accreditation activities and did not receive appropriate rewards for it (Gabriel et al., 2018). In the study by Ng et al., the increased workload of the staff and their resistance to changes were among the weaknesses of the accreditation program (Ng et al., 2013). In addition, the results of the study by Pongpirul et al. revealed that documentation of the patients' healthcare records was the biggest obstacle to the implementation of accreditation programs in Thailand (Pongpirul, Sriratanaban, Asavaroengchai, Thammatach-Aree, & Laoitthi, 2006).

According to the participants, the staff's resistance to accreditation due to its compulsory nature was one of the drawbacks of the accreditation executive issues. In fact, unlike the United States' accreditation program which was voluntary, the Iranian Ministry of Health and Medical Education necessitated all public and private hospitals to implement the accreditation program. Given the lack of standardized spaces for different departments and the dearth of human resources to enforce the standards, hospitals could not easily adapt themselves to the accreditation program, and thus a kind of resistance to the program was created. However, it seems that if the goals of accreditation are properly explained to the staff by holding training classes before the implementation of the program, such problems will be largely averted. One of the influential factors in reducing staff resistance in Hong Kong was the awareness of the accreditation goals and of the opportunities for the staff and hospitals (Ng et al., 2013). In the study by Saadati et al., negative perceptions of the nurses about hospital accreditation included poor motivation systems, over-documentation, and work stress (Saadati et al., 2018). Similarly, in the study by Mahmoodian et al., the increased workload of the staff and the lack of teamwork and task division were outlined as the accreditation challenges that caused staff dissatisfaction (Mahmoodian et al., 2016).

The lack of physicians' involvement in accreditation due to the lack of financial gain was also stated as a challenge of hospital accreditation in the area of executive issues. The participants maintained that physicians did not get involved in accreditation, and unfortunately, there was not enough supervision of the issue. Furthermore, physicians' tasks were carried out by nurses, and this gave rise to increased dissatisfaction. In their study, Hakkak et al. addressed the lack of physicians' participation in accreditation, which was considered a hospital accreditation challenge in the country, and is consistent with the results of the present study (Hakkak, Shahsiah, & Akhlaghi, 2018).

According to the participants, another executive issue of accreditation was its time-consuming nature. It seems that the implementation of the accreditation program is initially time-consuming due to the provision of the necessary context, and this is one of the challenges of accreditation in Iran and the world. In their studies, Sack, Pomey, and Reznich also stated that accreditation was a time-consuming process, and pointed out that the process could be shortened (Pomey, Contandriopoulos, François, & Bertrand, 2004; Reznich & Mavis, 2000; Sack et al., 2011).

Evaluators' Issues

Shortage of evaluators to be allocated to all the country's hospitals along with their lack of motivation due to inappropriate payments are among evaluators' issues in the present study. Due to the shortage of evaluators and their lack of motivation and their deficiency of relevant and sufficient knowledge, and in view of their evaluation skills which were not at a professional level, some conflicts between evaluators and evaluates may occur. The results of Shaw studies in European countries showed that accreditation evaluators had to be selected on the basis of their merits and qualifications. Moreover, they needed to have both management and clinical experiences and be fully familiar with accreditation standards and processes (Shaw, 2000; Shaw & World Health Organization, 2006).

Furthermore, irrelevancy of evaluators' expertise with the areas of the evaluation was another evaluator's issue. Many accreditation agencies believed that evaluators needed to have appropriate, relevant, and long-term experience of accreditation (Bohigas et al., 1998). Therefore, the members of an evaluation team should be graduates of medicine, nursing, and health-care management so that clinical and managerial experiences of the accreditation team would be balanced. The results of a study by Jaafaripooyan et al. on the performance of accreditation evaluators in Tehran also indicated educational weakness of the evaluators in terms of accreditation, work experiences irrelevant to evaluation, the lack of incentive programs for evaluators, and the limited access to professional evaluators all over the country, which is totally consistent with the results of the present study (Jaafaripooyan & Salarvand, 2018). Although the results of various studies indicated that the main members of evaluation teams should be 3 to 5 (Bohigas et al., 1998; Low, 2012), and in Uganda, a team of two to four people evaluates the accreditation program (Lane et al., 2014), the involvement of a large number of individuals and the effect of their personal tastes on evaluation might trigger many

problems in scoring the accreditation of Iranian hospitals. According to the present results, evaluators' moods and conditions have a great impact on their judgment and evaluation quality. In fact, evaluators should ideally judge and evaluate hospitals based on predetermined experiences and standards (Frisino, 2002). Nonetheless, the participants in this study believed that the evaluators' judgments and mood affected their evaluations in the hospital accreditation program in the country. Although Low held that evaluators should play the role of counselors and mentors in hospitals to provide high-quality care and acceptable standards to hospitals (Low, 2012), the irregular and tight evaluation schedules in Iranian hospitals are not following this goal, and it seems that, as accreditation evaluators were mainly health deputy inspectors in universities during the past few years, they did their evaluations like inspections and did not appear as accreditation evaluators.

Structures and Processes

Ignoring the related infrastructure such as space, finance, equipment, and human force for accreditation is considered as a challenge of structures and processes. In this regard, the challenges of Australian hospitals for accreditation implementation are divided into four levels including the system, program, organizational and individual levels, (Hinchcliff et al., 2013) which all can be taken as necessary accreditation structures.

Nonstandardized and old hospital buildings were another challenge related to structures and processes of accreditation. Prior to the implementation of the accreditation program, the standards and essential requirements such as buildings and physical and human infrastructure need to be investigated. Furthermore, the other national evidence shows that implementation of accreditation has a significant relationship with the structure, process, and outcome of a hospital (Ebrahim, Nasiripour, & Nasiripour, 2017).

Failure to create healthy competition between hospitals was another challenge of structure and processes of accreditation. In Iran, the Ministry of Health and Medical Education presents the accreditation program as an obligation for all public and private hospitals. Implementing and evaluating the accreditation is also done by the Ministry of Health's evaluators around the country. As is obvious this compulsory program along with a lack of standards, facilities, and trained personnel for implementing standards, restricts the possibility of competition among hospitals, and the program playing an effective role in continuous quality improvement. We can compare this situation with the successful experience of the United States. In the United States, the Health Ministry and Medicaid and Medicare Centers have strict annual regulations for issuing licenses for the establishment of hospitals and health-care centers, and hospitals will only be allowed to work with such licenses. Additionally, among the licensed hospitals, only those seeking reputation and gaining more market share endeavor to fulfill the advanced quality measures defined by a third-party nongovernmental organization such as the Joint Accreditation Committee (Aryankhesal, 2016).

Finally, the present results show that instrumental use of accreditation to raise hospital rank and increase tariffs can be another serious challenge for structure and process of accreditation. As we discussed above, in the Iranian context, the Ministry of health encounters many limitations to develop an improved accreditation system. One of them is the lack of regulations for punishing those hospitals which cannot achieve an acceptable grade. In this regard, the ministry has established a system to relate the hospital tariffs and the accreditation scores, such that those hospitals with higher scores and ranks are able to set higher tariffs. This has led many hospitals to see the accreditation program as a means of increasing their tariffs.

Accreditation Measures

In accordance with the results of this study, another challenge of hospital accreditation was that some measures were ambiguous and unclear. That is to say, some accreditation measures had been written vaguely and required literary editing, and some others were too general and only referred to the implementation of a single code or circular.

The use of the same measures in evaluating different hospitals was deemed to be one of the other challenges of the accreditation program. In other words, some measures were not feasible in some hospitals of the country, and the structure, ownership, and diversity of hospitals needed to be taken into account in the formulation of the measures. Similarly, in Pakistan, accreditation measures could not be applied to all hospitals because some hospitals were basically much weaker than others (Sax & Marx, 2013). Concerning the problems with the weakness of the measures in some areas, the study by Ahmadi et al. reflected the fact that the accreditation model of Iranian hospitals did not cover 45.4 percent of the measures provided by the Joint Accreditation Committee, and the Ministry of Health and Medical Education did not pay enough attention to some important issues related to the patient care process when setting up hospital standards (Ahmadi, Khoshgam, & Mohammadpoor, 2008).

Other results showed that the interviewees considered the same weight of the measures as one of the challenges of the accreditation measures. To put it differently, the same weight has been considered for accreditation measures in the current hospital accreditation system in the country, while the measures do not have the same importance and their implementation requires different workloads. Some measures are in the form of mere notifications, but some others entail several months of work in hospitals. Hence, giving different weights to the measures can help hospitals spend their time and resources on the more important ones. A study by Mosaddeqhrad et al. also indicated that hospital managers had moderate satisfaction with the content of hospital accreditation standards and the most frequent dissatisfaction was with the lack of transparency of the standards and measures, the same weight of accreditation measures, and a large number of standards and measures (Mosadeghrad, Akbari-sari, & Yousefinezhadi, 2017).

Considering what was discussed. it seems that accreditation as a useful instrument for quality improvement of the hospitals' services, cannot work in the Iranian context, and as a result, we must not wait for significant changes in hospitals' performance and quality. In other words, the obligatory nature of accreditation in Iran appears as a challenge for most hospital personnel especially nurses. Imposing an additional task of documentation along with ignoring the stakeholders and lack of any contribution at the time of goal setting and implementing accreditation causes many challenges instead of solving them.

Conclusion

According to the results, the main themes included macro and policymaking issues, evaluators' issues, structures and processes, executive issues, and accreditation measures. All of them contain related subthemes that indicate national challenges of implementing hospital accreditation in the country. Therefore, it can be stated that Iranian hospitals need to experience major changes in using accreditation as a quality assurance mechanism. These changes should include the change in the obligatory approach of the hospital accreditation as well as its related processes, executive actions, evaluators, measures, and structures. In this regard, it is necessary to transfer the responsibility of accreditation to the independent third organization with experienced, skillful, and motivated evaluators. Moreover, it is highly recommended to revise accreditation measures in accordance with hospital needs and to clarify the structure and executive process of the accreditation.

Strengths and Limitations

This study was one of the first comprehensive studies conducted to determine the accreditation challenges of Iranian hospitals by using the qualitative approach. However, similar to other studies, this study had some limitations which can be overcome in future studies. The results of this study can be triangulated with quantitative results related to the satisfaction of nurses, physicians, and other staff toward annual accreditation of hospitals. Another limitation is that the present results can only be useful for Iranian policymakers and those low middle-income countries with an exactly similar context and the same challenges.

Notes

The present article was extracted from the thesis written by Fatemeh Golestanmanesh and was financially supported by Shiraz University of Medical Sciences grant No. 96-01-07-15667. The researchers would like to thank all participants for their kind cooperation.

Conflicts of interest: None declared.

Ethics approval and consent to participate: The article's proposal was approved by ethics committee affiliated with Shiraz University of Medical Sciences with the ID of IR.SUMS.REC.1396.S1016.

Authors' Contributions: NB, FGM, KP, and SKN have contributed in data collection, data analysis, and preparing the initial draft of the article; RR and ZK have edited and finalized the article; and PB has designed the study and supervised the whole project.

Corresponding author: Ramin Ravangard, ra_ravangard@yahoo.com

Peivand Bastani is an associate professor in the Department of Health Services Management at the School of Management and Medical Information Sciences, Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

Najmeh Bordbar, MSc , is a MSc in Health Services Management, Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran.

Fatemeh Golestanmanesh, **MSc**, is a MSc in Health Services Management, Student Research Committee, Shiraz University of Medical Sciences, Shiraz, Iran

Zahra Kavosi is an associate professor in the Department of Health Services Management at the School of Management and Medical Information Sciences, Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

Kimia Pourmohammadi is a PhD in Health Services Management, Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran.

Sara Kashefian-Naeeini is an assistant professor in the Department of English Language at the Faculty of Paramedical Sciences, Shiraz University of Medical Sciences, Shiraz, Iran.

Ramin Ravangard is an associate professor in the Department of Health Services Management at the School of Management and Medical Information Sciences, Health Human Resources Research Center, Shiraz University of Medical Sciences, Shiraz, Iran (Corresponding author).

References

Ahmadi, Maryam, Masoomeh Khoshgam, and Ali Mohammadpoor. 2008. "Comparative Study of the Ministry of Health Standards for Hospitals With Joint Commission International Hospital Accreditation Standards." *Hakim Research Journal* 10 (4): 45–52.

Al Tehewy, Mahi, Bssiouni Salem, Ihab Habil, and Sayed El Okda. 2009. "Evaluation of Accreditation Program in Non-Governmental Organizations' Health Units in Egypt: Short-Term Outcomes." *International Journal for Quality in Health Care* 21 (3): 183–89.

Aryankhesal, Aidin 2016. "Strategic Faults in Implementation of Hospital Accreditation Programs in Developing Countries: Reflections on the Iranian Experience." *International Journal of Health Policy and Management* 5 (9): 515–17.

Bogh, Søren Bie, Anne Mette Falstie-Jensen, Erik Hollnagel, René Holst, Jeffrey Braithwaite, and Søren Paaske Johnsen. 2016. "Improvement in Quality of Hospital Care During Accreditation: A Nationwide Stepped-Wedge Study." *International Journal for Quality in Health Care* 28 (6): 715–20.

Bohigas, Lluis, Tessa Brooks, Tina Donahue, Barbara Donaldson, Elma Heidemann, Charles Drury Shaw, and Denis Smith. 1998. "A Comparative Analysis of Surveyors From Six Hospital Accreditation Programmes and a Consideration of the Related Management Issues." *International Journal for Quality in Health Care* 10 (1): 7–13.

Brubakk, Kirsten, Gunn Elisabeth Vist, Geir Bukholm, Paul Barach, and Ole Tjomsland. 2015. "A Systematic Review of Hospital Accreditation: The Challenges of Measuring Complex Intervention Effects." *BMC Health Services Research* 15: 280–90.

Ebrahim, Zahra, Amir Ashkan Nasiripour, and Pouran Nasiripour. 2017. "The Impact of Structure, Process and Output on the Establishment of an Accreditation System in Social Security Hospitals in Tehran." *International Journal of Health Studies* 3 (3): 5–8.

El-Jardali, Fadi, Diana Jamal, Hani Dimassi, Walid Ammar, and Victoria Tchaghchaghian. 2008. "The Impact of Hospital Accreditation on Quality of Care: Perception of Lebanese Nurses." *International Journal for Quality in Health Care* 20 (5): 363–71.

Fortes, Maria Thereza, Ruben Araujo de Mattos, and Tatiana Wargas de Faria Baptista. 2011. "Accreditation or Accreditations? A Comparative Study About Accreditation in France, United Kingdom and Cataluna." *Revista da Associação Médica Brasileira (English Edition)* 57 (2): 234–41.

Frisino, Joseph M. 2002. "COA's Accreditation System: Checks, Balances, and Firewalls." *Behavioral Health Accreditation and Accountability Alert* 4 (4): 1–4.

Gabriel, Carmen Silvia, Denise Franzé Bogarin, Sabrina Mikael, Greta Cummings, Andrea Bernardes, Larissa Gutierrez, and Graziela Caldana. 2018. "Brazilian Nurses' Perspective on the Impact of Hospital Accreditation." *Enfermería Global* 17 (1): 397–407.

Gale, Nicola K., Gemma Heath, Elaine Cameron, Sabina Rashid, and Sabi Redwood. 2013. "Using the Framework Method for the Analysis of Qualitative Data in Multi-Disciplinary Health Research." *BMC Medical Research Methodology* 13 (1): 117–124.

Guba, Egon G., and Yvonna S. Lincoln. 1994. "Competing Paradigms in Qualitative Research." *Handbook of Qualitative Research* 2 (163–194): 105–117.

Hakkak, Mohamad, Hozni, Seyed ali, Shahsiyah, Neda, and Akhlaghi, Tahereh. 2018. "Pathology of Accreditation in North Hospitals of Iran: A Qualitative Research." *Journal of Hospital* 17 (3): 45–54.

Hall, Margaret Jean, Carol J. DeFrances, Sonja N. Williams, Aleksandr Golosinskiy, and Alexander Schwartzman. 2010. "National Hospital Discharge Survey: 2007 Summary." *National Health Statistics Reports* (29): 1–20.

Hayati, I Nor, Azimatun Noor Aizuddin, H. Rozita, W. A. Sh Ezat, and A. M. Rizal. 2010. "In-patient's satisfaction in the medical and surgical wards-A comparison between accreditted and non accreditated hospital in the state of Selangor." *Jurnal Kesihatan Masyarakat* 16 (1): 60–68.

Hinchcliff, Reece, David Greenfield, Johanna I. Westbrook, Marjorie Pawsey, Virginia Mumford, and Jeffrey Braithwaite. 2013. "Stakeholder Perspectives on Implementing Accreditation Programs: A Qualitative Study of Enabling Factors." *BMC Health Services Research* 13 (1): 437.

Hsieh, Hsiu-Fang, and Sarah E. Shannon. 2005. "Three Approaches to Qualitative Content Analysis." *Qualitative Health Research* 15 (9): 1277–88.

Jaafaripooyan, Ebrahim 2014. "Potential Pros and Cons of External Healthcare Performance Evaluation Systems: Real-Life Perspectives on Iranian Hospital Evaluation and Accreditation Program." *International Journal of Health Policy and Management* 3 (4): 191–98.

Jaafaripooyan, Ebrahim, Dila Agrizzi, and Faizollah Akbari-Haghighi. 2011. "Healthcare Accreditation Systems: Further Perspectives on Performance Measures." *International Journal for Quality in Health Care* 23 (6): 645–56.

Jaafaripooyan, Ebrahim, Alimohammad Mosadeghrad, & Salarvand, Abbas. 2018. "Performance of Accreditation Surveyors in Tehran Hospitals: Strengths and Weaknesses." *Journal of Hospital* 17 (3): 31–43.

Lane, Jeffrey, Scott Barnhart, Samuel Luboga, John Arudo, David Urassa, and Amy Hagopian. 2014. "The Emergence of Hospital Accreditation Programs in East Africa: Lessons From Uganda, Kenya, and Tanzania." *Global Journal of Medicine and Public Health* 3 (2): 32–41.

Low, Lena 2012. "Medical Clinician Surveyors in the Hospital Accreditation Process: Their Motivations for Participating, the Factors That Influence Them and How They Deal With Those Influences." University of New South Wales, New South Wales. Available from: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi58dyvl-7uAhUpQEEAHX5fAHYQFjAAegQIARAC&url=http%3A%2F%2Funsworks.unsw.edu.au%2Ffapi%2Fdatastream%2Funsworks%3A10784%2FSOURCE01&usg=AOvVaw3PLj-YWftnMqsy-EJg2WYY

Mahmoodian, Sanaz Sadat, Fatemeh Safaei, Marzieh Meraji, Khalil Kimiafar, Naeemeh Farsinegar, and Raheleh Ghasemi. 2016. "Challenges and Strengths of Implementing Accreditation Process From Health Information Management Staff Perspective." *Journal of Paramedical Science and Rehabilitation* 5 (2): 25–33.

Marshall, Martin N. 1996. "Sampling for Qualitative Research." *Family Practice* 13 (6): 522–26.

Mosadeghrad, Ali Mohammad 2016. "Comments on "Iran Hospital Accreditation System." *Iranian Journal of Public Health* 45 (6): 837–839.

Mosadeghrad, Ali Mohammad, Ali Akbari-sari, and Taraneh Yousefinezhadi. 2017. "Evaluation of Hospital Accreditation Standards." *Razi Journal of Medical Sciences* 23 (153): 43–54.

Mosadeghrad, Ali Mohammad, Ali Akbari-Sari, and Taraneh Yousefinezhadi. 2018. "Evaluation of Hospital Accreditation in Tehran: Brief Report." *Tehran University Medical Journal* 76 (5): 354–359.

Ng, Gloria KB, Gilberto Leung, Janice M. Johnston, and Benjamin J. Cowling. 2013. "Factors Affecting Implementation of Accreditation Programmes and the Impact of the Accreditation Process on Quality Improvement in Hospitals: A SWOT Analysis." *Hong Kong Medical Journal* 19 (5): 434–46.

Nowell, Lorelli S., Jill Marie Norris, Deborah E. White, and Nancy J. Moules. 2017. "Thematic Analysis: Striving to Meet the Trustworthiness Criteria." *International Journal of Qualitative Methods* 16(1), 1–13.

Øvretveit, J., and D. Gustafson. 2002. "Evaluation of Quality Improvement Programmes." *Quality and Safety in Health Care* 11 (3): 270–75.

Pomey, Marie-Pascale, André-Pierre Contandriopoulos, Patrice François, and Dominique Bertrand. 2004. "Accreditation: A Tool for Organizational Change in Hospitals?" *International Journal of Health Care Quality Assurance* 17 (3): 113–24.

Pongpirul, Krit, Jiruth Sriratanaban, Santawat Asavaroengchai, Jadej Thammatach-Aree, and Poranee Laoitthi. 2006. "Comparison of Health Care Professionals' and Surveyors' Opinions on Problems and Obstacles in Implementing Quality Management System in Thailand: A National Survey." *International Journal for Quality in Health Care* 18 (5): 346–51.

Reznich, Christopher, and Brian E. Mavis. 2000. "Pilot test of family medicine faculty development fellowship accreditation guidelines." *Family Medicine* 32 (10): 709–719.

Saadati, Mohammad, Mohammadkarim Bahadori, Ehsan Teymourzadeh, Ramin Ravangard, Khalil Alimohammadzadeh, and Seyed Mojtaba Hosseini. 2018. "Accreditation in One Teaching Hospital: A Phenomenology Study Among Iranian Nurses." *International Journal of Health Care Quality Assurance* 31 (7): 855–63.

Sack, Cornelia, André Scherag, P. Lütkes, W. Günther, K.-H. Jöckel, and Gerald Holtmann. 2011. "Is there an association between hospital accreditation and patient satisfaction with hospital care? A survey of 37,000 patients treated by 73 hospitals." *International Journal for Quality in Health Care* 23 (3): 278–83.

Sax, Sylvia, and Michael Marx. 2013. "Local Perceptions on Factors Influencing the Introduction of International Healthcare Accreditation in Pakistan." *Health Policy and Planning* 29 (8): 1021–30.

Schyve, Paul M. 2000. "The Evolution of External Quality Evaluation: Observations From the Joint Commission on Accreditation of Healthcare Organizations." *International Journal for Quality in Health Care* 12 (3): 255–258.

Shaw, Charles Drury 2000. "External Quality Mechanisms for Health Care: Summary of the ExPeRT Project on Visitatie, Accreditation, EFQM and ISO Assessment in European Union Countries." *International Journal for Quality in Health Care* 12 (3): 169–75.

Shaw, Charles D. 2006. *Developing Hospital Accreditation in Europe*, First Edition, Copenhagen: WHO Regional Office for Europe. Available from: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjjmZ7Zoe7uAhWJX8AKHapOCiIQFjABegQIDhAC&url=https%3A%2F%2Fapps.who.int%2Firis%2Fbitstream%2Fhandle%2F10665%2F107683%2FE88038.pdf%3Fsequence%3D1%26isAllowed%3Dy&usg=AOvVaw27YZpaY_FXvF5SVZyEHcNt

The Joint Commission. 2019. *Hospital Accreditation Standards*. Joint Commission Resources, Inc. Oak Brook, IL, USA.

Tsai, Thomas C., Karen E. Joynt, E. John Orav, Atul A. Gawande, and Ashish K. Jha. 2013. "Variation in Surgical-Readmission Rates and Quality of Hospital Care." *New England Journal of Medicine* 369 (12): 1134–42.

Yousefinezhadi, Taraneh, Ali Mohammad Mosadeghrad, Mohammad Arab, Mozhdeh Ramezani, and Ali Akbari Sari. 2017. "An Analysis of Hospital Accreditation Policy in Iran." *Iranian Journal of Public Health* 46 (10): 1347–85.

Received: 3 August 2020 | Revised: 23 December 2020 | Accepted: 7 April 2021

DOI: 10.1002/wmh3.446

ORIGINAL ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Strategies to mitigate inequity within mandatory health insurance systems: A systematic review

Shalvaree Vaidya | **Stefan Boes**

Department of Health Sciences and Medicine, University of Lucerne, Lucerne, Switzerland

Correspondence
Shalvaree Vaidya, Department of Health Sciences and Medicine, University of Lucerne, Frohburgstrasse 3, 6002 Lucerne, Switzerland.
Email: shalvaree.vaidya@stud.unilu.ch

Abstract

Mandatory health insurance (MHI) systems carry potential inequities due to their infrastructures. However, they are difficult to categorize and compare due to a high level of global variation. Thus, we conducted a review to define MHI systems typology and set forth recommendations regarding health systems classifications. Subsequently, we also aimed to understand the strategies used within MHI systems to decrease inequity. Using a systematic literature review, we found that health system typologies tend to classify MHI systems within the overarching social health insurance category, thus using the MHI term more as a descriptor rather than an official grouping of systems. Additionally, mandatory payments toward insurance lead to vertical and horizonta\ inequities that impact health outcomes. Social benefit schemes within countries aim to mitigate these inequities, although success rates vary greatly. MHI has the potential to be highly effective in providing universal coverage, thus contributing directly to the health system goals.

KEYWORDS

health inequity, healthcare access, insurance mandate, mandatory health insurance, social benefit schemes, social health insurance

Key points

- Mandatory health insurance (MHI) systems are highly varied globally.
- They can also increase inequity within the system due to the insurance mandate.
- In order to understand the categorization of MHI systems within the overall health system typology, as well as understanding strategies to mitigate inequity, a systematic literature review was conducted.

- MHI systems can be categorized according to various different characteristics, and are also referred to by different names, highlighting a need for improvement in the classification of health systems for future research.
- Strategies to mitigate inequity are successful to varying degrees based on MHI infrastructures. Premium subsidies can be highly useful, but out-of-pocket payments also need to be targeted by social security measures.

BACKGROUND

The institutional response provided by a country to address the health needs of its population is referred to as the health system. As such, health systems exist in every country in some capacity, regardless of their effectiveness or degree of organization (WHO, 2002). Part of the health system response is characterized by the type of health insurance model that is implemented. Health insurance aims to improve access to care, services, and goods, while financially protecting the population in case of illness or injury (WHO, 2002).

Health insurance systems are typically financed either through general tax or separate health contributions (or a mix of the two) to secure adequate health care at an affordable price (Carrin & James, 2004). Ideally, financial security should apply to all equitably, with health care provided homogenously regardless of socioeconomic bracket. One such health system, with the goal of universal coverage, is the mandatory health insurance (MHI) system. An MHI system can be defined as a system of governance in which healthcare costs are paid, to a certain extent, for all members of the population upon obligatory enrollment (The World Bank, 2008). MHI systems function on mandatory contributions, a feature that has the potential of resulting in inequity if the *ability-to-pay* is not adequately addressed. For example, contributions toward health insurance can be inequitable if contribution rates are uniformly applied to all citizens. Indeed, research from Germany, the Netherlands, and Switzerland (countries with MHI systems) suggests that even though basic health insurance is mandatory, there are individuals who are unable to afford it (Guessous et al., 2012; von Wyl & Beck, 2015). This results in either refusal to purchase insurance or defaulting on payments, which can lead to fines (van Ginneken & Rice, 2015).

It is important to note that a complete lack of health insurance coverage can have severe negative consequences on an individual's health status (Hadley, 2003). That is, health inequalities tend to favor high-income individuals (Hosseinpoor et al., 2012). This is due, in part, to uninsured individuals seeking out less medical care than the insured individuals (Hadley, 2003). Studies have found that on average, there is a negative relationship between individuals with an uninsured status and their healthcare demand and utilization (Dong, 2012; Jeon & Kwon, 2013). Early work by Wilkinson states that income inequity in higher-income countries is linked to a decreased life expectancy (Wilkinson, 1992). Since then, there has been a vast amount of research that confirms this more generally, that is, the economically better off individuals on average have better health outcomes (Adler et al., 1994; Chetty et al., 2016; Marmot et al., 2010).

Although MHI systems are common, there tends to be a high level of global variation in their structure, functioning, and application (The World Bank, 2008). This variation leads to difficulties in formally differentiating between health (insurance) systems, and subsequently in identifying MHI systems. Many categorizations of health systems in recent years have based their typologies on the type of funding, primarily because it is a readily observable feature and it allows for direct comparison across countries. However, the presence of an MHI system does not imply the existence of a health system that is financed by either private or public insurance exclusively. Indeed, MHI systems tend to operate within mixed financing schemes, with the use of public and private sectors to provide resources and coverage (The World Bank, 2008).

To address inequity in financing and inform current and future health policy within MHI systems, it is of utmost importance to understand the features of MHI systems and their place in current health system typologies. Only through the identification of these systems can we seek to improve the nature of inequity within them. To this effect, we first seek to contribute to the literature by ascertaining the place of MHI systems within current health system typologies. In a second step, we aim at conducting an international comparison of MHI systems and their individual approaches to equity in healthcare financing to understand the characteristics of a well-functioning and equitable system. To the best of our knowledge, there does not exist any study that would systematically compare approaches to financial equity across MHI systems, which we deem a major contribution of our research.

OBJECTIVES

We first aim to identify existing health system typologies to understand and better ascertain the position of MHI systems in the same. Subsequently, we hope to understand the strategies and approaches undertaken within different MHI systems to increase equity in healthcare financing.

Our research questions were:

1. Can MHI systems be uniquely categorized in existing health system typologies?
2. How is the concept of equity in healthcare financing approached in different MHI systems?
3. What health system strategies are implemented to support low-income households, and are they successful in mitigating inequity in healthcare financing?

METHODOLOGY

Our research strategy builds on a systematic literature review (SLR) to identify the relevant publications on the theme, that is, MHI systems, health system typologies, and related discussions on addressing inequity in healthcare financing. We critically appraise the identified literature and analyze the current body of evidence with respect to the above research questions, with a focus on public support schemes.

Inclusion/Exclusion criteria

All studies included were peer-reviewed. In addition, only websites and gray literature from reputable and trusted sources were accepted. Gray literature included government reports, technical papers, and scientific presentations. All sources published before 2000 were excluded. This is to ensure that only the latest and most accurate information is included. All non-English sources were excluded.

Sources of evidence

During the initial search for primary studies, three research databases were used; these are NCBI's PubMed, Google Scholar, as well as Science Direct. Additionally, official government websites and globally recognized organizations (e.g., WHO, World Bank, OECD, and UN) were separately examined. Finally, the reference lists of gathered studies were explored for any missed sources. The search was conducted in September 2018, and last updated in March 2019 to include the latest publications.

TABLE 1 Predecided search terms

Subject	Search strings
Mandatory health insurance systems	(mandatory OR obligatory OR compulsory OR mandate) AND ("health insurance" OR "health system")
	"health insurance" AND (social OR national)
	(typology OR types) AND ("health insurance" OR "health system")
Equity in mandatory health insurance	Equity AND ("mandatory health system" OR "mandatory health insurance" OR "universal health care")
	("equity" AND "access") AND ("mandatory health insurance")
	("equity" AND "financing") AND ("mandatory insurance")
	("equity" AND "financing") AND ("universal coverage")
Subsidies or other social support schemes	(mandatory OR obligatory OR compulsory OR mandate) AND ("health insurance" OR "health system") AND (subsidy OR subsidies OR "social support")

Research phases

I. Title search: During this phase, predecided search terms, as summarized in Table 1, were applied to the sources of evidence. Evidence with appropriately matching titles was collected into a primary database.

The titles gathered were subsequently categorized according to the subject matter to understand the availability of evidence in this study area.

II. Abstract search: Abstracts belonging to all studies from phase 1 were analyzed and compared to the written objectives. Those with topics differing from the objective and the research questions were deleted. The remaining evidence was sorted further based on the abstracts and read in full.
III. Full review: In the final phase, all studies were read and reviewed in full to extract data relevant to the SLR. Two reviewers extracted the evidence independently, and a consensus was reached between both in case of differing selection of articles. Any sources not applicable to the final SLR were deleted.

Quality assessment

All sources that passed on to the end of phase II were assessed for quality. This is to protect the end quality of the SLR itself and the conclusions and discussions that are presented in the study.

On the basis of the objective of the SLR, most studies included in the final report were qualitative in nature. Thus, we used the assessment tool by Hawker et al. (2002) for qualitative studies. The following categories, drawn directly from the assessment tool, were used as a questionnaire for all studies included in the SLR.

a. Abstract and title: Complete information and clear title
b. Introduction and aims: Clear and concise background and objectives

c. Method and data: Appropriate and well-explained method and data
d. Sampling: Appropriate strategy
e. Data analysis: Accurate and descriptive analysis
f. Ethics and bias: Issues of ethics and bias properly addressed
g. Results: Explicit and clear results
h. Transferability: Comparison to other settings possible
i. Implications and usefulness: Important and insightful

In all categories listed, studies are assessed by the rating "good," "fair," "poor," or "very poor." Any decisions on exclusion based on poor quality were made collaboratively between both reviewers.

RESULTS

Study characteristics

As presented in Figure 1, the initial scoping search resulted in 240 articles. Additional exclusions based on the objectives resulted in 50 final studies included in the review.

As our aim was to identify MHI systems and their approaches to equity in healthcare financing, the final articles reflected the scarcity of the term in literature. Out of 50 final articles, only five (10%) mentioned "mandatory" in their titles (Hidayat et al., 2004; Sapelli & Torche, 2001; Sapelli, 2004; Savedoff, 2008; van de Ven & Schut, 2008). Another main focal point of this review was the use of subsidies as a strategy to provide support to low-income families. Among the 50 studies, eight (16%) study titles mentioned "subsidies" (Jaspersen & Richter, 2013, 2015; Kaufmann et al., 2017; Kifmann & Roeder, 2011; Lamers et al., 2003; van de Ven et al., 2000, 2004; van de Ven, 2006). This is not to say that more studies on these topics do not exist, however, the lack of searchable terms within the titles makes it more difficult to find relevant evidence. The aim of this review is highly specific and research in the area is scarce, thus the studies reviewed are highly varied in their own objectives and subjects. The overall themes that can be extracted based on the study titles are the following:

- Universal coverage (Carrin & James, 2004; van de Water, 2008)
- Health systems overview and descriptions (Busse & Blumel, 2014; Crivelli & Salari, 2014b; de Pietro et al., 2015; Dixit & Sambasivan, 2018; Gerkens & Merkur, 2010; Gerritzen & Kirchgässner, 2013; Greß et al., 2007; Hofmarcher & Quentin, 2013; Kroneman et al., 2016; OECD, 2006; Sapelli & Torche, 2001; Schabloski, 2008; Schoen et al., 2010; Siskou et al., 2009; The Commonwealth Fund, 2016; The World Bank, 2008; Thomson et al., 2013; van de Ven & Schut, 2008; van Ginneken & Rice, 2015; Wagstaff, 2009; Wendt et al., 2009; WHO, 2004, 2005)

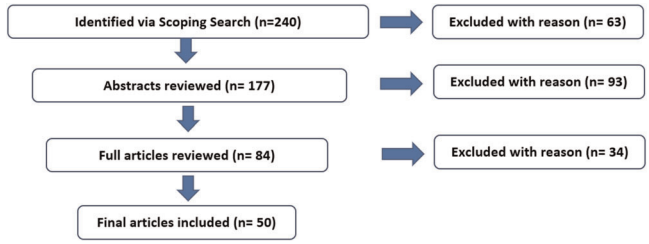


FIGURE 1 Descriptive steps resulting in the final included studies (PRISMA diagram)

- Financing and costs (Carrin et al., 2001; European Observatory, 2002; Guessous et al., 2012; Perneger & Hudelson, 2005; von Wyl & Beck, 2015; Xu et al., 2007)
- Usage and impact of subsidies (Jaspersen & Richter, 2013, 2015; Kaufmann et al., 2017; Kifmann & Roeder, 2011; Lamers et al., 2003; van de Ven et al., 2000, 2004; van de Ven, 2006)
- Equity in health (Bilger, 2008; Bitrán et al., 2000; Crivelli & Salari, 2014a; Hidayat et al., 2004; Leu & Schellhorn, 2006; Oliver & Mossialos, 2004; Sapelli, 2004; Schokkaert et al., 2009; Waters, 2000)

Although many themes overlap among the studies, the topics listed are associated with the major objectives and descriptions of the selected studies.

MHI: Terminology and usage

The importance of being able to categorize health systems has led to the development of numerous frameworks meant to describe and analyze health system performance (Murray & Frenk, 2000). Early research by Esping-Andersen into the categorization of welfare regimes provided the basis for many later studies on the taxonomy of health systems (Esping-Anderson, 1990). One of the main elements missing from Esping-Andersen, however, was a focus on social welfare and healthcare services, thus limiting its adaptation to modern health systems (Alber, 1995; Moran, 2000). Before Esping-Andersen, an OECD study published in 1987 used a taxonomy of health systems according to National Health Service, social insurance, and private insurance (OECD, 1987).

The concept of MHI did not appear regularly in the literature to date. In this review, there are only five studies positioning their work from a mandatory insurance perspective (Hidayat et al., 2004; Sapelli & Torche, 2001; Sapelli, 2004; Savedoff, 2008; van de Ven & Schut, 2008). Within these papers, MHI is not always given as an overarching definition. Instead, it is described within the scope of a specific nation (Sapelli & Torche, 2001; Sapelli, 2004; van de Ven & Schut, 2008). The only explicit definition describes MHI as a "system that pays the costs of health care for those who are enrolled and in which enrollment is required for all members of a population" (Savedoff, 2008). This gap in the literature is not based on the lack of MHI systems, rather on the existing typology of health systems. MHI tends to be used as descriptive terminology rather than within a health system typology (Busse & Blumel, 2014; Carrin & James, 2004; de Pietro et al., 2015; Gerkens & Merkur, 2010; Hofmarcher & Quentin, 2013; van de Water, 2008; Wagstaff, 2009; WHO, 2005). Although there is no officially agreed upon the typology of health systems, we have identified patterns in the usage of terms.

Studies have categorized health systems by regulatory, provision-based, and financing characteristics Carrin & James, 2004; European Observatory, 2002; van de Water, 2008; Wagstaff, 2009; Wendt et al., 2009; WHO, 2004). The majority of literature divides health systems into three major groups based on the financial features associated with the funding paradigm: National health insurance (NHI), social health insurance (SHI), and private health insurance (PHI), as summarized in Table 2 (Carrin & James, 2004; Carrin et al., 2001; Kifmann & Roeder, 2011; WHO, 2005). Moreover, we see that MHI systems are often treated synonymously in the literature to SHI systems, due to their close similarities, even though most health systems do not follow the exact specification of any one type of system and incorporate features of all systems described (Carrin & James, 2004; European Observatory, 2002). These are referred to as mixed healthcare financing systems and include, for example, general tax-based

TABLE 2 Common health system categories identified in health system literature

Health system categorizations	Brief description
National Health Insurance (NHI)	– All citizens covered by NHI funded by taxes
Mandatory Health Insurance Social Health Insurance	– Legal mandate to purchase health insurance from a third-party insurer
Private Health Insurance (PHI)	– PHI can be purchased by choice – No legal mandate to purchase health insurance

financing for some services and health insurance for another specified part of the healthcare services provision (Carrin & James, 2004).

PHI systems may have public programs but financing for health care is primarily paid for by citizens who purchase private health insurance by choice (Kifmann & Roeder, 2011). NHI systems are based on general tax revenues as the main source of funding, and healthcare services are usually provided both through public and private organizations. SHI systems are those in which, by principle, membership is mandatory and regular payments are made by those enrolled, including employees, government, and enterprises (Carrin & James, 2004; Carrin et al., 2001; European Observatory, 2002). The difference between NHI and SHI systems relies on the explicit/implicit nature of healthcare financing (Savedoff, 2008). In NHI systems, funding is implicit (through general tax to the government instead of a third party) and the provision of health care is often separated from the financing of the health system (Savedoff, 2008).

Mossialos et al. define SHI systems in further detail as the following: "Social health insurance funding occurs when it is legally mandatory to obtain health insurance with a designated (statutory) third-party payer through contributions or premiums not related to risks that are kept separate from other legally mandated taxes or contributions" (European Observatory, 2002). This definition considers the three main areas of variation among SHI systems; the provision for those unable to provide contributions (e.g., low-income, unemployed, and pensioners), the difference in benefits for those covered by SHI versus those who are not, and the premium payment mechanism (risk-rated, community-rated, or income-based) (Wagstaff, 2009). As SHI systems are, by definition, the subject of our study, we continue to use the original terminology introduced and refer to them as MHI systems in the following. We deem this approach consistent with the literature, for example, Switzerland and Germany, known to have an MHI system (Busse & Blumel, 2014; de Pietro et al., 2015) are often categorized under SHI (European Observatory, 2002; Savedoff, 2008; van de Water, 2008; von Wyl & Beck, 2015; Wagstaff, 2009; WHO, 2004).

Carrin and colleagues specify 30 countries as having an MHI system as of 2001 (Carrin & James, 2004; Carrin et al., 2001). These countries are further analyzed within Table 3 to determine their similarities and differences. From the original list of Carrin et al. (2001), we excluded Australia and Monaco (which according to official documents are rather classified as NHI systems, see REFS), Chile (which has a combination of voluntary public and private insurance, see REF), and Yugoslavia (which does not exist in this form anymore). In all the systems mentioned, private insurance can be available for purchase and plays a supplementary role for additional services (Carrin & James, 2004). Health insurance, whether through an MHI system or supplementary private insurance, can be community-based, risk-based, or income-based (Perneger & Hudelson, 2005). Within MHI, formal-sector workers, and the government, contribute to a health fund with varying degrees of social assistance available for those with

TABLE 3 Health-care financing characteristics in MHI countries

Countries	Insurance mandate	Third-party Payer
Austria (Hofmarcher & Quentin, 2013)	MHI Voluntary PHI	Twenty-two insurance providers, 19 provide health insurance: This includes four funds, nine regional insurers, six professional insurers, self-employed insurance institution, farmers' fund, and railway workers and miners' fund.
Belgium (Gerkens & Merkur, 2010)	MHI	MHI through not-for-profit sickness funds (six private, one public national).
Bulgaria (Commission, 2017)	MHI	National Health Insurance Fund.
Costa Rica (Forde, 2017)	MHI Voluntary PHI	Costa Rican Social Security Fund. Private insurance through the government-owned insurance company.
Croatia (Dzakula et al., 2014)	MHI Voluntary PHI	Croatian Health Insurance Fund for MHI and PHI. Additional insurers for PHI.
Czech Republic (Alexa et al., 2015)	MHI Voluntary PHI	Seven health insurance funds.
Estonia (Koppel et al., 2008)	MHI Voluntary PHI	Estonian Health Insurance Fund for MHI.
France (Chevreul et al., 2015)	MHI Voluntary PHI	Three main schemes represented by the National Union of Health Insurance Fund.
Germany (Busse & Blumel, 2014)	MHI Substitutive (Mandatory) and Complementary (Voluntary) PHI	Sickness funds for MHI. Forty-two Private health insurers (Association of Private Health Insurance Companies) plus 30 small and regional private insurance companies.
Greece (Economou, 2010)	MHI Voluntary PHI	Greater than 30 sickness funds and schemes.
Hungary (Gaál et al., 2011)	MHI Voluntary PHI	Health Insurance fund for MHI. Private insurers and voluntary mutual health funds.
Israel (Rosen et al., 2015)	MHI Voluntary PHI	Four sickness funds called Health Plans for MHI. Supplementary voluntary health insurance offered by health plans. Additional commercial private insurance available through companies.
Japan (Tatara & Okamoto, 2009)	MHI Voluntary PHI	Three MHI schemes with 3662 funds. PHI provided by life insurance companies.
Latvia (Tragakes et al., 2008)	MHI Voluntary PHI	MHI system purchaser is the State Compulsory Health Insurance Agency. PHI provided by four private companies and one municipal company.

(Continues)

TABLE 3 (Continued)

Countries	Insurance mandate	Third-party Payer
Lithuania (Murauskiene et al., 2013)	MHI Voluntary PHI	Compulsory Health Insurance Fund for MHI. State Insurance Agency, joint-stock companies, insurance societies, or mutual insurance societies can provide voluntary PHI.
Luxembourg (Berthet et al., 2015)	MHI Voluntary PHI	MHI provided within three schemes.
Netherlands (Kroneman et al., 2016)	MHI Voluntary PHI	Sickness funds for MHI. Twenty-six health insurers grouped into nine groups.
Norway (Ringard et al., 2013)	MHI Voluntary PHI	National Insurance scheme for SHI. PHI offered by eight profit-making companies.
Poland (Panteli et al., 2011)	MHI Voluntary PHI	The primary payer within the SHI is the National Health Fund. Very limited PHI is offered by commercial companies, public providers, and the National Health Fund.
Republic of Korea (Bae Chun et al., 2009)	MHI Voluntary PHI	Single insurer is the National Health Insurance System Cooperation. Mutual and commercial insurers for private health insurance.
Romania (Vladescu et al., 2016)	MHI Voluntary/Supplementary PHI	MHI payments collected by the National Health Insurance Fund. PHI offered by 12 commercial insurers and the National Health Insurance House.
San Marino (Cetani, 2002)	MHI Voluntary PHI	MHI provided by the Social Security Institute.
Slovakia (Smatana et al., 2016)	MHI Voluntary PHI	Three healthcare companies collect SHI contributions: General Health Insurance Company, Dovera, Union. Commercial insurance companies used for PHI.
Slovenia (Albreht et al., 2016)	MHI Voluntary PHI	MHI provided by the Health Insurance Institute of Slovenia. Voluntary insurance provided by three companies: Adriatic-Slovenica, Triglav, and Vzajemna.
Switzerland (de Pietro et al., 2015)	MHI Voluntary PHI	MHI offered by more than 60 insurance companies. More than 30 insurance companies offer PHI.
F. Y of Macedonia (Milevska Kostova et al., 2017)	MHI Voluntary PHI	Main purchaser in the MHI is the Health Insurance Fund. Limited PHI.

Abbreviations: MHI, mandatory health insurance; PHI, private health insurance; SHI, social health insurance.

lower financial resources (Carrin & James, 2004; European Observatory, 2002; Wagstaff, 2009). In some countries, contributions are also split between employers and employees. For example, in Austria, Belgium, Germany, and Luxembourg, this contribution is shared 50–50 by the employer and employee (European Observatory, 2002). Additionally, countries labeled as having an MHI system may still have different sources of funding, that is, taxation still can play a role in funding health services, just to a varying degree (Carrin et al., 2001; European Observatory, 2002).

Policies surrounding individuals with lower incomes, pensioners, or those who are unemployed vary across MHI systems (Wagstaff, 2009; WHO, 2004, 2005). For example, in Luxembourg, pensioners pay the same rate of contributions as workers, and there is a 30% higher cut-off than for the minimum wage. Although in Austria the contribution of pensioners is lowered to 3.75%, Switzerland has subsidies for those unable to pay; however, pensioners are treated the same as employed workers (WHO, 2004).

On the basis of the information in Table 3, three main overarching characteristics seem to define MHI systems:

1. Separate role for MHI and private (complementary or substitutive) health insurance with varying popularities of the two depending on the country.
2. Mandatory requirement for participation in MHI and ability to buy voluntary PHI.
3. Third-party purchaser to whom payments are made.

Although the degree to which health expenditures rely on funding from MHI versus other sources varies greatly among countries, the existence of an insurance mandate via a third-party provider results in the categorization of the country as an MHI system. This aspect can result in inequity within the country if not addressed, which is especially true given the insurance mandate enforces insurance purchase among individuals of all economic strata. Thus, the need for proper insurance infrastructure and policies governing equitable access and use is paramount.

Role of equity

Within the health systems literature, the principles of equity are similarly used and presented; that is, within the scope of *access* and *use* (Oliver & Mossialos, 2004; Wagstaff, 2009; Waters, 2000; WHO, 2004). Equal access requires all individuals with equal needs to receive equal access and treatment to health care also referred to as horizontal equity (Oliver & Mossialos, 2004; Waters, 2000). The counterpart, vertical equity, ascertains that those with unequal needs should receive appropriately related unequal access and treatment to health care (Oliver & Mossialos, 2004; Waters, 2000). In other words, equity in health care is described as equal access for individuals with equal needs (Oliver & Mossialos, 2004; Waters, 2000).

Within the scope of equitable access, and as related to contributions toward MHI, horizontal access refers to equal payments for those with equal incomes. Vertical equity refers to unequal payments for those with unequal incomes (Crivelli & Salari, 2014a). Thus, horizontal and vertical equities are primarily measured via the level of progressivity of the funding system, that is, whether the system is progressive or regressive is dependent on the amount of vertical/horizontal inequity that exists within the system (Crivelli & Salari, 2014a). That is, do individuals contribute to health insurance based on their ability to pay (Crivelli & Salari, 2014a)?

MHI systems tend to vary greatly, and as a result, equity within these systems differs greatly as well. As depicted in Table 4 (and more fully described in Table A1), equitable access is closely linked to socioeconomic factors, with low income being one of the major restrictive

TABLE 4 Categories in health care are restricted by socioeconomic status in a sample of MHI countries

Type of care	Country	Inequity
Unmet medical need	Austria	Several studies show that preferential treatment is given to those in higher-income groups (Hofmarcher & Quentin, 2013).
	Belgium	Those in the highest income class have a lower risk of being admitted to a general hospital, psychiatric service, or psychiatric hospital, than those in the lowest income class (Gerkens & Merkur, 2010).
Dental care	Netherlands	A 2013 study found that 18% of those in need of dental care did not receive any because of the costs involved (Kroneman et al., 2016).
	Croatia	The main barrier to receiving dental care was the inability to pay the associated costs (Dzakula et al., 2014).
Waiting times	Germany	Private insurance led to shorter waiting times for patients compared to their SHI-covered counterparts (Busse & Blumel, 2014).
	Romania	10.4% of the population reported that they had not received the needed medical care either due to travel, expense, or waiting times (Vladescu et al., 2016).

Abbreviations: MHI, mandatory health insurance; SHI, social health insurance.

components in accessing care (Busse & Blumel, 2014; Dimova et al., 2018; Dzakula et al., 2014; Economou, 2010; Gaál et al., 2011; Gerkens & Merkur, 2010; Hofmarcher & Quentin, 2013; Murauskiene et al., 2013; Rosen et al., 2015; Tragakes et al., 2008). In addition to the higher unmet (health care) needs among lower-income individuals, an often-seen trend in MHI systems is the forgoing of dental care due to financial restraints. This may be due to the fact that many MHI systems do not include dental coverage (full or partial) as part of the plan, leading to co-payments or full payment by patients (Smatana et al., 2016). Those in the higher-income brackets are also sometimes able to shorten waiting times through private insurance or additional payments, either legal or illegal (Busse & Blumel, 2014; Gaál et al., 2011; Hofmarcher & Quentin, 2013; Vladescu et al., 2016).

It should be mentioned that although there seems to be a correlation between lower socioeconomic status and unmet medical care, the pathway may be more complicated than purely the inability to afford services at the point of care. For example, individuals from lower socioeconomic status may not live within easily travelable distances to healthcare infrastructure due to geographical disparities or they may feel discriminated against at healthcare facilities themselves. Additionally, lower-income groups may also have lower healthcare awareness and literacy, thus their ability to make use of health services could be affected (Oliver & Mossialos, 2004). Even though there are many such possibilities, it is beyond the scope of our study to investigate the causes behind this correlation.

It is generally agreed upon that direct taxation and public funding, both based on proportional income-based payments are the most progressive methods of ensuring equity in financing. This results in health care funded primarily based on individuals' ability to pay (Gerkens & Merkur, 2010). In contrast, regressive contributions are those where relative to the individuals' disposable income, low-income households pay a greater proportion toward health insurance than higher-income households (Balthasar et al., 2007). This is the case in Switzerland, where premiums are community-rated, that is, individuals living in the same premium region pay the same premium, irrespective of their health status or other background characteristics (Beck, 2013). The only exception is a premium differentiation by three age groups (0–18, 19–25, 26+). A community-rated premium mechanism, as compared to a risk-rated system, places a greater financial burden on low-income households because *ceteris paribus* they spend less on health care (Kaufmann et al., 2017). Hence,

community-rated premiums imply vertical inequity, meaning that lower-income individuals have to pay a greater proportion of their disposable income for health insurance premiums than higher-income individuals.

Out-of-pocket (OOP) payments are also considered to be highly regressive in nature (Gaál et al., 2011). In Bulgaria, the share of private individual expenditures is especially high (almost 42% of healthcare expenditures), with most of the payments being OOP (Dimova et al., 2018). This is a major factor contributing to the health inequity present in the country. On the contrary, the Estonian and Lithuanian MHI is predominantly financed via a payroll tax that ensures a high degree of horizontal and vertical equity (Koppel et al., 2008). This slightly progressive system (the second and third payment mechanisms are OOP and value-added tax—both regressive), has seen a slight decline in progressivity in recent years due to an increase in OOP payments (Koppel et al., 2008). In relation to financing, Switzerland has a rather high rate of OOP payments at 25.9% of total healthcare expenditures in 2013, which is almost twice as much as the EU15 average (de Pietro et al., 2015).

Another characteristic of an MHI system that may lead to added regressivity are contribution ceilings, that is, as income increases above the ceiling, contributions toward SHI are capped and do not increase proportionately. This is the case in Germany, where contributions are progressive until they reach the ceiling, subsequently turning regressive (Busse & Blumel, 2014). Similarly, in Austria, insurance contributions increase proportionately with income until the contribution ceiling, which is between €4,110 and €4,795/month (Hofmarcher & Quentin, 2013). In Hungary, there is no contribution ceiling. However, the Hungarian system is still slightly leaning toward the regressive side because there is a minimum contribution base (Gaál et al., 2011).

In addition to OOP payments and payments not based on income (as is the case in Switzerland), co-payments are also regressive in nature as they pose a financial barrier for lower-income individuals (Rosen et al., 2015). In Israel, for example, there is evidence that these co-payments have led to higher unmet medical care needs (Rosen et al., 2015).

Social benefit schemes

To combat equity issues, MHI systems have established various mechanisms to improve accessibility and insurance coverage targeting, in particular, low-income families. The most important social benefit schemes that have been discussed in the literature will be presented below.

Contribution rates and co-payments

In attempting to ensure equal access regardless of economic position, insurance fund contribution rates are often set based on individual characteristics. If individuals meet the requirements as they are set within the MHI system, they either receive lower contribution rates or contributions are waived entirely and paid, for example, by state funding (Alexa et al., 2015; Bastías et al., 2008; Chevreul et al., 2015; Dimova et al., 2018; Dzakula et al., 2014; Economou, 2010; Forde, 2017; Hofmarcher & Quentin, 2013; Koppel et al., 2008; Kroneman et al., 2016; Smatana et al., 2016).

In Austria, for example, health insurance contributions are set at 7.65% of income, but pensioners have a separate lower rate at 5.10% (Hofmarcher & Quentin, 2013). MHI contributions in Bulgaria are at a similar level of 8% of monthly income. The contribution rate of 8% is paid by the state budget for those who are unemployed, veterans, pensioners, or children (Dimova et al., 2018). In Chile, coverage is based on the income group a person belongs to, with the lowest-income groups receiving free care without co-payments (Bastías et al., 2008).

Similar to insurance contributions, co-payments are equalized via percentages. However, those with economic difficulties often pay lower co-payments on medical services or their co-payments are waived. Although co-payments are regressive (as they fall under OOP) MHI systems allow them as extra financing as well as a means to control unneeded healthcare utilization (Dimova et al., 2018; Smatana et al., 2016). In Belgium, for example, patients with "preferential reimbursement" have their co-payments lowered (Gerkens & Merkur, 2010), whereas, in Croatia, certain groups are exempted from having to pay any co-payments (Dzakula et al., 2014). In Germany, in 2003, 48% of prescription treatments belonged to individuals meeting criteria for exemption from co-payments (Busse & Blumel, 2014). Depending on the country, certain VHI covers co-payments in the mandatory PHI; however, this is not universal (Rosen et al., 2015). For example, VHI in Israel does not fully cover or reduce co-payments (Rosen et al., 2015), whereas, in Latvia, voluntary insurance can be used to cover co-payments, also referred to as "patient fees" (Tragakes et al., 2008).

Subsidies

The role and effectiveness of subsidies are highly contingent on the type of health insurance system in place as well as the premium payment plans (Jaspersen & Richter, 2015; Kifmann & Roeder, 2011; van de Ven et al., 2000). Within the context of mandatory insurance, premium subsidies exist to lighten the financial burden and thus make insurance more affordable for low-income families (Jaspersen & Richter, 2015). Indeed, increasing access to insurance coverage is more effective through subsidies than a restriction of contribution rates, which can result in adverse effects (van de Ven et al., 2000). Overall, it is still deemed the best policy from an equity viewpoint to establish subsidies within a system (Kifmann & Roeder, 2011).

Research tends to present premium subsidies as having a high impact on moral hazard, that is, subsidies leading to increased insurance demand and subsequently overutilization of health services (Jaspersen & Richter, 2015; Kifmann & Roeder, 2011). However, there is not much evidence to date that would support this argument empirically, and the previous studies mainly focused on insurance markets that do not have mandatory insurance, and thus, results are not directly applicable to a fixed coverage market with limited choice (Jaspersen & Richter, 2013, 2015; Kifmann & Roeder, 2011; van de Ven et al., 2000). The impact of premium subsidies in mandatory insurance exists via wealth effects rather than insurance demand (Jaspersen & Richter, 2015). In particular, the fewer choices surrounding the coverage that exist, the less likely that moral hazard will play a role, and instead the impact will tilt toward individuals' wealth (Jaspersen & Richter, 2015). In Switzerland, for example, although there is a choice of deductible level, the mandatory policy dictates the amount of OOP and thus insurance demand is likely not impacted by much (Jaspersen & Richter, 2015). However, there is also evidence supporting increased insurance coverage due to premium subsidies (e.g., Kaufmann et al., 2017).

In Switzerland, premium subsidies are the most important way in which cantons can counteract inequity. In 2013, approximately 30% of the population received premium subsidies, with the lowest-income households on welfare receiving full financial relief by the government (Gerritzen & Kirchgässner, 2013). Eligibility criteria for subsidies differ greatly across cantons, leading to increased horizontal inequity (de Pietro et al., 2015). However, this tool has not been able to mitigate the regressivity of the system to date (Crivelli & Salari, 2014b). In Germany, there is an internal subsidy model where the solidarity fund distributes premium subsidies. These subsidies are available to those earning less than 60,000 USD/year, as well as pensioners, students, unemployed, or homeless individuals (Schabloski, 2008). In the Netherlands, although subsidies exist, in 2006, 1.5% of the population were not covered by health insurance, and these were primarily those with lower incomes (van de Ven & Schut, 2008).

DISCUSSION

In this study, our main goal was to present information on existing terminology surrounding MHI systems, understand the approach to equity within these systems, describe the strategies used to mitigate inequity within MHI systems, and finally, to ascertain if these strategies are successful and to what degree. To achieve these goals, we conducted a SLR and included all articles available on MHI systems that discuss strategies to reduce inequity within the scope of access to and use of healthcare services.

The study aims to fill an important gap within health systems research. Current research continues to try and organize the many different health systems into comparable and universal categories, with no consensus yet (Böhm et al., 2013; Mays et al., 2010; Topp et al., 2018; Toth, 2016). Research focusing on the role of MHI systems within health systems typology is lacking. Additionally, there are no studies found analyzing equity, and the strategies used to mitigate inequity, within specifically defined MHI systems. We also did not find much information on which of the strategies used by MHI systems to mitigate inequity were successful, and to what degree. More research is needed to take a closer look at the most efficient ways to ensure an equitable MHI system.

Terminology and usage

In our attempt to isolate and analyze MHI systems, it became clear that the term "mandatory health insurance" was used primarily as a descriptor in the health systems literature rather than a universally used category. The term MHI was often used synonymously with SHI, with the latter being more prevalent in health systems literature and studies that mention MHI as a health systems classification largely outnumbered (Hidayat et al., 2004; Sapelli & Torche, 2001; Sapelli, 2004; Savedoff, 2008; van de Ven & Schut, 2008).

An MHI system, although having distinctive features separating it from other systems, still varies greatly across countries. Indeed, the WHO categorizes the two extremes of health systems as being either government or private and suggests that the two are linked by many other systems on a continuum (WHO, 2002). This assessment is consistent with the results of this study. Health systems that tend to exist in the middle, with varying characteristics of government (public) and private insurance, tend to be categorized as MHI (Albreht et al., 2016; Alexa et al., 2015; Bae Chun et al., 2009; Bastías et al., 2008; Berthet et al., 2015; Busse & Blumel, 2014; Cetani, 2002; Chevreul et al., 2015; Commission, 2017; de Pietro et al., 2015; Dzakula et al., 2014; Economou, 2010; Forde, 2017; Gaál et al., 2011; Gerkens & Merkur, 2010; Glover, 2020; Hofmarcher & Quentin, 2013; Koppel et al., 2008; Kroneman et al., 2016; Milevska Kostova et al., 2017; Murauskiene et al., 2013; Panteli et al., 2011; Ringard et al., 2013; Rosen et al., 2015; Smatana et al., 2016; Tatara & Okamoto, 2009; Tragakes et al., 2008; Vladescu et al., 2016). Further research should involve better understanding and further classifying MHI systems into smaller, more distinct categories based on more detailed similarities and differences.

The role of equity

The main focus of our study was on the role of equity (and inequity) in the context of MHI systems. In the case of equity, MHI is an attractive health system feature because of the positive correlation found between health and income, and MHI subsequently has the potential to be highly progressive in nature (Leu & Schellhorn, 2006). However, this does not apply to MHI systems universally, and especially where mandatory contributions are community- or risk-based. Premiums based on incomes allow those who are less well-off to pay proportionately to their salaries,

leading to health care based on *ability-to-pay*, and thus, all things considered, they tend to be more equitable. Additionally, even when MHI countries are income- and thus, risk-based, there tends to be a ceiling on contributions that can increase inequity as there is a lack of proportional increase of insurance contributions among the wealthier (Busse & Blumel, 2014; Gaál et al., 2011; Hofmarcher & Quentin, 2013).

Mitigating inequity is more successfully done when proper social benefit mechanisms are put in place that addresses socioeconomic brackets and ability-to-pay. We find that the most common strategies used by countries with MHI systems to try and mitigate inequity are controlling the premium/contribution rates and co-payments, and having some type of subsidies for low-income individuals. Although we did not find detailed information about the success rates of these strategies for each MHI system, there seems to be evidence that these approaches are beneficial to reduce inequity. Indeed, subsidy schemes are more beneficial in increasing insurance coverage in competitive markets compared to restricting premium rates for vulnerable groups. Thus, one can infer that health policy should focus on strategies that target at-risk groups rather than blanket solutions.

The study also has several limitations. In particular, only English language studies were used, but studies on health systems performance and evaluations of specific mechanisms within a health system may also be published in the local language (e.g., due to government sponsoring to conduct such a study). Additionally, compared to the vast nature of the subject matter (number of countries following MHI systems), the lack of studies specifically investigating MHI systems may lead to biased conclusions as the evidence to date is still limited. MHI systems being developed or already implemented in lower-income countries may also have been missed due to a lack of research. We conclude by encouraging more research on health system comparisons, especially in the domain of MHI systems and such systems' approach to the question of equitable access to necessary care.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

Not applicable.

REFERENCES

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health. The challenge of the gradient. *American Psychologist*, *49*(1), 15–24.

Alber, J. (1995). A framework for the comparative study of social services. *Journal of European Social Policy*, *5*(2), 131–149. https://doi.org/10.1177/095892879500500204

Albreht, T., Pribakovic Brinovec, R., Jošar, D., Poldrugovac, M., Kostnapfel, T., Zaletel, M., Panteli, D., & Maresso, A. (2016). Slovenia: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0018/312147/HiT-Slovenia_rev3.pdf?ua=1

Alexa, J., Lukas, R., Votápková, J., van Ginneken, E., Spranger, A., & Wittenbecher, F. (2015). Czech Republic: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0005/280706/Czech-HiT.pdf

Bae Chun, C., Soon, Y. K., Jun, Y. L., & Sand, Y. L. (2009). Republic of Korea: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0019/101476/E93762.pdf

Balthasar, A., Bieri, O., & Gysin, B. (2007). Monitoring 2007: Die sozialpolitische Wirksamkeit der Prämienverbilligung in den Kantonen (BAG Report).

Bastías, G., Pantoja, T., Leisewitz, T., & Zárate, V. (2008). Health care reform in Chile. *Canadian Medical Association Journal*, *179*(12), 1289–1292. https://doi.org/10.1503/cmaj.071843

Beck, K. (2013). *Risiko Krankenversicherung. Risikomanagement in einem regulierten Krankenversicherungsmarkt*. Haupt Verlag.

Berthet, F., Calteux, A., Wolter, M., Weber, L., & van Ginneken, E. (2015). Luxembourg: Health systems in transitions in brief. http://www.euro.who.int/__data/assets/pdf_file/0006/287943/Mini-HiT_Luxembourg-rev1.pdf?ua=1

Bilger, M. (2008). Progressivity, horizontal inequality and reranking caused by health system financing: A decomposition analysis for Switzerland. *Journal of Health Economics*, *27*(6), 1582–1593. https://doi.org/10.1016/j.jhealeco.2008.07.009

Bitrán, R., Muñoz, J., Aguad, P., Navarrete, M., & Ubilla, G. (2000). Equity in the financing of social security for health in Chile. *Health Policy*, *50*(3), 171–196. https://doi.org/10.1016/S0168=8510(99)00071-8

Busse, R., & Blumel, M. (2014). Germany: Health system review. *Health Systems in Transition*, *16*(2), 1–296.

Böhm, K., Schmid, A., Götze, R., Landwehr, C., & Rothgang, H. (2013). Five types of OECD healthcare systems: Empirical results of a deductive classification. *Health Policy*, *113*(3), 258–269. https://doi.org/10.1016/j.healthpol.2013.09.003

Carrin, G., & James, C. (2004). *Reaching universal coverage via social health insurance: Key design features in the transition period*. WHO. Discussion Paper No. 2.

Carrin, G., Riadh, Z., Philip, M., Jean-Pierre, P., Nicole, V., & Ke, X. (2001). *The impact of the degree of risk-sharing in health financing on health system attainment*. WHO.

Cetani, T. (2002). San Marino. http://apps.who.int/iris/bitstream/handle/10665/107381/E74647.pdf?sequence=1%26isAllowed=y

Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., Bergeron, A., & Cutler, D. (2016). The association between income and life expectancy in the united states, 2001–2014. *Journal of the American Medical Association*, *315*(16), 1750–1766. https://doi.org/10.1001/jama.2016.4226

Chevreul, K., Berg Brigham, K., Durand-Zaleski, I., & Hernandez-Quevedo, C. (2015). France: Health system review, *Health System in Transition*, *17*(3), 1–218.

Crivelli, L., & Salari, P. (2014a). The inequity of the Swiss Health Care system financing from a federal-state perspective. *International Journal for Equity in Health*, *13*, 17. https://doi.org/10.1186/1475-9276-13-17

Crivelli, L., & Salari, P. (2014b). The impact of federalism on the healthcare system in terms of efficiency, equity, and cost containment: The case of Switzerland. In R. Levaggi, & M. Montefiori (Eds.), *Health care provision and patient mobility: Health integration in the European Union* (pp. 155–178). Springer Milan.

de Pietro, C., Camenzind, P., Sturny, I., Crivelli, L., Edwards-Garavoglia, S., Spranger, A., Wittenbecher, F., & Quentin, W. (2015). Switzerland: Health system review, *Health System in Transition*, *17*(4), 1–288.

Dimova, A., Rohova, M., Koeva, S., Atanasova, E., Koeva-Dimitrova, L., Kostadinova, T., & Spranger, A. (2018). Bulgaria: Health system review. *Health System in Transition*, *20*(4), 1–230.

Dixit, S. K., & Sambasivan, M. (2018). A review of the Australian healthcare system: A policy perspective. *SAGE Open Medicine*, *6*, 2050312118769211. https://doi.org/10.1177/2050312118769211

Dong, Y. (2012). How health insurance affects health care demand—A structural analysis of behavioral moral hazard and adverse selection. *Economic Inquiry*, *51*(2), 1324–1344. https://doi.org/10.1111/j.1465-7295.2012.00457.x

Dzakula, A., Sagan, A., Pavic, N., Lonccarek, K., & Sekelj-Kauzlaric, K. (2014). Croatia: Health system review, *Health System in Transition*, *16*(3), 1–162.

Economou, C. (2010). Greece: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0004/130729/e94660.pdf

Esping-Anderson, G. (1990). *The three worlds of welfare capitalism*. Polity Press.

European Commission. (2017). Bulgaria country health profile. https://ec.europa.eu/health/sites/health/files/state/docs/chp_bulgaria_english.pdf

European Observatory on Health Care Systems. (2002). In Mossialos, E., Dixon, A., Figueras, J., & Kutzin, J. (Eds.), *Funding health care: Options for Europe*.

Forde, I. (2017). OECD reviews of health systems: Costa Rica. https://read.oecd-ilibrary.org/social-issues-migration-health/oecd-reviews-of-health-systems-costa-rica-2017_9789264281653-en#page6

Gaál, P., Szigeti, S., Márton Csere, G., & Matthew, D. P. (2011). Hungary: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0019/155044/e96034.pdf

Gerkens, S., & Merkur, S. (2010). Belgium: Health system review. *Health System in Transition*, *12*(5), 1–266.

Gerritzen, B. C., & Kirchgässner, G. (2013). Federalism in health and social care in Switzerland. In J. Costa-Font, & S. L. Greer (Eds.), *Federalism and decentralization in European health and social care* (pp. 250–271). Palgrave Macmillan UK.

Glover, L. (2020). International health care system profiles. *The Commonwealth Fund*. https://international.commonwealthfund.org/countries/australia/

Greß, S., Maral, M., & Jürgen, W. (2007). *Health insurance reform in the Netherlands* (ifo DICE Report). ifo Institute - Leibniz Institute for Economic Research at the University of Munich, *5*(1), 63–67.

Guessous, I., Gaspoz, J. M., Theler, J. M., & Wolff, H. (2012). High prevalence of forgoing healthcare for economic reasons in Switzerland: A population-based study in a region with universal health insurance coverage. *Preventive Medicine*, *55*(5), 521–527. https://doi.org/10.1016/j.ypmed.2012.08.005

Hadley, J. (2003). Sicker and poorer—The consequences of being uninsured: A review of the research on the relationship between health insurance, medical care use, health, work, and income. *Medical Care Research and Review*, *60*(2_Suppl), 3S–75S. https://doi.org/10.1177/1077558703254101

Hawker, S., Payne, S., Kerr, C., Hardey, M., & Powell, J. (2002). Appraising the evidence: Reviewing disparate data systematically. *Qualitative Health Research*, *12*(9), 1284–1299. https://doi.org/10.1177/1049732302238251

Hidayat, B., Thabrany, H., Dong, H., & Sauerborn, R. (2004). The effects of mandatory health insurance on equity in access to outpatient care in Indonesia. *Health Policy and Planning*, *19*(5), 322–335. https://doi.org/10.1093/heapol/czh037

Hofmarcher, M. M., & Quentin, W. (2013). Austria: Health system review, *Health System in Transition*, *15*(7), 1–292.

Hosseinpoor, A. R., Stewart Williams, J. A., Itani, L., & Chatterji, S. (2012). Socioeconomic inequality in domains of health: Results from the World Health Surveys. *BMC Public Health*, *12*, 198. https://doi.org/10.1186/1471-2458-12-198

Jaspersen, J. G., & Richter, A. (2013). The influence of premium subsidies on moral hazard in insurance contracts.

Jaspersen, J. G., & Richter, A. (2015). The wealth effects of premium subsidies on moral hazard in insurance markets. *European Economic Review*, *77*, 139–153. https://doi.org/10.1016/j.euroecorev.2015.03.007

Jeon, B., & Kwon, S. (2013). Effect of private health insurance on health care utilization in a universal public insurance system: A case of South Korea. *Health Policy*, *113*(1), 69–76. https://doi.org/10.1016/j.healthpol.2013.05.007

Kaufmann, C., Schmid, C., & Boes, S. (2017). Health insurance subsidies and deductible choice: Evidence from regional variation in subsidy schemes. *Journal of Health Economics*, *55*, 262–273. https://doi.org/10.1016/j.jhealeco.2017.08.002

Kifmann, M., & Roeder, K. (2011). Premium subsidies and social health insurance: substitutes or complements? *Journal of Health Economics*, *30*(6), 1207–1218. https://doi.org/10.1016/j.jhealeco.2011.08.007

Koppel, A., Kahur, K., Triin Habicht, S., Pille, J. H., & Ewout, V. G. (2008). Estonia: Health system review. World Health Organization. Regional Office for Europe. https://apps.who.int/iris/handle/10665/107891

Kroneman, M., Boerma, W., van den Berg, M., van Groenewegen, P., de Jong, J., & Ginneken, E. (2016). Netherlands: Health system review. *Health System in Transittion*, *18*(2), 1–240.

Lamers, L. M., van Vliet, R. C. J. A., & van de Ven, W. P. M. M. (2003). Risk-adjusted premium subsidies and risk sharing: Key elements of the competitive sickness fund market in the Netherlands. *Health Policy*, *65*(1), 49–62. https://doi.org/10.1016/S0168-8510(02)00116-1

Leu, R. E., & Schellhorn, M. (2006). The evolution of income-related health inequalities in Switzerland over time. *CESifo Economic Studies*, *52*(4), 666–690. https://doi.org/10.1093/cesifo/ifl013

Marmot, M., Allen, J., Goldblatt, P., Boyce, T., McNeish, D., Grady, M., & Geddes, I. (2010). Fair society, healthy lives, *Strategic review of health inequalities in England post-2010*. University College London.

Mays, G. P., Scutchfield, F. D., Bhandari, M. W., & Smith, S. A. (2010). Understanding the organization of public health delivery systems: An empirical typology. *The Milbank Quarterly*, *88*(1), 81–111. https://doi.org/10.1111/j.1468-0009.2010.00590.x

Milevska Kostova, N., Chichevalieva, S., Ponce, N. A., van Ginneken, E., & Winkelmann, J. (2017). The former Yugoslav Republic of Macedonia: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0006/338955/Macedonia-HiT-web.pdf?ua=1

Moran, M. (2000). Understanding the welfare state: The case of health care. *The British Journal of Politics and International Relations*, *2*(2), 135–160. https://doi.org/10.1111/1467-856X.00031

Murauskiene, L., Janoniene, R., Veniute, M., van Ginneken, E., & Karanikolos, M. (2013). Lithuania: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0016/192130/HiT-Lithuania.pdf

Murray, C. J. L., & Frenk, J. (2000). A WHO framework for health system performance assessment. *Bulletin of the World Health Organisation*, *78*(6), 717–731.

OECD. (1987). *Financing and delivering health care: A comparative analysis of 30 countries*.

OECD, World Health Organization. (2006). *OECD review of health systems: Switzerland 2006*.

Oliver, A., & Mossialos, E. (2004). Equity of access to health care: outlining the foundations for action. *Journal of Epidemiology and Community Health*, *58*(8), 655.

Panteli, D., Sagan, A., & Busse, R. (2011). Poland: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0018/163053/e96443.pdf

Perneger, T. V., & Hudelson, P. M. (2005). Public support for social financing of health care in Switzerland. *International Journal of Health Services*, *35*(1), 91–99. https://doi.org/10.2190/WP6U-Y3PP-UMVQ-W75M

Ringard, Å., Sagan, A., Sperre Saunes, I., & Karin Lindahl, A. (2013). Norway: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0018/237204/HiT-Norway.pdf?ua=1

Rosen, B., Waitzberg, R., & Merkur, S. (2015). Israel: Health system review. *Health System in Transition*, *17*(6), 1–212.

Sapelli, C. (2004). Risk segmentation and equity in the Chilean mandatory health insurance system. *Social Science and Medicine*, *58*(2), 259–265.

Sapelli, C., & Torche, A. (2001). The mandatory health insurance system in Chile: Explaining the choice between public and private insurance. *International Journal of Health Care Finance and Economics*, *1*(2), 97–110. https://doi.org/10.1023/A:1012886810415

Schabloski, A. (2008). *Healthcare Systems around the world*. WorldCat.

Schoen, C., Osborn, R., Squires, D., Doty, M. M., Pierson, R., & Applebaum, S. (2010). How health insurance design affects access to care and costs, by income, in eleven countries. *Health Affairs*, *29*(12), 2323–2334. https://doi.org/10.1377/hlthaff.2010.0862

Schokkaert, E., van Ourti, T., de Graeve, D., Lecluyse, A., & van de Voorde, C. (2009). Supplemental health insurance and equality of access in Belgium. *Health Economics*, *19*(4), 377–395. https://doi.org/10.1002/hec.1478

Siskou, O., Kaitelidou, D., Economou, C., Kostagiolas, P., & Liaropoulos, L. (2009). Private expenditure and the role of private health insurance in Greece: Status quo and future trends. *The European Journal of Health Economics: HEPAC: Health Economics in Prevention and Care*, *10*(4), 467–474. https://doi.org/10.1007/s10198-009-0164-3

Smatana, M., Pažitný, P., Kandilaki, D., Laktišová, M., Sedláková, D., Palušková, M., van Ginneken, E., & Spranger, A. (2016). Slovakia: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0011/325784/HiT-Slovakia.pdf?ua=1

Tatara, K., & Okamoto, E. (2009). Japan: Health system review. *Health Systems in Transition (European Observatory on Health Systems and Policies)*, *11*(5), 164.

The Commonwealth Fund. (2016). In Mossialos, E., Wenzl, M., Osborn, R., & Sarnak, D. (Eds.), *2015 international profiles of health care systems*.

The World Bank. (2008). In Savedoff, D. W., & Gottret, P. (Eds.), *Governing mandatory health insurance: Learning from experience*.

Thomson, S., Busse, R., Crivelli, L., van de Ven, W., & van de Voorde, C. (2013). Statutory health insurance competition in Europe: A four-country comparison. *Health Policy*, *109*(3), 209–225. https://doi.org/10.1016/j.healthpol.2013.01.005

Topp, S. M., Abimbola, S., Joshi, R., & Negin, J. (2018). How to assess and prepare health systems in low- and middle-income countries for integration of services—A systematic review. *Health Policy and Planning*, *33*(2), 298–312. https://doi.org/10.1093/heapol/czx169

Toth, F. (2016). Classification of healthcare systems: Can we go further? *Health Policy*, *120*(5), 535–543. https://doi.org/10.1016/j.healthpol.2016.03.011

Tragakes, E., Brigis, G., Karaskevica, J., Rurane, A., Stuburs, A., & Zusmane, E. (2008). Latvia: Health system review. http://www.euro.who.int/__data/assets/pdf_file/0003/95124/E91375.pdf

van de Ven, W. (2006). Response: The case for risk-based subsidies in public health insurance. *Health Economics, Policy, and Law*, *1*(2), 195–199. https://doi.org/10.1017/S1744133105001076

van de Ven, W. P. M. M., & Schut, F. T. (2008). Universal mandatory health insurance in The Netherlands: A model For The United States? *Health Affairs*, *27*(3), 771–781. https://doi.org/10.1377/hlthaff.27.3.771

van de Ven, W. P. M. M., van Vliet, R. C. J. A., & Lamers, L. M. (2004). Health-adjusted premium subsidies in The Netherlands. *Health Affairs*, *23*(3), 45–55. https://doi.org/10.1377/hlthaff.23.3.45

van de Ven, W. P. M. M., van Vliet, R. C. J. A., Schut, F. T., & van Barneveld, E. M. (2000). Access to coverage for high-risks in a competitive individual health insurance market: Via premium rate restrictions or risk-adjusted premium subsidies? *Journal of Health Economics*, *19*(3), 311–339. https://doi.org/10.1016/S0167-6296(99)00028-4

van de Water, P. N. (2008). Achieving universal participation in social insurance systems. *Health and Income Security Brief*.

van Ginneken, E., & Rice, T. (2015). Enforcing enrollment in health insurance exchanges: Evidence from The Netherlands, Switzerland, and Germany. *Medical Care Research and Review*, *72*(4), 496–509. https://doi.org/10.1177/1077558715579867

Vladescu, C., Scintee, S. G., Olsavszky, V., Hernandez-Quevedo, C., & Sagan, A. (2016). Romania: Health system review. *Health System in Transition*, *18*(4), 1–170.

von Wyl, V., & Beck, K. (2015). Failure to pay for social health insurance premiums: Acts of protest or desperation? *Preventive Medicine Reports*, *2*, 127–133. https://doi.org/10.1016/j.pmedr.2015.02.001

Wagstaff, A. (2009). Social health insurance reexamined. *Health Economics*, *19*(5), 503–517. https://doi.org/10.1002/hec.1492

Waters, H. R. (2000). Measuring equity in access to health care. *Social Science & Medicine*, *51*(4), 599–612. https://doi.org/10.1016/S0277-9536(00)00003-4

Wendt, C., Frisina, L., & Rothgang, H. (2009). Healthcare system types: A conceptual framework for comparison. *Social Policy & Administration*, *43*(1), 70–90. https://doi.org/10.1111/j.1467-9515.2008.00647.x

Wilkinson, R. G. (1992). Income distribution and life expectancy. *British Medical Journal*, *304*(6820), 165–168.

World Health Organisation (WHO). (2002). Health insurance systems and access to medicines—Case studies from Argentina, Chile, Colombia, Costa Rica, Guatemala, and the United States of America. http://apps.who.int/medicinedocs/en/d/Jh3012e/4.1.html

World Health Organisation (WHO). (2004). In Saltman, R. B., Busse, R., & Figuera, J. (Eds.), *Social health insurance systems in western Europe*.

World Health Organization, Regional Office for South-East Asia. (2005). *Social health insurance. Selected case studies from Asia and the Pacific*.

Xu, K., Evans, D. B., Carrin, G., Aguilar-Rivera, A. M., Musgrove, P., & Evans, T. (2007). Protecting households from catastrophic health spending. *Health Affairs*, *26*(4), 972–983. https://doi.org/10.1377/hlthaff.26.4.972

AUTHOR BIOGRAPHIES

Shalvaree Vaidya is a PhDSc Candidate at the University of Lucerne in Switzerland.

Prof. Dr. Stefan Boes is the Vice Principal of the Department of Health Sciences and Medicine at the University of Lucerne in Switzerland.

How to cite this article: Vaidya, S., & Boes, S. (2021). Strategies to mitigate inequity within mandatory health insurance systems: A systematic review. *World Medical & Health Policy*. 13, 272–292. https://doi.org/10.1002/wmh3.446

APPENDIX

TABLE A1 Categories in health care restricted by socioeconomic status

Type of care	Country	Inequity
Unmet medical need	Austria	Several studies show that preferential treatment is given to those in higher-income groups (Hofmarcher & Quentin, 2013).
	Belgium	Those in the highest income class have a lower risk of being admitted to a general hospital, psychiatric service, or psychiatric hospital, than those in the lowest income class (Gerkens & Merkur, 2010).
	Bulgaria	Out-of-pocket payments play a huge role in the Bulgarian SHI system. Thus, certain groups have trouble accessing health care leading to a negative impact on their health status (Dimova et al., 2018).
	Croatia	Women with lower incomes receive less gynecologic care than economically better-off women (Dzakula et al., 2014).
	Czech Republic	1% of the lowest income population reported unmet medical needs because of financial constraints (Alexa et al., 2015).
	Estonia	2%–4% of households experience catastrophic expenditure (inability to pay) that restricts their access to health care (Koppel et al., 2008).
	Germany	Lower-income individuals have an increased risk of health problems compared to high-income individuals. In 2011, 6% of interviewed individuals reported an unmet need for prescription medicine, and 16% reported skipping a medically needed GP visit. Additionally, preferential treatment is received by privately insured patients (Busse & Blumel, 2014).

TABLE A1 (Continued)

Type of care	Country	Inequity
	Greece	Specialist usage is greater among higher-income individuals (Economou, 2010).
	Israel	In 2014, a study reported that 11% of citizens could not afford needed medical care (Rosen et al., 2015).
	Latvia	Access to medical care is strongly linked to low income. A study of 1000 citizens reported that one-third have unmet medical need due to lower incomes (Tragakes et al., 2008).
	Lithuania	4.3% of the population has unmet medical needs with 25% reporting services to be unaffordable (Murauskiene et al., 2013).
	Norway	4.6% of citizens were unable to pay for health care due to financial constraints (Ringard et al., 2013).
	Poland	10%–12% of respondents forgo health care because they are unable to pay for the service (Panteli et al., 2011).
	Republic of Korea	The health status gap between the highest and lowest income groups reached an economic crisis in the 2000s (Bae Chun et al., 2009).
	Romania	9.1% of the population report an unmet medical need due to financial constraints (Vladescu et al., 2016).
	Slovakia	Lower-income quintiles report higher levels of unmet medical need compared to higher-income quintiles (Smatana et al., 2016).
	F.Y. of Macedonia	Low-income groups have high levels of unmet medical needs due to the services being unaffordable (Milevska Kostova et al., 2017).
	Switzerland	1% of interviews in a 2013 survey reported unmet medical need due to inability to pay (de Pietro et al., 2015). A similar survey in Geneva reported 14.5% of households had unmet medical needs because of costs. A 2012 study by Guessous et al, showed that even with the existence of subsidies, there is a high prevalence in Switzerland of forgoing health care for economic reasons (Guessous et al., 2012).
Dental care	Austria	Those within the highest income are 40% more likely to visit a dentist than those in the lowest income group (Hofmarcher & Quentin, 2013).
	Croatia	The main barrier to receiving dental care was the inability to pay the associated costs (Dzakula et al., 2014).
	Belgium	In 2006, a study of the Christian Sickness Fund reported that children in the highest income bracket have a 28% higher chance of receiving preventative dental care than children in the lowest income group (Gerkens & Merkur, 2010).
	Netherlands	A 2013 study found that 18% of those in need of dental care did not receive any because of the costs involved (Kroneman et al., 2016).
	Poland	In 10%–12% of respondents having financial trouble paying for health care, 47% reported skipping dental services because of financial constraints (Panteli et al., 2011).
	Slovakia	Financial barriers have led to the lowest income quintile to have 5.5 times higher need for dental care than those in the highest income quintile (Smatana et al., 2016).

(Continues)

TABLE A1 (Continued)

Type of care	Country	Inequity
	Switzerland	4.6% of individuals on a 2013 survey reported unmet dental care due to economic reasons (de Pietro et al., 2015).
Waiting times	Austria	Private payments to physicians and/or private health insurance allow wealthier patients to shorten or avoid waiting times (Hofmarcher & Quentin, 2013).
	Germany	Private insurance led to shorter waiting times for patients compared to their SHI-covered counterparts (Busse & Blumel, 2014).
	Hungary	Although not well-documented, some medical treatments that require waiting lists are impacted by socioeconomic factors (Gaál et al., 2011).
	Romania	10.4% of the population reported that they had not received needed medical care either due to travel, expense, or waiting times (Vladescu et al., 2016).

Received: 8 October 2020 | Revised: 20 April 2021 | Accepted: 20 April 2021

DOI: 10.1002/wmh3.447

ORIGINAL ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Climate change and health in Ethiopia: To what extent have the health dimensions of climate change been integrated into the Climate-Resilient Green Economy?

Anand Bhopal[1] | **Haileselassie Medhin**[2] | **Kristine Bærøe**[3] | **Ole F. Norheim**[1]

[1]Bergen Centre for Ethics and Priority Setting, Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

[2]Europe Regional Office, World Resources Institute, The Hague, The Netherlands

[3]Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

Correspondence
Anand Bhopal, University of Bergen, Department of Global Public Health and Primary Care, Årstadveien 217804, Bergen, Norway.
Email: anand.bhopal@uib.no

Abstract

Ethiopia is experiencing an increasing frequency and intensity of slow-onset and acute disasters caused by climate change, with significant health impacts. Understanding and addressing these impacts involves trade-offs, which are central to effective priority setting in health and overarching efforts to meet the Sustainable Development Goals. Despite minimal historic greenhouse gas emissions, Ethiopia has been at the forefront of climate action since launching the Climate-Resilient Green Economy (CRGE) in 2011, a low-carbon development strategy. To learn from the Ethiopian approach, this paper examines to what extent health has been integrated into the CRGE. We found that the early years of the CRGE prioritized developing the financial basis of the green economy, while the health impacts of climate change have only been tentatively considered to date and remain detached from broader health strategies. Further analysis of climate adaptation measures, "health co-benefits," and reducing specific vulnerabilities of the health sector could help improve health and build climate resilience.

Key Points

- Ethiopia has been at the forefront of climate action since launching the Climate Resilient Green Economy (CRGE) in 2011, a low-carbon development strategy.

- Early years of CRGE prioritised the economic foundations while the health impacts of climate change have only been tentatively considered to date and remain detached from broader health strategies.
- Further analysis integrating adaptation measures, health co-benefits of non-health interventions and ways to reduce specific vulnerabilities of the health sector could help identify synergies and build resilience to climate change in Ethiopia.
- The current conflict in the Tigray region presents an ongoing risk of wider destabilisation across the country.
- Post-conflict reconstruction and development efforts to follow should seek to better integrate the climate resilience dimension into the health system.

KEYWORDS

climate change, Climate-Resilient Green Economy, sustainable development

BACKGROUND

Climate change is a present and growing threat to health and wellbeing across the world (Hoegh-Guldberg et al., 2018; Watts et al., 2015). Ethiopia, located in the Horn of Africa, is considered by the Notre Dame Global Adaptation Initiative to be among the most vulnerable countries with a low capacity to adapt to the negative impacts of climate change (Notre Dame Global Adaptation Initiative, n.d.). There are several overlapping reasons for this, including the combination of landlocked geography, drought-prone weather systems, and the socioeconomic dimensions of rural poverty (Climate Security Expert Network, 2019). Climate change is already exacerbating the risks of acute and chronic food insecurity, internal displacement, poor sanitation, and conflict, undermining broader human, and economic development goals, which could help adapt to these challenges (Ethiopian Panel on Climate Change, 2015b; Federal Ministry of Health, 2018). Despite having had one of the world's fastest-growing economies and steadily increasing life expectancy—increasing almost 1 year, every year, for the last 20 years—avoidable mortality in Ethiopia remains high (Norheim et al., 2015) and also increasingly precarious in the face of the climate change, the COVID-19 pandemic, and geopolitical unrest, including the conflict in Tigray.

Ethiopia is a home to rapidly growing population of 110 million people, making it the second-most populous country in Africa and one of the youngest in the world, with a median age of only 19.5 years (United Nations, n.d.). The country has a federal government divided into ten regional states and two self-governing city-states. Development policy has been primarily the responsibility of the Federal Government, whereas regional governments have focused on implementation. Small-scale rain-fed farming remains a principal source of employment, which means food security remains intricately entwined with livelihoods, health, and the climate (Climate Security Expert Network, 2019; Robinson et al., 2013). Access to electricity remains a major challenge, especially in rural areas, and there is a continued reliance on biomass fuels for cooking, which has a direct health effect of indoor air pollution as well as a range of other indirect health effects (Medhin & Mekonnen, 2019).

Environmental risks have been increasingly recognized in the policies and laws of the country since the 1990s, not least because of the awareness created by the devastating 1984 drought. The Disaster Prevention and Preparedness Commission launched in 1995 included a comprehensive disease risk management approach, including social, economic, and food security, coordinated by a newly established high-level committee to oversee the implementation. Similarly, Ethiopia's first environmental policy (Federal Democratic Republic of Ethiopia, 1997) launched in 1997 articulated the interdependence of people and the environment, encapsulating the Rio Principles of Sustainable Development and laying the foundation for the country's poverty reduction strategy ever since (Ethiopian Environmental Protection Agency, 2012).

The Climate-Resilient Green Economy (CRGE) strategy, launched in 2011, is a multisectoral approach to developing a climate-resilient, middle-income economy within 15 years. The approach focuses on meeting the twin goals of human and economic development in a warming world through a net-zero growth in carbon emissions, to a large extent based on reversing deforestation and increasing forest cover (Federal Democratic Republic of Ethiopia, 2011).

The CRGE strategy had four key pillars focused on carbon mitigation from high-emission sectors (agriculture, forestry, and transport) together with the expansion of hydropower electricity. It received strong cross-governmental commitment, which has been sustained after a change in government (Federal Democratic Republic of Ethiopia, 2011, p. 20). The strategy mirrored the first 5-year Growth and Transformation Plan ("GTP I"), though it featured heavily in the second GTP ("GTP II"), thereby mainstreaming climate change into central planning. An overarching National Adaptation Plan was released in 2019 (Federal Government of Ethiopia, 2019). Health-specific resilience plans were first released in 2014–2015 (Federal Ministry of Health, 2014), followed by a broader National Adaptation Plan for Health in 2018 (Federal Ministry of Health, 2018).

Over the last 5 years, there has been increasing acknowledgment among Ethiopian policymakers of the need for parity between carbon mitigation and societal adaptation, with growing interest in health (Admasu & Debessa, 2015; Simane et al., 2016; United Nations Development Programme, 2015). To our knowledge, the health dimensions of the CRGE have not been systematically explored. Incorporating the trade-offs of different approaches to tackling climate change is central to effective health priority setting (Johansson et al., 2019) and meeting the overarching Sustainable Development Goals (Norheim et al., 2019). In the face of public health threats, such as undernutrition, food insecurity, and noncommunicable diseases, tackling climate change can have benefits—the 2015 Lancet Commission on Health and Climate Change described these synergies as "the greatest global health opportunity of the 21st century" (Watts et al., 2015). This paper will assess to what extent the health dimensions of climate change have been integrated into the Climate-Resilient Green Economy process, and report on which aspects have been incorporated and identify gaps in the research base.

METHODS

We undertook a scoping review exploring the health dimensions of Ethiopia's CRGE initiative. A scoping review aims to identify research gaps and including different sources and types of evidence are especially valuable in mapping out the key concepts in areas, which have not been comprehensively reviewed (Arksey & O'Malley, 2005). A scoping review is therefore appropriate because the health dimension of climate change policies is in general poorly understood. We followed the five-stage Arksey and O'Malley's (2005) framework outlined below.

Identifying the research question

To what extent have the health dimensions of climate change been integrated into the CRGE? This study question formed a starting point for the search strategy, which was narrowed as the overview of the field was improved.

Identifying relevant studies

The scoping review aims to identify all relevant literature, regardless of study design or data source (Arksey & O'Malley, 2005). This study draws on government policy documents, published articles, and nongovernmental reports from large published literature databases (Pubmed, Embase, Web of Science and Google Scholar), gray literature databases (Gray literature report, Worldcat), and relevant websites, including the United Nations Framework Convention on Climate Change (unfccc.int), the Ethiopian government (Ethiopia.gov.et), Prevention Web (preventionweb.net) and the Global Green Growth Institute (gggi.org).

The literature search, undertaken in May 2020, combined search terms relating specifically to Ethiopia, climate change, and health impacts:

- (climate change [Title/Abstract] OR (Global warming[Title/Abstract] OR (climate resilient green economy[Title/Abstract] OR (CRGE[Title/Abstract]).
- **AND** (health[Title/Abstract] OR disease[Title/Abstract] OR nutrition[Title/Abstract]).
- **AND** (Ethiopia[Title/Abstract]).

Extensive use of "snowballing" (the examination of citation lists) was used to identify additional policy documents and relevant unpublished literature.

Study selection

Establishing the relevance criteria is an iterative process, refined with increasing familiarity with the literature (Arksey & O'Malley, 2005). This review is primarily interested in policy documents from within the Ethiopian CRGE. However, as the CRGE is a broad, multisectoral initiative, not all documents are relevant; conversely, many relevant health documents are aligned to, but not part of the CRGE. We, therefore, included material within the Ethiopian CRGE initiative and Ethiopian government policy documents relevant to the CRGE published since 2010, a year before the formal launch, during which time preparatory documents, such as regional assessments, were being prepared. We included external articles and nongovernmental reviews, which were published after 2011 and directly addressed the CRGE, with no restrictions on study design. The review excluded material that was not available in English. Our reliance on English language searches and databases may be one factor limiting our ability to locate all the regional policy documents.

Charting the data

Using a descriptive-analytic method, data were collected on author, year, document type, stated purpose, and health dimensions in line with our study aims.

Collating, summarizing, and reporting the results

We mapped our findings against the analytic framework used in the 2019 report of the Lancet Countdown on health and climate change (Watts et al., 2019), a leading, international, multidisciplinary research initiative tracking the impact of climate change on health and ways to prevent these harms. "Health threats" correlates with Section 1 of the Lancet Countdown ("Climate change impacts"), which includes health impacts and health sector vulnerability (i.e., infrastructure, electricity supply, transportation). "Health opportunities" correlates with Sections 2 and 3 of the Lancet Countdown ("Adaptation" and "Mitigation and Health Co-benefits"), which include adaptations to improve health and health co-benefits (i.e., health gains from nonhealth interventions). To help understand the relevance for health, the author, title, stated aim, and priority CRGE sector is given for each item included in the results.

RESULTS

Overall profile of documents identified

The literature search identified 25 government policy documents, five published articles, and seven nongovernmental reports, of which 15 government policy documents,one published article, and six reports were included in the review. Out of the 15 included government policy documents, four (27%) were Federal Government documents, three (20%) were regional government documents, five (33%) were from the health ministry, and three (20%) were from other government ministries. We included one (33%) of the published articles and four (57%) of the nongovernmental reports, all of which were released between 2013 and 2016. Regional adaptation plans were all published in 2010, national policies were published throughout the period 2011–2019, and sectoral-specific policies (including health) were published between 2014 and 2018. The key findings are in Tables 1–4.

Policy documents—National Government

As shown in Table 1, seven diverse national policy documents were included in this review: the '*CRGE Vision*' (Federal Government of Ethiopia, 2011), laying out the ambitions of the CRGE, which was launched at the Conference of Parties climate change summit in 2011; the *CRGE Strategy* (Federal Democratic Republic of Ethiopia, 2011), a blueprint for implementing the Green Economy (which explicitly does not cover climate resilience); GTP II (National Planning Commission, 2016, p. 93)—an economic strategy, which aimed to mainstream the CRGE strategy, Sustainable Development Goals (SDGs) and Agenda-2063 relevant to health (National Planning Commission, 2016, p. 190); the National Adaptation Plan (NAP) (Federal Government of Ethiopia, 2019), an intersectoral assessment of measures to build climate resilience and reduce vulnerability to climate change; and climate-resilient plans from the agriculture and forestry, water and energy and transport sectors, outlining adaptation and mitigation measures and financing plans.

Health threats

Health impacts of climate change are described in six out of seven documents with a focus on the increased spread of vector and water-borne diseases, flooding incidents, and impacts

TABLE 1 Federal government policy documents

Overview			Health threats		Health opportunities	
Title/Author	**Aim**	**Stated CRGE priority sectors**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health**	**Health co-benefits of non-health interventions**
CRGE Vision, 2011 (Federal Government of Ethiopia, 2011)	"Roadmap for achieving a climate-resilient green economy"	"*Vulnerable sectors*" Agriculture, Transport, Industry, Energy, Health, Environment	• Vector-borne diseases • Non-vector-borne diseases • Poorer food and water supply • Air pollution • Floods and storms • Heat-related mortality	*Not specified* (but mentions close links between rainfall, GDP growth, and wellbeing due to reliance on agriculture)	• Expand health extension program • Strengthen health systems • Introduce early warning systems	Cleaner energy sources → reduce air pollution
CRGE Strategy, 2011 (Federal Democratic Republic of Ethiopia, 2011)	"Protect against the adverse effects of climate change and build a green economy"	"*Key pillars*" Agriculture, Forestry, Power, Transport	*Not specified*	*Not specified*	*Not specified*	• Fuel-efficient stoves (indoor air quality) • Decreased exhaust fumes → less outdoor air pollution • Improved road safety • Improved water quality
Growth and Transformation Plan II (GTP II), 2016 (National Planning Commission, 2016)	"Spring-board toward the national vision of being a low- to a middle-income country by 2025"	*Not specified*	• "Spread transmitted diseases in the form of epidemic" • "Aggravate food insecurity"	*Not specified*	• Up to date early warning systems • Strengthened safety net programs to improve food security	• Fuel-efficient stoves (indoor air pollution) • Clean water and sanitation → range of health benefits

TABLE 1 (Continued)

Overview			Health threats		Health opportunities	
Title/Author	**Aim**	**Stated CRGE priority sectors**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health**	**Health co-benefits of non-health interventions**
National Adaptation Plan (NAP), 2019 (Federal Government of Ethiopia, 2019)	Strategy to "reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience"	"*Vulnerable sectors*" Agriculture, Forestry, Health, Transport, Power, Industry, Water, Urban	• Vector-borne diseases • Water-borne diseases • Severe malnutrition • Increase in flood incidence and displacement	*Not specified*	• Improved access to potable water • Environmental health surveillance. • Developing technologies and research • Climate-sensitive disease prevention • Improved basic health services	Minimize flood risk → protect health
Climate Resilience Strategy: Agriculture & Forestry, 2015 (Federal Democratic Republic of Ethiopia, 2015a)	Identify challenges related to climate change, adaptations, and financing	"*Key pillars*" Agriculture, Forestry, Power, Transport	• Droughts and water stress • Floods • Heat stress	*Not specified*	• Enhancing weather warning systems • Social protection for high priority groups, including women and children	*Not specified*
Climate Resilience Strategy: Water and Energy, 2015 (Federal Ministry of Water Irrigation and Energy, 2015)	Identify the economic and social impacts of climate variability and prioritize interventions	Agriculture	• Poor water access	• Reliance on vulnerable surface water → diarrhea, malnutrition, and neglected tropical diseases	• Universal access to water, sanitation, and hygiene (WASH) → "saves 946,032 maternal and child deaths"	• Access to energy and water "could prevent 1.2 m lives" • Fuel-efficient stoves (indoor air pollution – "72,400 deaths annually")

(Continues)

TABLE 1 (Continued)

Overview			Health threats		Health opportunities	
Title/Author	**Aim**	**Stated CRGE priority sectors**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health**	**Health co-benefits of non-health interventions**
Ethiopia's Climate-Resilient Transport Sector Strategy, 2017 (Federal Ministry of Transport of Ethiopia, 2017,2010)	Explore 'transport synergies and cost-efficiencies while increasing GHG emission reduction gains'	*Not specified*	• Direct temperature mortality • Damaged transport infrastructure from adverse weather events → increased road accidents	• Climate resilience of health infrastructure • Access points to health facilities are 'critical road corridors'	• Enhanced standards for buildings, transport, bridges • Health and safety assessments • Long-term emergency preparedness, including health infrastructure	• Reduce air and noise pollution → public health benefits • Encourage active transport → improve mental and physical health

Abbreviation: CRGE, Climate-Resilient Green Economy.

TABLE 2 Regional government policy documents

Overview		Health threats		Health opportunities	
Title/Author	**Aim**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health (indicators)**	**Health co-benefits of non-health interventions**
Dire Dawa Program of adaptation to Climate Change, 2011 (Dire Dawa Environmental Protection Agency, 2011)	Assess climate change vulnerabilities in sectors important for livelihood, the ecosystem, and natural resource of the area	• Malnutrition • Malaria at higher altitudes • Water-borne diseases	• Population growth outstripped expansion of health sector	• Strengthen malaria prevention and control service • Increase community awareness • Communication equipment • Sufficient trained staff in all health centers • Early warning systems	*Not specified*
Oromia Program of Plan on Adaptation to Climate Change, 2011 (Oromia National Regional State Task Force, 2011)	Identify the major vulnerable sectors to climate change and their adaptive capacity and response measures	• Malnutrition and famine • Malaria at higher altitudes • Water-borne diseases	• Low availability of social services and schooling for pastoralist communities • Poorly functioning health facilities and low vaccination coverage • Pre-existing food insecurity	• Awareness-raising on health • Mobile health service provisions • Health insurance systems • Strengthen health extension workers • Increase access to household level sanitary services	*Not specified*
Afar National Programme of Plan on Adaptation to Climate Change, 2010 (Afar National Regional State Task Force, 2010)	Identify the major vulnerable sectors to climate change and their adaptive capacity and response measures	• Malnutrition • Poor child development • Vector-borne diseases • Water-borne diseases • Heat stress	• Inadequate health services, often far from main roads • Low-quality infrastructure. • Rural poverty and lack of alternative incomes • Low health literacy and widely practiced harmful traditional practices	• Malaria protection and prevention campaigns • Improve health facilities • Integrated disaster risk reduction and early warning system systems • Improve water sources (boreholes, springs, wells) • Solar power drilling system → reliable water supply	• Switch fuelwood for clean fuels → reduced physical impacts of carrying wood and reduced indoor air pollution

TABLE 3 Ministry of health policy documents

Overview			Health threats		Health opportunities	
Title/Author	**Aim**	**Formal part of CRGE?**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health (indicators)**	**Health co-benefits of nonhealth interventions**
National Framework of Climate-Resilient Health Sector, 2014 (Federal Ministry of Health, 2014)	"Serve as policy guidance and provide roadmap for the realization of Health National Adaptation Plan"	Yes	• Malnutrition • Water-borne diseases • Vector-borne diseases • Meningitis • Heat mortality • Asthma	• Health facilities ill-equipped (equipment, staff) and lacking water/power/phone to respond to disasters and outbreaks	• Integrated environmental health surveillance • Public health capacity building • Community-based social security fund for disaster victims • Health development army	• Reducing diesel exhaust → decreased asthma
Vulnerability and Adaptation Assessment of Health to Climate Change in Ethiopia, 2015 (Federal Ministry of Health, 2015b)	Assess health vulnerabilities to climate change and their interlinkages	Yes	• Malnutrition • Water-borne diseases • Vector-borne diseases • Meningitis • Heat stress • Extreme weather events • Food-borne diseases	• Infrastructure at risk from flooding • Limited electricity • Basic medical equipment • Poor water and sanitation • Unsustainable health financing • Structural social problems (e.g., widespread poverty)	• Improve public health surveillance systems • Strengthen early warning systems • Human resource for health development • Establish health and climate data system • Improve public health services • Improve water, sanitation, and hygiene system • Advocacy to raise public awareness	Adaptation measures → reduce gender inequities
Review of Policy Documents On Climate Change, WASH & Public Health in	Examine sensitivity of WASH policy documents to	Yes	• Vector-borne diseases • Nonvector-borne diseases	• Health infrastructure at risk of flood damage	• Integrate climate data and early warning data with WASH/health sectors.	Integration of interventions controlling diseases sharing

TABLE 3 (Continued)

Overview			Health threats		Health opportunities	
Title/Author	**Aim**	**Formal part of CRGE?**	**Health impacts**	**Health sector vulnerability**	**Adaptations to improve health (indicators)**	**Health co-benefits of nonhealth interventions**
Ethiopia, 2015 (Federal Ministry of Health, 2015a)	climate change and vice versa.		• Extreme events compromising routine health programs and development goals • Heat stress • Drinking water contamination		• Capacity building and technical training to mainstream health into climate change adaptation	climatic risk factors
Health Sector Transformation Plan, 2015 (Federal Democratic Republic of Ethiopia, 2015b)	Five-year plan to reach Universal Health Coverage	No: In line with GTP II	High deaths from infectious diseases, obesity, diabetes, and heart disease if climate change not mitigated	Not specified	• Strong public health emergency management system, including an early warning system • Strengthen health development army • Develop climate resilience and adaptability framework	Not specified
National Health Adaptation Plan to Climate Change (2018–2020), 2018 (Federal Ministry of Health, 2018)	Blueprint for a climate-resilient health system	Yes	• Malnutrition • Water-borne diseases • Vector-borne diseases • Heat stress • Respiratory tract infections	• Health centers: not attached to the national electric grid, lack clean water, paved road access, phones • Latrines at risk from flooding	• Integrated disease surveillance and strengthen early warning systems • Community health insurance scheme • Develop and adopt climate-proof latrine design • Improve access to safe drinking water • Promote family planning	• Reduced indoor and outdoor air pollution • Active transport

Abbreviations: CRGE, Climate-Resilient Green Economy; GTP, growth and transformation plan.

TABLE 4 Scientific articles and non-governmental reports

Overview		Health dimensions of CRGE	
Title	**Aim**	**Key findings**	**Recommendations**
Making Growth Green and Inclusive: The Case of Ethiopia, OECD 2013 (Bass et al., 2013)	Showcase progress and prospects for green growth and clarify the added value of the CRGE strategy	• Health sector adaptation measures will be added in the next phase of CRGE	• Develop a set of inclusive green growth principles, including health
Integration of Poverty and Sustainability into National Development Planning: Ethiopia Report, 2015 (United Nations Development Programme, 2015)	Assess integration of development processes and transition to a more inclusive greener economy	*Health not included in the analysis*	• Institutionalization of CRGE within Ministries at national and regional levels
Ethiopian Panel on Climate Change (Health & Settlement), 2015 (Ethiopian Panel on Climate Change, 2015a)	Present known effects of climate change on human health, including population vulnerability and co-benefits	• Systematic review of the evidence • Criteria presented for identifying key vulnerabilities, key risks, emergent risks	• Strategies to respond to climate change (adaptation, mitigation, finance, capacity-building) should take health impacts into account
Ethiopian Panel on Climate Change, summary for policymakers, 2015 (Ethiopian Panel on Climate Change, 2015b)	Summary of the report for the policymakers	• Health impacts are direct, ecosystem-related, and mediated through institutions. Effective short-term solutions are strengthening basic public health services and disaster preparedness and poverty alleviation.	• The Government could make health a priority area in the current climate change activities
Review of Climate Change and Health in Ethiopia: Status and Gap Analysis, 2016 (Simane et al., 2016)	Assess environment, climate change, and health and identify research, training, and capacity gaps	• Lack of Ethiopia-based research hindering effective adaptation and mitigation strategies within the CRGE. • Limited intersectoral collaboration regionally and nationally • Lack of coordination between academia, NGOs, and policy makers	• Establish climate and health research centers and update policies. • Specialized training to develop research capacity • Combine health and climate data to monitor climate-sensitive diseases • Establish multistakeholder fora for climate change and health
Review of current and planned adaptation action in Ethiopia, International	Outline efforts to increase climate adaptation on	• "There are gaps in adaptation action addressing	*Not specified*

TABLE 4 (Continued)

Overview		Health dimensions of CRGE	
Title	**Aim**	**Key findings**	**Recommendations**
Development Research Centre/UK Aid, 2016 (Echeverria & Terton, 2016)	national and subnational levels	vulnerabilities in specific sectors, notably health"	
Ethiopia's Country Planning, 2016–2020, 2016 (Global Green Growth Institute, 2016)	"Detail how GGGI will support Ethiopia in planning and implementing the CRGE vision"	• Non-health sector climate resilience strategies indicate benefits for public health • Investment in health will be essential to meeting the CRGE goals	• Complete outstanding CRGE analysis for health • Greater attention to interlinkages between sectors and initiatives

Abbreviation: CRGE, Climate-Resilient Green Economy.

on nutrition. Nonhealth sectoral plans describe some health impacts and identify specific vulnerabilities of the health sector from climate change.

Health opportunities

Adaptations to improve health are outlined in six out of seven documents, focusing on the health system, improving access to health services, and developing early warning systems. The health co-benefits of nonhealth interventions were mentioned in six out of seven of documents, though not systematically or as in depth as has been done elsewhere (Haines et al., 2009; Scovronick et al., 2019). Reduced indoor air pollution from the use of fuel-efficient stoves and improved access to clean water were the most frequently described. The NAP noted the historical omission of health from the priority CRGE sectors (Federal Government of Ethiopia, 2019) and mentioned the health dimensions of a range of inter-sectoral initiatives, including integrated health and environmental surveillance (see *Annex 2* in Federal Government of Ethiopia, 2019, for further information).

Policy documents—Regional governments

We included three regional plans on climate change resilience as outlined in Table 2. All identified health as especially vulnerable to climate change and focused primarily on adaptations to improve health. For more details on regional plans see Federal Government of Ethiopia (2019).

Health threats

Health impacts of climate change were discussed in all regional plans and common themes were malnutrition, the spread of malaria at higher altitudes, and water-borne diseases. In contrast to the national policies (Table 1), regional policies discussed some specific vulnerabilities of the health sector to climate change, focusing on poverty, education, and poor access to health services.

Health opportunities

All documents identified several adaptations to improve health. The main themes were the need for increased awareness, early warning systems, and improved basic health services. One document mentioned health co-benefits (reduced indoor air pollution from switching firewood for clean fuels).

Policy documents—Health ministry

Health sector-specific policy documents, shown in Table 3, were first released in 2014, 3 years after the CRGE launch. The National Framework of Climate-Resilient Health Sector (Federal Ministry of Health, 2014) began the process of developing a comprehensive health sectoral response, strengthened a year later in the Health Vulnerability and Adaptation Assessment (Federal Ministry of Health, 2015b). In 2015, the CRGE was mainstreamed into GTP II on which the Health Sector Transformation Plan (HSTP) is based—the HSTP is, therefore, included here.

Health threats

All CRGE-related documents describe a wide range of health impacts from climate change, including malnutrition, water-borne diseases, and vector-borne diseases, and heat mortality. The HSTP states that the risk of higher obesity, diabetes, and heart disease-related deaths if climate change is not mitigated but does not substantiate upon the causes or interventions needed.

Specific vulnerabilities of the health sector identified to focus on equipment and staffing and the physical integrity of buildings limiting sectoral resilience. Structural social problems, such as poverty and access to clean water and sanitation, are included in the vulnerability and adaptation assessment but not substantiated in either the HSTP or the National Health Adaptation Plan. The HSTP does not discuss specific vulnerabilities of the health sector and makes no reference to either the Vulnerability and Adaptation Assessment or the CRGE initiative.

Health opportunities

All documents included in this review identified a range of adaptations to improve health, including investing in public health infrastructure, staffing, and data systems, and developing early warning systems. Other specific adaptations include developing community social security schemes, improving access to clean water and sanitation, and increasing awareness of climate change. The interrelationship between health and the wider social and environmental context was not a clear narrative within these documents. Health co-benefits of public health interventions outside the health sector received scant attention and no detailed analysis to indicate the potential benefits of interventions mentioned, such as promoting active transport or decreasing air pollution.

Reviews—Scientific articles and reports

Outlined in Table 4 are published review articles and nongovernmental reports. The articles (the Ethiopian Panel on Climate Change chapter on health, the accompanying summary for

policymakers, and a "status gap and analysis") focus on health and climate change in Ethiopia, though not specifically on the CRGE. The nongovernmental reports are not health-focused, although two reports highlight the centrality of health analysis to delivering the aims of the CRGE.

An article ("status gap and analysis") suggested establishing climate and health research centers to monitor the impacts and build capacity, alignment of climate, and health data to monitor climate-sensitive diseases and increase intersectoral collaboration. The Ethiopian Panel on Climate Change (2015) highlighted the need to incorporate health into broader climate change strategies.

This is echoed in the nongovernmental reports—which highlight gaps in health sector analysis and the importance of health to achieving CRGE goals. Recommendations within the nongovernmental reports include developing a broad set of green growth principles, including health, and greater attention to interlinkages between sectors and initiatives.

DISCUSSION

This review investigated to what extent health is integrated into the Ethiopian CRGE. We found that the CRGE identified priority areas (Table 1) on the basis of the economic importance of sectors and the potential for reduced emissions (Federal Democratic Republic of Ethiopia, 2011). Though health and climate resilience were central to the regional adaptation plans (see Table 3) compiled a year before the CRGE launch, the first 5 years of the CRGE were characterized by a focus on building the Green Economy.

Health remains at a less developed stage than other aspects of the strategy. This perhaps reflects delays initiating the health technical subcommittee and undertaking health-specific analysis—it was 3 years before a preliminary analysis was undertaken and 7 years until a comprehensive national health adaptation plan was launched. It may, with sound reasons, not have been a priority. For example, the Ethiopian health Minister in 2015 wrote that the health co-benefits of interventions to tackle climate change "cannot be overemphasized" but agriculture and energy security are the keys to broader development goals (Admasu & Debessa, 2015).

Another barrier to incorporating health into the CRGE earlier may have been the indirect nature of the relationship between climate change and health (Watts et al., 2019, Section 4). It has traditionally been difficult to directly quantify the health impacts of climate change (McMichael et al., 2003, chap. 7). The World Bank report on the economics of adaptation to climate change in Ethiopia, partly informing the CRGE, explicitly did not consider the health-related implications (World Bank, 2010). Incorporating emerging evidence—for example, the health co-benefits of interventions to improve air quality (Markandya et al., 2018; Vandyck et al., 2018), low-carbon urban transport systems (Shaw et al., 2014), and uptake of a planetary diet (Willett et al., 2019)—through an overarching public health approach could strengthen the CRGE.

The Health Sector Transformation Plan states in the foreword that "Climate change is the greatest global health threat of the 21st century" (Federal Democratic Republic of Ethiopia, 2015b) though does not follow up with coherent actions to mitigate the risks. This mismatch is far from unique to Ethiopia (Ethiopian Panel on Climate Change, 2015b; Watts et al., 2015). However, this challenge may be compounded by a lack of technical expertise (Mitike et al., 2016)—addressing deficits in country-specific, localized data remain a major challenge for designing effective policies across the world.

As indicated by the Ethiopian public health community (Simane et al., 2016), independent reviews (Echeverria & Terton, 2016; Global Green Growth Institute, 2016), and by the government itself (Admasu & Debessa, 2015), health has been somewhat

fragmented within the CRGE. The potential public health benefits of pursuing a green economic development path have been underutilized. Ultimately, many of the health impacts of climate change are dependent on how human systems respond (16); building climate resilience is key to avoid losing hard-won progress in health (Smith et al., 2014). Ethiopia's 5-year HSTPs present ongoing opportunities to develop synergies between these agendas.

LIMITATIONS

Within this review, we were unable to satisfactorily explore the relationship between national policy making and regional implementation. This paper is intended to form the basis for future in-depth qualitative interviews exploring the implementation of the CRGE. However, given the growing importance of effective integration between health and climate policy across the world (Watts et al., 2015), we believe this study provides useful insights for policymakers engaged in this urgent challenge.

Conclusion and policy implications

Understanding and addressing the health impacts of climate change on health are essential for effective priority setting in health and meeting the overarching SDGs. This study set out to evaluate to what extent the health dimensions of climate change have been integrated into the CRGE of Ethiopia. We found that the early years of the CRGE prioritized developing the financial basis of the green economy, whereas the potential health impacts—and benefits—of climate change mitigation and adaption have only been tentatively considered within the CRGE to date and are not currently coordinated in the health-specific analysis or broader health strategies. Further analysis integrating the necessary adaptation measures, health co-benefits of nonhealth interventions and steps to reduce specific vulnerabilities of the health sector could help identify synergies and build resilience. Updating regional adaptation plans may facilitate this process. Fuller's integration of the health dimensions of climate change is key to its success.

A key factor we must acknowledge impeding the successful implementation of the CRGE vision is the conflict in the Tigray region with the ongoing risk of wider destabilization across the country. Tigray's health system has been a major casualty of the violence, with widespread damage and looting of facilities, a lack of remaining health personnel, and occupation by armed soldiers jeopardizing the safe access to health care and compounding the conflict's human toll (MSF, 2021). Post-conflict reconstruction and development efforts to follow should seek to better integrate the climate resilience dimension into the health system.

The Ethiopian CRGE program remains a leading example of a transformational, low-carbon, climate-resilient economic development agenda, which offers insights for countries across sub-Saharan Africa pursuing a similar path, such as Kenya, Uganda, Ghana, Rwanda, and South Africa (see Green Growth Knowledge Platform, n.d.). The sub-Saharan Africa region faces the dual challenge of improving the health and welfare of citizens through the as yet little tested green developmental path—that is, renewable energy-led socio-economic development, rather than fossil fuels—while contending with, and building resilience to, climate risks, such as extreme weather events. Well-informed, medium- to long-term decision-making is, therefore, essential to prepare for this uncertain future.

As the then Prime Minister of Ethiopia, Meles Zenawi, said at the launch of the CRGE in 2011: "While we did not cause climate change, we must protect ourselves from its impact. We have the opportunity to demonstrate that in the 21st century a new form of green growth

is possible" (United Nations Development Programme, n.d.). One way the research community, both in sub-Saharan Africa and across the world, can support this effort is through undertaking national and cross-country comparative research on health and the green economy agenda to refine policy development, disseminate best practice and fulfill the greater mission of a climate-resilient society for all.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

Ethical approval was not required for this scoping review. This article is entirely the authors' own original work, which has not been previously published in any form elsewhere.

REFERENCES

Admasu, K., & Debessa, K. (2015). Action to protect human health from climate change: An African perspective. *The Lancet*, *386*(10006), e31–e33. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)61139-4/abstract

Afar National Regional State Task Force. (2010). *Afar National Regional State: Programme of plan on adaptation to climate change*.

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, *8*(1), 19–32. https://doi.org/10.1080/1364557032000119616

Bass, S., Wang, S., Ferede, T., & Fikreyesus, D. (2013). *Making growth green and inclusive: The case of Ethiopia, OECD Green Growth Papers*. OECD Publishing. https://www.oecd-ilibrary.org/docserver/5k46dbzhrkhl-en.pdf?expires=1620200647&id=id&accname=guest&checksum=CE3A67A8CC484FE1308D9AB98680728C

Climate Security Expert Network. (2019). Climate-fragility risk brief: Ethiopia. https://climate-security-expert-network.org/sites/climate-security-expert-network.com/files/documents/csen_climate_fragility_risk_brief_-_ethiopia_0.pdf

Dire Dawa Environmental Protection Agency. (2011). Dire Dawa Administration Program of Adaptation to Climate Change.

Echeverria, D., & Terton, A. (2016). *Review of current and planned adaptation action in Ethiopia* (CARIAA Working Paper No. 8). International Development Research Centre. www.idrc.ca/cariaa, https://www.iisd.org/system/files/publications/idl-55864-ethiopia.pdf

Ethiopian Environmental Protection Agency. (2012). United Nations Conference on Sustainable Development (Rio20): National Report of Ethiopia. https://sustainabledevelopment.un.org/content/documents/973-ethiopia.pdf

Ethiopian Panel on Climate Change. (2015a). *First assessment report—Working Group II Health and Settlement*. Ethiopian Academy of Sciences. http://publication.eiar.gov.et:8080/xmlui/bitstream/handle/123456789/2424/Ethiopia%20Panel%20on%20climate%20change.pdf%20pCCC.pdfab%20bbbyyyyyy.pdf?sequence=1&isAllowed=y

Ethiopian Panel on Climate Change. (2015b). *First assessment report, Summary of reports for policy makers*. Ethiopian Academy of Sciences. http://publication.eiar.gov.et:8080/xmlui/handle/123456789/2430

Federal Democratic Republic of Ethiopia. (1997). Environmental policy. http://archive.basel.int/legalmatters/natleg/documents/ethiopia01.pdf

Federal Democratic Republic of Ethiopia. (2011). Ethiopia's Climate-resilient Green Economy: Green economy strategy. https://www.preventionweb.net/files/61504_ethiopiacrge.pdf

Federal Democratic Republic of Ethiopia. (2015a). Climate Resilience Strategy: Agriculture and forestry. http://gggi.org/site/assets/uploads/2017/11/2015-08-Sectoral-Climate-Resilience-Strategies-for-Ethiopia-1-Agriculture-and-Forestry-Climate-Resilience-Strategy.pdf

Federal Democratic Republic of Ethiopia. (2015b). Health Sector Transformation Plan (2015/16–2019/20). https://ehia.gov.et/sites/default/files/Resources/HSTP%20Final%20Print%202015-11-27%20Print%20size.pdf

Federal Government of Ethiopia. (2011). Climate Resilient Green Economy: Vision. https://www.preventionweb.net/files/24317_24317crgegevision40pagesforprinting.pdf

Federal Government of Ethiopia. (2019). CRGE National Adaptation Plan. https://www4.unfccc.int/sites/NAPC/Documents/Parties/Final%20Ethiopia-national-adaptation-plan%20%281%29.pdf

Federal Ministry of Health. (2014). National framework of climate-resilient health sector. https://www.who.int/globalchange/resources/wash-toolkit/national-framework-of-climate-resilient-health-sector.pdf?ua=1

Federal Ministry of Health. (2015a). Review of policy documents on climate change, WASH, and public health in Ethiopia. https://www.who.int/globalchange/resources/wash-toolkit/review-of-policy-documents-on-climate-change-wash-and-public-health-in-ethiopia.pdf?ua=1

Federal Ministry of Health. (2015b). Vulnerability and adaptation assessment of health to climate change in Ethiopia. https://www.who.int/globalchange/resources/wash-toolkit/vulnerability-and-adaptation-assessment-of-health-to-climate-change-in-ethiopia.pdf

Federal Ministry of Health. (2018). National health adaptation plan to climate change. https://www.who.int/globalchange/resources/wash-toolkit/national-health-adaptation-plan-to-climate-change.pdf?ua=1

Federal Ministry of Transport of Ethiopia. (2017). Ethiopia's climate-resilient transport sector strategy. https://www.mofed.gov.et/media/filer_public/15/31/153174c3-b472-4339-b3bb-fb2c48cad629/transport_cr.pdf

Federal Ministry of Water, Irrigation, and Energy. (2015). Ethiopia's Climate Resilient Green Economy. Climate resilience strategy: Water and energy. http://gggi.org/wp-content/uploads/2015/08/2015-08-10-FINAL-CR-Strategy-Water-and-Energy.compressed.pdf

Global Green Growth Institute. (2016). Ethiopia Country Planning 2016–2020. https://www.greengrowthknowledge.org/national-documents/gggis-ethiopia-country-planning-framework-2016-2020

Green Growth Knowledge Platform. (n.d.). Africa. https://www.greengrowthknowledge.org/region/africa

Haines, A., McMichael, A. J., Smith, K. R., Roberts, I., Woodcock, J., Markandya, A., Armstrong, B. G., Campbell-Lendrum, D., Dangour, A. D., Davies, M., Bruce, N., Tonne, C., Barrett, M., & Wilkinson, P. (2009). Public health benefits of strategies to reduce greenhouse-gas emissions: Overview and implications for policy makers. *The Lancet*, *374*(9707), 2104–2114. https://www.sciencedirect.com/science/article/pii/S0140673609617591

Hoegh-Guldberg, O., Jacob, D., Taylor, M., Bindi, M., Brown, S., Camilloni, I., Diedhiou, A., Djalante, R., Ebi, K., Engelbrecht, F., Guiot, J., Hijioka, Y., Mehrotra, S., Payne, A., Seneviratne, S. I., Thomas, A., Warren, R., … Zhou, G. (2018). Impacts of 1.5°C global warming on natural and human systems. Global warming of 1.5°C: An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. https://research-repository.uwa.edu.au/en/publications/impacts-of-15%C2%BAc-global-warming-on-natural-and-human-systems

Johansson, K. A., Tolla, M. T., Memirie, S. T., Miljeteig, I., Habtemariam, M. K., Woldemariam, A. T., Verguet, S., & Norheim, O. F. (2019). Country contextualisation of cost-effectiveness studies: Lessons from Ethiopia. *BMJ Global Health*, *4*(6), e001320. https://gh.bmj.com/content/4/6/e001320

Markandya, A., Sampedro, J., Smith, S. J., van Dingenen, R., Pizarro-Irizar, C., Arto, I., & González-Eguino, M. (2018). Health co-benefits from air pollution and mitigation costs of the Paris Agreement: A modelling study. *The Lancet Planetary Health*, *2*(3), e126–e133.

McMichael, A. J., Campbell-Lendrum, D. H., Corvalán, C. F., Ebi, K. L., Githeko, A., Scheraga, J. D., & Woodward, A. (2003). *Climate change and human health: Risks and responses*. World Health Organization.

Medhin, H. A., & Mekonnen, A. (2019). Green and climate-resilient transformation in Ethiopia, *The Oxford handbook of the Ethiopian economy*. Oxford University Press.

Mitike, G., Motbainor, A., Kumie, A., Samet, J., & Wipfli, H. (2016). Review of policy, regulatory, and organizational frameworks of environment and health in Ethiopia. *The Ethiopian Journal of Health Development*, *30*(1 Spec Iss), 42–49.

MSF. (2021). Health facilities targeted in Tigray Region, Ethiopia. *Médecins Sans Frontières (MSF) International*. https://www.msf.org/health-facilities-targeted-tigray-region-ethiopia

National Planning Commission. (2016). Growth and transformation plan II (GTP II) (2015/16-2019/20). Vol. I: Main text. https://ethiopia.un.org/sites/default/files/2019-08/GTPII%20%20English%20Translation%20%20Final%20%20June%2021%202016.pdf

Norheim, O. F., Ezekiel, J. E., & Millum, J. (2019). *Global Health Priority-Setting: Beyond Cost-Effectiveness*. Oxford University Press.

Norheim, O. F., Jha, P., Admasu, K., Godal, T., Hum, R. J., Kruk, M. E., Gómez-Dantés, O., Mathers, C. D., Pan, H., Sepúlveda, J., Suraweera, W., Verguet, S., Woldemariam, A. T., Yamey, G., Jamison, D. T., & Peto, R. (2015). Avoiding 40% of the premature deaths in each country, 2010–30: Review of national mortality trends to help quantify the UN Sustainable Development Goal for Health. *The Lancet*, *385*(9964), 239–252. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)61591-9/abstract

Notre Dame Global Adaptation Initiative. Notre Dame Global Adaptation Initiative—Country Index. https://gain.nd.edu/our-work/country-index/rankings/

Oromia National Regional State Task Force. (2011). Oromia National Regional State: Program of plan on adaptation to climate change. https://www.academia.edu/32904711/Oromia_National_Regional_State_Program_of_Plan_on_Adaptation_to_Climate_Change_Team_Members_Participated_in_this_Document_Preparation_Regional_Task_force_Members

Robinson, S., Strzepak, K., & Cervigni, R. (2013). *The cost of adapting to climate change in Ethiopia: Sector-wise and macro-economic estimates* (ESSP Working Paper 53). International Food Policy Research Institute.

Scovronick, N., Budolfson, M., Dennig, F., Errickson, F., Fleurbaey, M., Peng, W., Socolow, R. S., & Wagner, F. (2019). The impact of human health co-benefits on evaluations of global climate policy. *Nature Communications*, *10*(1), 1–12. https://www.nature.com/articles/s41467-019-09499-x

Shaw, C., Hales, S., Howden-Chapman, P., & Edwards, R. (2014). Health co-benefits of climate change mitigation policies in the transport sector. *Nature Climate Change*, *4*(6), 427–433. https://www.nature.com/articles/nclimate2247

Simane, B., Beyene, H., Deressa, W., Kumie, A., Berhane, K., & Samet, J. (2016). Review of climate change and health in Ethiopia: Status and gap analysis. *Ethiopian Journal of Health Development*, *30*(1), 28–41. https://www.ajol.info/index.php/ejhd/article/view/147317

Smith, K. R., Campbell-Lendrum, D., Chadee, D. D., Honda, Y., Liu, Q., Olwoch, J. M., Revich, B., & Sauerborn, R. (2014). Climate Change 2014: Impacts, adaptation, and vulnerability. Part A: Global and sectoral aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, *Human Health: Impacts, Adaptation, and Co-Benefits* (pp. 709–754). Cambridge University Press.

United Nations Development Programme. (n.d.). Ethiopia launches strategy for low-emission climate-resilient development. https://www.undp.org/content/undp/en/home/presscenter/articles/2011/12/08/ethiopia-launches-strategy-for-low-emission-climate-resilient-development.html

United Nations Development Programme. (2015). Integration of poverty and sustainability into National Development Planning: Ethiopia Report. https://www.un-page.org/files/public/page_ethiopia_scoping_study_2015.pdf

United Nations, Department of Economic and Social Affairs, Population Division. (2019). World Population Prospects 2019, Volume I: Comprehensive Tables (ST/ESA/SER.A/426). https://population.un.org/wpp/Publications/Files/WPP2019_Volume-I_Comprehensive-Tables.pdf

Vandyck, T., Keramidas, K., Kitous, A., Spadaro, J. V., van Dingenen, R., Holland, M., & Saveyn, B. (2018). Air quality co-benefits for human health and agriculture counterbalance costs to meet Paris Agreement Pledges. *Nature Communications*, *9*(1), 4939.

Watts, N., Adger, W. N., Agnolucci, P., Blackstock, J., Byass, P., Cai, W., Chaytor, S., Colbourn, T., Collins, M., Cooper, A., Cox, P. M., Depledge, J., Drummond, P., Ekins, P., Galaz, V., Grace, D., Graham, H., Grubb, M., Haines, A., … Costello, A. (2015). Health and climate change: Policy responses to protect public health. *The Lancet*, *386*(10006), 1861–1914. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60854-6/abstract

Watts, N., Amann, M., Arnell, N., Ayen-Karlsson, S., Belesova, K., Boykoff, M., Byass, P., Cai, W., Campbell-Lendrum, D., Capstick, S., Chambers, J., Dalin, C., Daly, M. E., Dasandi, N., Davies, M., Drummond, P., Dubrow, R., Ebi, K. L., Eckelman, M., … Taylor, J. (2019). The 2019 report of The Lancet Countdown on Health and Climate Change: Ensuring that the health of a child born today is not defined by a changing climate. *The Lancet*, *394*(10211), 1836–1878. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)32596-6/abstract

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T, Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., de Vries, W., Sibanda, L. M., … Murray, C. J. L. (2019). Food in the anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, *393*(10170), 447–492. https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)31788-4/abstract

World Bank. (2010). *Ethiopia—Economics of adaptation to climate change*. http://documents.worldbank.org/curated/en/310391468340238724/Main-report

AUTHOR BIOGRAPHIES

Anand Bhopal, MBChB, MA, is a PhD Research Fellow at the Bergen Centre for Ethics and Priority Setting, Department of Global Health and Primary Care, University of Bergen, Bergen, Norway.

Haileselassie Medhin, PhD, is the Director of Strategy and Partnerships, Africa at the World Resources Institute, The Hague, The Netherlands.

Kristine Bærøe, PhD, is a Professor of Medical Ethics and Philosophy of Science at the Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway.

Ole F. Norheim, PhD, is a Professor of Medical Ethics and the Director of the Bergen Centre for Ethics and Priority Setting, Department of Global Health and Primary Care, University of Bergen, Bergen, Norway.

How to cite this article: Bhopal, A., Medhin, H., Bærøe, K., & Norheim, O. F. (2021). Climate change and health in Ethiopia: To what extent have the health dimensions of climate change been integrated into the Climate Resilient Green Economy? *World Medical & Health Policy*. 13, 293–312. https://doi.org/10.1002/wmh3.447

Received: 4 April 2020 | Revised: 30 January 2021 | Accepted: 5 February 2021

DOI: 10.1002/wmh3.451

ORIGINAL ARTICLE

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Exploring the implications of the relationship between BMI and household consumptions for countries in transition

Lida Fan[1] | **Nazim Habibov**[2] | **Rong Luo**[3] | **Alena Auchynnikava**[2]

[1]School of Social Work, Lakehead University–Thunder Bay Campus, Thunder Bay, Ontario, Canada

[2]School of Social Work, University of Windsor, Windsor, Ontario, Canada

[3]University of Windsor, Windsor, Ontario, Canada

Correspondence

Lida Fan, School of Social Work, Lakehead University–Thunder Bay Campus, 955 Oliver Road, Thunder Bay, ON P7B 5E1, Canada.
Email: lfan@lakeheadu.ca

Abstract

This article explores the relationship between body mass index (BMI) and social status, namely household consumption and university education of the respondents, together with a set of demographics of 27 transitional countries in Eastern Europe using the data of the 2016 Life in Transition Survey. The two-stage least squares (2SLS) estimations are conducted on the full sample of 27 countries, the sub-datasets of former Soviet Union republics, as well as other Eastern European transitional countries, males and females, respectively, in an effort to compare the relationships between BMI and social status in different contexts. The results highlighted two important findings: First, household consumption has a strong and positive correlation with BMI across all the sub-datasets. Second, the father's education of the respondent is a strong predictor in predicting low BMI. These findings indicate that these transitional countries still run the same model as that typical developing countries, 25 years after the beginning of the transition.

KEYWORDS

BMI, social status, transitional countries

Key points

- Household consumption has a strong and positive correlation with BMI across all the sub-datasets of the 27 transitional countries.
- Father's education of the respondent is a strong predictor in predicting low BMI.
- These findings indicate that these transitional countries still run the same model like typical developing countries.

INTRODUCTION

The growing trend of obesity is one of the major challenges of public health in both developing and developed countries in the 21st century (Ng et al., 2014; WHO, 2006). Consequently, the study of the social determinants of obesity has been an important concept motivating public health research (Bishwajit, 2017; Kim & von dem Knesebeck, 2018). Although it is frequently said that lower income is associated with higher rates of obesity, this statement is too simplistic and does not present a clear picture of the relationship between income and obesity.

The focus of this study is the relationship between obesity and social status, namely household consumptions and university education of the respondents, together with a set of demographics. In this study, we explore this relationship by comparing countries of different contexts, the former Soviet Union (FSU) republics, as well as other Eastern European transitional countries, using the datasets of the 2016 Life in Transition Survey (LiTS).

The aim of this study is twofold. First, the results of this analysis provide an assessment of the current situation regarding life and health issues in 27 transitional countries. Second, the comparison among the countries provides evidence of how far these countries have gone on the road of transition, especially the comparison between the FSU countries and other transitional Eastern European countries. Given these objectives, our research inquiry is formulated into two interrelated questions:

(1) Do household consumptions affect the health status (BMI) in the former Soviet countries and other Eastern European transitional counties?
(2) Are there any differences between these two groups of countries regarding the relationship between household consumptions and obesity? What are the implications for these differences?

The following sections are organized this way: Section 2 discusses the theoretical framework; Section 3 explains the dataset and models used; Section 4 discusses the results, and finally, Section 5 summarizes findings and conclusions.

THEORETICAL FRAMEWORK

At the national level, in regard to the association between income and risks of obesity, it seems that with the progress in the national economy, obesity would increase as evidenced in many developing economies (Helble & Sato, 2018). The rapid increase in obesity in many developing countries is due to lower food costs compared with people's income, and the introduction of Westernized and processed foods, accompanied by rapid growth in wealth. Behind this phenomenon, there is a strong economic cause for obesity (Dang & Meenakshi, 2017; Finkelstein et al., 2005). However, if the units of analysis are individuals within a country, the picture is complicated. Sobal and Stunkard (1989) reviewed 144 published studies on the relationship between social status and obesity in both developed and developing countries. They summarized two important findings in their review: (1) In developing countries, a strong direct relationship between social status and obesity can be found among men, women, and children. The reason is that obesity among the population is rare because of insufficient food in underdeveloped countries. (2) However, in developed countries, there is a strong inverse relationship between social status and obesity among women but not among men and children. This pattern for women in developed societies may be attributed to the attitudes toward obesity caused by several variables.

More recent studies confirmed the abovementioned differences for developing and developed countries. For developing countries, the relationship between wealth and obesity is quite straightforward. For example, a study on Nepal and Bangladesh indicates that "higher household wealth is associated with an increased likelihood of being overweight and obese among adult women," and the richest households have the highest likelihood to be obese (Bishwajit, 2017, p. 185). On the contrary, in the developed world, McKay et al. (2007) found that above-normal BMI is related to lower social status among adolescents in the United States. Villar and Climent Quintana-Domeque (2009) study of nine European Countries confirmed the negative relationship between family income and BMI for women but found no statistically significant relationship for men. In general, the risks of obesity increase with income until a certain level, then decrease among the individuals in the highest income group. This scenario can also happen in some emerging economies. For example, Asiseh and Yao (2016) found that BMI increased with family income up to a threshold, then decreased within the wealthiest individuals, an inversed U-shaped curve, when looking at data from China.

Sobal and Stunkard's (1989) stated that social-economic status "must act in a different and more complex manner in developed societies than it does in developing societies" (p. 267). In their literature review, they investigated a few variables that might affect the relationship between socioeconomic status and obesity. Among these variables, they identified two core variables: dietary restraint and exercise. These two variables are too straightforward; however, other socioeconomic variables affect obesity through them. The complex relationship between social status and obesity in developed countries emerges from a lack of a single overriding force, such as food shortages experienced by developing nations. However, as we can hardly observe the caloric intake of individuals, using the observable indicators of social status is a feasible way to predict BMI. For this reason, the discussions about the variables estimated in this study will address the indirect links between social status and BMI. Exploring the direct links between BMI and diet restraint and exercise is not within the scope of this study.

The above discussion makes the following assumptions: First, wealth (family income or consumptions in our study) is a necessary but not a sufficient condition for obesity. In other words, without sufficient calories, obesity cannot happen, if we agree with the "law of conservation of mass." Second, knowledge about health and self-discipline are sufficient conditions for not being obese, except for individuals with certain kinds of diseases that cause obesity and genetic issues beyond personal choice. In other words, when people have sufficient resources for food, they can control what to consume and how much to consume.

Therefore, although obesity is caused by an overconsumption of food in terms of calories over a long period, it is the choice of individuals regarding what to consume and how much to consume. We use the word "choice" for implying the existence of free will that individuals can do otherwise if conditions permit. Many factors may affect this choice, among which cognition of the negative effects of obesity, knowledge about food and health, preference of thinness are well-documented factors affecting BMI (Sobal & Stunkard, 1989; Villar & Climent Quintana-Domeque, 2009). However, these factors do have different effects on people with different social backgrounds. The above discussion can be summarized in Figure 1, which is the framework for the analysis of the relationship between social status and BMI. We will use this framework to explain the results of our model estimation.

The focus of this paper is to examine factors affecting BMI among different countries in different social-economic contexts. We include some demographic characteristics, such as age and genetic factors, which are important factors affecting BMI, but they are beyond the control of the individuals and are less sensitive to healthcare policy. It is reasonable to believe that the inverted U-shaped relationship between household consumption and BMI reflects behavior change with the change of people's economic situation as indicated in

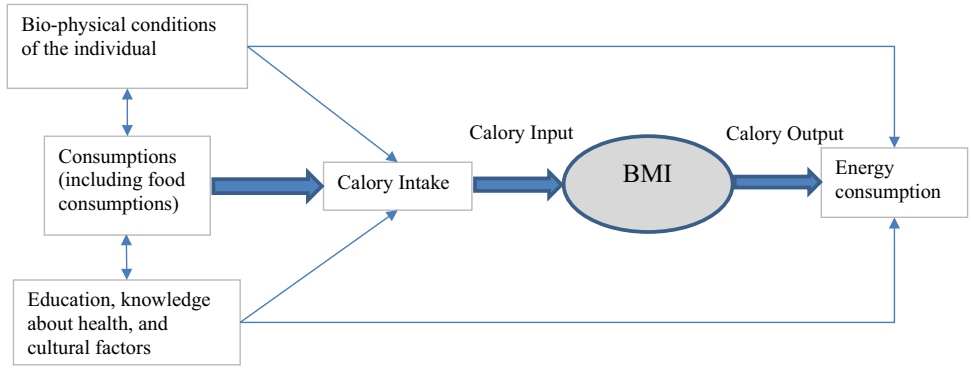


FIGURE 1 A theoretical framework: the root of body mass index (BMI)

some of the previous studies. What we are interested in is that the effects of social status on BMI in different social contexts can tell us about how public health policy would deal with obesity in a specific social setting. Meanwhile, the pattern of this relationship can reveal the level of development for a specific country. Fortunately, the dataset we use can support the endeavor for such a difference among transitional countries, namely between the FSU countries and other transitional countries.

DATA, VARIABLES, AND METHODOLOGY

Dataset

The dataset we use is the LiTS III conducted by the European Bank and the World Bank in 2016. LiTS has been conducted for understanding social change, and its impact on the life of individuals in transitional countries since the fall of the Iron Curtain in 1989. It collects respondents' information on their socioeconomic status, their attitudes and perceptions about various economic, political and social issues, and their well-being and the impacts of economic and political change on their life. LiTS III was conducted in 2016, a few years after the recovery from the 2008 financial crisis. It covered 51,000 households in 34 countries, including 29 transitional countries, as well as Cyprus, Greece, Germany, and Italy for comparison. The information collected in this survey provides vivid evidence of the lives of individuals and is sufficient for our investigation into the relationship between obesity and social status in different social contexts. For more information about the LITS survey, please see the European Bank for Reconstruction and Development (EBRD) (2016).

Since some of the country-level aggregated data are not available for Kosovo and Montenegro, these two countries are excluded in the analysis of this study. The remaining 27 transitional countries are included in this study. These countries are further broken down into the FSU countries and the non-FSU countries. The 12 FSU countries include Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Mongolia, Russia, Tajikistan, Ukraine, and Uzbekistan; the 15 Non-FSU countries are Albania, Bosnia and Herz, Bulgaria, Croatia, Czech Republic, Estonia, FYR Macedonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia, Slovak Republic, and Slovenia. Estonia, Latvia, and Lithuania were in the Soviet Union in the communist time. The reason we classify them into Non-FSU countries is that these three countries are so different from the other FSU countries after the transition. These countries were the first to join the EU among other

transitional countries. The economic freedom of these three countries is among the most developed Western countries (Fraser Institute [FI], 2019).

To compare the relationship of BMI and socioeconomic factors in countries of different social contexts, the full dataset is divided into four sub-datasets: FSU, Non-FSU, Males, and Females. We have two ways to examine the relationship between females and BMI, as a variable and as a group (Females sub-dataset). As a variable, we estimate the effect of being a female on BMI; as a group, we estimate the pattern of the female population. The regressions will be performed on the full dataset and these four sub-datasets, respectively.

Variables

BMI

Respondent's body mass index, or BMI for short, is the dependent variable in this study. BMI is calculated using a person's height in meters and weight in kilograms with the formula BMI = body weight in kg/(height in m)^2. So, this is a continuous variable that allows us to run ordinary least square (OLS) regressions and two-stage least squares (2SLS) against different variables with meaningful values of coefficients. As a standard measure, if a person's BMI is between 18.5 and 25, this person's weight is optimal; if the value of BMI is more than 25, the person is considered to be overweight, and if BMI is 30 or more, the person is considered obese. The average BMI for the respondents in our dataset is 25.92 with an *SD* of 4.53, slightly overweight.

Household Consumptions

Household Consumptions, as a more direct measurement of living standard, is a better measurement than household wealth. This variable is the research interest of this study. In the LiTS, the respondent's household consumptions were recorded in the currency of the country. So, we cannot use this variable as it is. So, in this study, the respondent's total household consumptions are adjusted to a conventional equivalent scale that the total household consumptions are divided by the square root of the number of individuals in the household. Then, the equivalent consumptions are recoded into five quintiles with an equal number of respondents in each quintile: from the lowest quintile 1 = 0%–20% of households in the country, to the highest quintile 5 = 80%–100% of households in the country. This variable is our research interest because its relationship with BMI depends on both the physical aspect of calory intake as well as the social aspect of food consumption. Given the literature study in the early section, we predict a positive association between *Household Consumptions* and BMI, given the social context in these transitional countries.

Subjective Wealth

Subjective Wealth is defined as a subjective assessment of household wealth by respondents (1 = the poorest of 10% households in the country to 10 = the wealthiest 10% of households in the country). Among the respondents in our dataset, the average response is 4.46 with an *SD* of 1.69. Although it is not an accurate estimate of the wealth of the household, it does give the respondent's perception of the economic conditions of the households. It is the self-perceived social status. As discussed earlier, social status affects

BMI from the two variables: caloric intake as input and exercise as the output of the calories. Wealthy individuals have more power to choose healthy food and time and money for exercise. So, although the relationship between this variable and BMI is not straightforward, it may be reasonable to believe that individuals with a high perception of their wealth level tend to have healthy behaviors and lower BMI. However, we should note that subjective assessment could be different from actual wealth.

Life Satisfaction

This variable is a subjective response of the respondent for the level of life satisfaction. It is a Likert scale measurement, which takes the value of 1 if the respondent is strongly unsatisfied with life, and 5 if the respondent is strongly satisfied with life. The mean value of the respondents' life satisfaction in the dataset is 3.24 with an *SD* of 1.12, slightly higher than the neural response. Obviously, this variable is associated with other variables of social status and health conditions but has its unique subjective meaning reflecting the respondent's attitude toward life. Drawing the estimates from a large sample of about 1.5 million people in the United States, Kuroki (2016) demonstrated a statistical relationship between life satisfaction and lower weight and lower obesity. In this study, we also predict a negative correlation between *Life Satisfaction* and BMI.

Female

Being a woman is an important predictor of obesity. Previous studies indicated that women have negative attitudes toward obesity, especially women with high social status. Consequently, women of higher social status tend to diet more often than women with lower social status (Sobal & Stunkard, 1989). This can explain the reverse relationship between obesity and social status, at least for women in the more developed societies. We predict a negative relation between *Female* and *BMI*.

Age

Previous studies indicated that the relationship between age and body weight is not linear, but a sinusoidal pattern, increasing in middle age and decreasing in old age (Perry et al., 1997; Silver et al., 1993). In general, BMI increases with age as a natural course if we treat it as a linear process. In this study, *Age* is a control variable, however, the effect of age on BMI should be further studied if the results indicate differences in its effects among the countries under study.

Married

Previous studies found that marriage has a positive effect on body weight (Jeffrey & Rick, 2002; Sobal, 1991; Sobal et al., 1992; Teachman, 2016). The explanation of this effect is that married individuals are more likely to eat regularly and consequently gain weight; also, married individuals are less likely to be concerned about their body weight since they are not in the marriage market (Averett et al., 2013; Jeffrey & Rick, 2002; Umberson, 1992; Umberson et al., 2009). Being married is a control variable in this study and we predict that it is positively correlated with BMI.

University Education

This is a dummy variable that takes the value of 1 if the respondent had a university education or higher. It is generally believed that individuals with higher education have lower BMI than those less educated individuals, because they have knowledge about the negative effects of being overweight, and they have a higher economic status to afford healthy food and lifestyles (Drewnowski, 2010; Mirowsky & Ross, 2013). However, as a few studies indicated, the association between higher education and low BMI may be largely due to selection, meaning that lower BMI adolescents are more likely to pursue higher education (Benson et al., 2018). Although we predict a negative association between University Education and BMI, we notice the existence of reverse causality. This calls for the need to apply a 2SLS estimation of the research in which university education is the instrumented variable. However, as the instrumented variable is Household Consumptions, this issue is not addressed in this study.

Father's University Education

This is a dummy variable that takes the value of 1 if the respondent's father had a university education or higher. It is fortunate to have a variable of father's university education in the LiST questionnaire. It is an important piece of information about the intergenerational factors that could affect the BMI of the people of the second generation. Parental education may influence BMI "in young adulthood, especially among White women" as observed in the United States (Greenlund et al., 1996). However, a similar study on schoolboys in a transitional country, 1997s Poland, did not have such a clear-cut conclusion (Kozieł et al., 2000). Although we are short of sufficient information about the relationship between father's education and BMI for transitional countries in the previous research, we predict that this variable is a strong variable affecting BMI.

Poor Health

Health conditions and BMI are obviously interrelated to each other, and in many instances, it is unclear whether poor health leads to high BMI or the reverse is true, or this relationship is indirect and depends on circumstances. As a cause, obesity is associated with many diseases such as diabetes, hypertension, heart disease, stroke, and some types of cancer (Mokdad et al., 2001; National Task Force on the Prevention and Treatment of Obesity [NTCPTO], 2000). However, various illnesses (unhealthy conditions) can also lead to higher BMI because of the lack of activities and because of the association of health conditions to socioeconomic status (Sobal & Stunkard, 1989; Weinstein et al., 2004). We assume that Poor Health is positively correlated to BMI.

Unemployment

The relationship between unemployment and BMI is complicated because unemployment is a factor that affects both the economic situation as well as the mental condition of individuals, which, in turn, affects calorie intake and physical activity, and finally BMI. "Unemployment is associated with both underweight and obesity for different subgroups, these associations may previously have masked each other" (Hughes & Kumari, 2017, p. 19). So, the pathways of how unemployment affects BMI are different for people in developing countries and developed countries (Sobal & Stunkard, 1989). In this study, we

have a chance to compare the effects of unemployment on BMI among different countries in slightly different socioeconomic contexts.

Urban

This is a dummy variable; it takes the value of 1 if the respondent resides in an urban area. In the dataset for our estimation, about 57% of the respondents reside in the urban area. If all other conditions are the same, the phenomenon of living in an urban area should not matter for BMI. However, living in an urban area would have more advantages over living in the countryside. These advantages affect BMI. As we do not have variables or indicators representing these advantages, living in the urban is such an indicator. The effects of living in the urban area on BMI is multifold. First, urban residents are more likely to use motorized transportation and eat high-sugar industrial foods, which will increase BMI. On the contrary, people living in urban areas may have better healthcare providers, more information about health and more products for a healthy life depending on their socioeconomic status. So, the actual effects on BMI for individuals living in urban areas depend on how the specific circumstances of the country and the specific social-economic status of the individuals (Luan et al., 2019; McLaren, 2007; Popkin, 1999, 2006). Given these, we still predict that living in the urban area is negatively related to BMI, because an urban resident has a higher socioeconomic status in general compared with a rural resident, which will have a negative impact on BMI.

Household Size

Previous studies on family size and BMI focus on children and adolescents. Family size has a strong impact on children's weight, and evidence indicates an association between family structure and BMI in the developed countries (Chen & Escarce, 2010, 2014), where having more siblings is associated with lower BMI for children in the United States (Datar, 2017). In developing countries, there is a negative effect on BMI as the number of siblings increases, resulting in underweight children (Mohammad et al., 2013). However, for the adult population, the relationship is unclear, again due to the social contexts.

Own Dwelling

This is the instrumental variable with Household Consumptions as the instrumented variable. This is a binomial variable, takes the value of 1 if the respondent lived in his or her own dwelling, otherwise, 0. The two requirements for an instrumental variable are: it correlates with the instrumented variable but not correlates with the dependent (outcome) variable of the analysis. The results of the first stage of the 2SLS regression provide statistics for a significant relationship between this instrumental variable and Household Consumptions estimation indicate that Own Dwelling is a good instrumental variable (the first stage regression is not reported to save the space).

Methodology and estimate strategies

To capture the relationship between BMI and socioeconomic factors in transitional countries, we perform a simple linear regression on the full data, and linear 2SLS on the full data, FSU, Non-FSU, Males and Females, respectively (Table 1).

TABLE 1 Summary statistics

Variable	Description	Mean	*SD*	Min	Max
Outcome Variable					
BMI	Respondent's BMI	25.947	4.590	11.44	65
Predictors					
Household Consumption	The equivalent household consumptions in quintile scale. The equivalent household consumption= (Household consumptions/(Number of individuals)$^{1/2}$. Then, the equivalent consumptions are recoded into 5 quintiles with an equal number of respondents in each quintile: from the lowest quintile 1 = 0%–20% of households in the country, to the highest quintile 5 = 80%–100% of households in the country	2.996	1.417	1	5
Subjective Wealth	Subjective assessment of household wealth, 1 = the poorest 10%, 10 = the wealthiest 20%	4.457	1.685	1	10
Life Satisfaction	Likert scale, strongly satisfied with life = 5	3.245	1.120	1	5
Female	0 = male, 1 = female	0.572	0.495	0	1
Age	Age in years	48.88	17.43	18	95
Married	Unmarried = 0, married = 1	0.581	0.493	0	1
Poor Health	Bad or very bad health = 1, otherwise = 0	0.139	0.346	0	1
University Education	Bachelor's degree or higher = 1, otherwise = 0	0.200	0.400	0	1
Father's University Education	Bachelor's degree or higher = 1, otherwise = 0	0.057	0.232	0	1
Unemployed	Unemployed = 1, otherwise = 0	0.379	0.4485	0	1
Urban Area	Residing in an urban area = 1, otherwise = 0	0.558	0.497	0	1
Household Size	Number of people in the household than 4 years ago = 1, otherwise = 0	2.961	1.749	1	10
Instrumental Variable					
Ownership	Living in owned dwelling	0.876	0.329	0	1

Abbreviation: BMI, body mass index.

Source: Authors' calculation on 2016 Life in Transition Survey.

Linear 2SLS model

In our linear 2SLS model, Household Consumptions is an explanatory variable. As the dependent variable BMI is a continuous variable, we can run OLS regressions using the following function:

$$BMI_i = \alpha_0 + \alpha_1 Consumption_i + \alpha_2 X_{2,i} + \cdots + \varepsilon. \quad (1)$$

Equation (1) will produce estimates of the social-economic factors without considering endogeneity. To capture the reverse causality between BMI and household consumptions and some of the unobservable effects, we use 2SLS regression with the following functions:

$$Consumptions_i = b_0 + b_2 X_{2,i} + b_3 X_{3,i} + \cdot\cdot + Own\ Dwelling + \varepsilon, \quad (2)$$

$$BMI_i = c_0 + c_1 Consumptions_i + c_2 X_{2,i} + c_3 X_{3,i} + \cdot\cdot + \varepsilon. \quad (3)$$

where, *Consumptions*, the instrumented variable, is the equivalent Household Consumptions as an approximation of the wealth of the household, the variable of interest in our study; *Own Dwelling*, the instrumental variable, denotes that the respondent owned the dwelling in which he or she lived, and *X* denotes a set of covariates. One of the basic assumptions of linear regression is that there is no correlation between the predictor variable (Household Consumptions) and the error term. Instrumental variables estimators can be used as an alternative in this case. Both the Durbin test and Wu–Hausman tests (at the bottom rows of Table 2) suggest the presence of strong endogeneity, which signals that the results of classic OLS are biased, and therefore suggest that the results from 2SLS are preferable. Our initial study indicated that *Own Dwelling* passed the endogeneity test for the sample of both the FSU countries and the Non-FSU. This initial study suggests that *Own Dwelling* affects *Consumptions* but does not affect the dependent variable, BMI, directly. We estimate the full sample and four sub-datasets, FSU, Non-FSU, Male and Female sub-datasets, respectively.

Robust analysis

The purpose of this robust analysis is to address the nonlinear relationship between Household Consumptions and BMI. In this robust analysis, we conduct OLS estimations by taking quintiles of Household Consumptions as five dummy variables and taking the lowest quintile as a reference using. The results of these estimations will show whether the coefficients of these quintiles demonstrate consistent indications of a linear relationship or not. In addition, the nonlinear issue of age is also addressed in the robust analysis by adding a variable of Squared Age.

The reason that the abovementioned variables are not included in the main models (2SLS IV regressions) is the issue of multicollinearity.

RESULTS AND DISCUSSIONS

Results of 2SLS estimation

The results from linear regression OLS and 2SLS, and are listed in Table 2. The OLS estimation for the full sample of the transitional countries shows that eight explanatory variables, *Household Consumptions*, *Life Satisfaction*, *Female*, *Age*, *Married*, *Poor Health*, *University Education*, *Father's University Education*, and *Urban Area* are statistically significant. *Household Consumptions* appears to have a positive relationship with BMI, which is the pattern of developed countries. All other explanatory variables with statistical significance demonstrate expected signs.

In an effort to address the issue of endogeneity, we conducted 2SLS regression using *Ownership* of a dwelling as the instrument, as shown in Model 2 to Model 6 in Table 2 for the full sample, sub-datasets of FSU and Non-FSU transitional countries, Males and Females sub-datasets. All of these samples pass the Durbin and Wu–Hausman tests of endogeneity, meaning that the results from these 2SLS regressions are less biased and more reliable compared with those from OLS regression. Although the general pattern of 2SLS results is similar to that of OLS, the coefficients derived from 2SLS are a few times larger than those of OLS. For example, the coefficient of *Household Consumptions* for the full sample is 1.516 for 2SLS versus 0.164 for OLS. Therefore, we will focus our discussion on the results of 2SLS regressions in the next section.

TABLE 2 Regression results from OLS and 2SLS

Predictors	Model 1 OLS Full sample	Model 2 2SLS Full sample	Model 3 2SLS FSU	Model 4 2SLS Non-FSU	Model 5 2SLS Males	Model 6 2SLS Females
Household Consumption	0.164***	1.516***	4.371*	1.016**	1.266*	1.668**
	(0.02)	(0.376)	(1.958)	(0.358)	(0.551)	(0.515)
Subjective Wealth	−0.035	−0.183***	−0.350*	−0.185***	−0.122	−0.240***
	(0.018)	(0.045)	(0.178)	(0.050)	(0.063)	(0.063)
Life Satisfaction	−0.039	−0.161***	−0.290*	−0.131*	−0.055	−0.245***
	(0.027)	(0.045)	(0.148)	(0.054)	(0.069)	(0.060)
Woman	−0.636***	−0.638***	−0.096	−0.992***		
	(0.054)	(0.059)	(0.139)	(0.072)		
Age	0.067***	0.072***	0.082***	0.066***	0.046***	0.089***
	(0.002)	(0.003)	(0.006)	(0.003)	(0.003)	(0.004)
Married	0.411***	0.102	−0.388	0.226	0.573***	0.035
	(0.061)	(0.108)	(0.403)	(0.123)	(0.101)	(0.191)
Poor Health	0.529***	0.598***	0.969***	0.479***	−0.058	0.928***
	(0.086)	(0.095)	(0.276)	(0.116)	(0.135)	(0.130)
University Education	−0.329***	−0.749***	−1.763**	−0.570***	−0.550*	−0.801***
	(0.068)	(0.137)	(0.684)	(0.139)	(0.219)	(0.175)
Father's University Education	−0.634***	−1.187***	−2.170**	−1.080***	−0.625*	−1.666***
	(0.111)	(0.197)	(0.793)	(0.218)	(0.254)	(0.290)
Unemployment	−0.041	0.490**	1.244	0.459**	0.168	0.805***
	(0.068)	(0.165)	(0.689)	(0.177)	(0.242)	(0.235)
Urban Area	−0.231***	−0.751***	−2.219*	−0.573***	−0.642**	−0.845***
	(0.057)	(0.157)	(1.003)	(0.130)	(0.231)	(0.206)
Household Size	−0.009	0.003	0.01	0.008	0.007	0.004
	(0.021)	(0.023)	(0.047)	(0.034)	(0.030)	(0.034)
Country dummies included	Yes	Yes	Yes	Yes	Yes	Yes
F statistics	72.78***	94.28***	11.90***	96.88***	34.64***	58.25***
Testing endogeneity						
Durbin test		15.13***	11.32***	6.83***	4.15*	10.61***
Wu–Hausman test		15.11***	11.30***	6.81***	4.14*	10.59***
Wald χ^2		2337.31***	399.85***	1658.71***	700.38***	1962.42***
N	27,424	27,299	10,963	16,336	12,627	14,672

Note: *SE*s are reported in parentheses.

Abbreviations: 2SLS, two-stage least squares; FSU, former Soviet Union; OLS, ordinary least square.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

The general picture of these results can be highlighted as follows:

First, similar patterns appear in the comparison between the results of Model 3 for FSU countries and Model 4 for Non-FSU countries. However, two more variables are statistically significant for Non-FSU than for FSU. More importantly, the difference in coefficients of *Household Consumptions* between FSU and Non-FSU is huge, 4.371 versus 1.016.

Second, some differences appear between the results of the Males and Females subsamples, in a number of variables that are statistically significant and in the values of their coefficients. This suggests that females and males have different patterns regarding the relationship between BMI and social-economic status.

Given the above briefing, we will discuss the results for all the explanatory variables that are statistically significant respectively. We will compare the results from the FSU dataset with those from the Non-FSU dataset, and the results from the Females dataset with those from the Males dataset, to explore the relationship between social status and BMI among different social contexts and behaviors between males and females.

Household Consumptions

The coefficients of Household Consumptions, the variable of our research interest, appear a positive sign and are statistically significant for all the sub-datasets. These results confirm that Household Consumptions and BMI have a positive correlation within the general social context of the countries in transition, specifically, the Eastern European countries and countries of the FSU, as well as Males and Females. However, there are differences across these groups of samples.

First, a large difference (about 9.4 times) between the estimated values of coefficients of Household Consumptions for OLS and 2SLS indicates the improvement of the 2SLS model in addressing the problem of endogeneity, in which *Owning the Dwelling* is the instrumental variable and *Household Consumptions* is the instrumented variable.

Second, the value of the coefficient for FSU is 4.371, about four times as much as Non-FSU at 1.016. Considering the quintile measurements for *Household Consumptions*, we can say that one quintile increase in *Household Consumptions* is associated with a 4.371 and 1.016 units increase in BMI for FSU and Non-FSU, respectively. This is interpreted as one unit increase of quintile of *Household Consumptions* is associated with a weight increase of 12.29 and 2.95 kg for a person of average height 167.68 cm tall for FSU and 170.43 cm tall for Non-FSU, respectively. The values of coefficients for Males and Females are 1.266 and 1.668, meaning that an increase of one Household Consumptions quintile leads to 3.69 and 4.46 kg increase in weight for a man of average height (170.61 cm) and for a woman of average height (163.58 cm), respectively.

Third, the association between *Household Consumptions* and BMI is slightly stronger for Females than for Males as seen from the value of the coefficients and levels of significance.

In general, *Household Consumptions* is strongly associated with BMI for transitional countries included in the estimation.

Subjective Wealth

This variable is the self-assessed wealth in decile. This is a subjective measurement. Three out of four coefficients from our sub-datasets are statistically significant. The coefficient for Males is not significant. Interestingly, the coefficients of this variable for all sub-datasets appear a negative sign, the opposite sign compared with that of *Household Consumptions* which is a more reliable measurement of the actual wealth. Also, the relationship between

Subjective Wealth and *BMI* is weaker than between real consumptions and *BMI*. For example, the absolute value of the coefficient for FSU is 0.350, equivalent to 0.7 for quintile measurement used for Household Consumptions whose value is 4.371.

Life Satisfaction

This variable is also a subjective Likert response to life satisfaction. The results are very similar to those of Subjective Wealth. Coefficients for FSU and Non-FSU, as well as Females are significant, but with small negative values. Obviously, this variable is associated with other variables of social status and health conditions but has a unique subjective meaning that reflects the respondent's attitude toward life. Statistically, the results of our estimation confirmed Kuroki's (2016) study about the relationship between life satisfaction and lower weight and lower obesity.

Woman

We have two ways to examine the relationship between being a woman and BMI in our 2SLS estimation.

First, Woman, as an explanatory variable for the Full sample, FSU, and Non-FSU, has a negative statistical correlation with BMI for all samples and the correlation for FSU is not statistically significant. These results partially support that being a woman is an important predictor for lower BMI. It also echoes the finding that women of higher social status tend to diet more often than women with lower social status (Sobal & Stunkard, 1989). If this is true, the difference in the results between countries of the FSU and Non-FSU also indicates the differences in social status between the people from these two groups of countries. However, we are cautious about these conclusions, as the biological differences between the BMI of males and the BMI of females. This difference may be the physical difference in a biological sense. This is the reason we estimate the Males and Females sub-samples for the social factors affecting BMI.

Second, for Females as a group, the differences of the estimations (Model 5 for Males and Model 6 for Females) on these two sub-datasets highlight how social status affects the BMI for males and females. Males and Females demonstrate a similar pattern for the relationship between social status and BMI. The variables whose coefficients appear to be statistically significant for both Males and Females are Household Consumptions, *Age*, *University Education*, *Father's University Education*, and *Urban Area*. Three variables are statistically significant for Females, but not for Males: *Subject Assessment of Wealth*, *Unhealthy*, and *Unemployment*. Conversely, only one variable, *Married*, is statistically significant only for Males. Furthermore, the level of significance and the absolute values of the coefficients for Females are higher than those for Males for most of the variables. For example, the coefficients for *University Education*, and *Father's University Education* for Males are –0.550 at 0.05% level and –0.625 at 0.05% level, respectively; while these coefficients for Females are –0.801 at 0.00% level and –1.666 at 0.00% level, respectively. This implies that women's BMI is more sensitive to social status than males in these transitional countries.

Age

The relationship between age and BMI is well documented in the medical field. It is generally believed that BMI increases with age among middle-aged individuals and decreases in old age,

following a reversed U-shaped curve (Perry et al., 1997; Silver et al., 1993). However, many factors may contribute to how an individual progresses throughout his or her life cycle, and the relationship between BMI and age is one of the features affected by this cycle as well as affecting this cycle. The estimation results confirm a positive relationship with statistical significance. Although the values of these coefficients look small, considering that Age is a continuous variable with one year as one unit, an increase of 10 years in age is associated with 0.46 and 0.89 units increase in BMI, or 1.34 and 2.59 kg for Males and Females with averages heights, respectively. Unfortunately, we cannot see whether this relationship is a sinusoidal shape as previous studies indicated from this linear type of regression.

Married

Although marriage is believed to have a positive effect on body weight as previous studies indicate, the results of our estimation illustrate that this assertion only works for Males in transitional countries. Only the coefficient of Males is statistically significant, with a positive value of 0.573. Meaning that being married increased weight by about 1.68 kg for a male with an average height. These results are only partially in line with other previous studies (Jeffrey & Rick, 2002; Sobal, 1991). Marriage and stability provide a condition for sufficient food and eating regularly, and consequently, individuals gain weight, especially in developing countries.

Poor Health

All the coefficients of *Poor Health* are statistically significant at 0.00 level with negative values for all the models, except for Males, which is not significant at all. It is understood that health conditions can result in issues with being underweight or overweight. However, BMI is a measurement of a continuous variable and cannot distinguish the issues of underweight, which is related to cancer, and overweight, which is related to diabetes and heart disease.

University Education

All the coefficients of *University Education* for all the models are statistically significant with a negative sign. These results are unsurprising as it is reasonable to believe that people with higher education would be not only more knowledgeable about the importance of weight control and self-disciplined, but also have more resources for healthy food and lifestyles. It is important to mention that the absolute value of the coefficient for FSU is about three times as that for Non-FSU. However, it seems that we need additional information to explain the huge difference in coefficients between FSU and Non-FSU.

Father's University Education

Father's University Education turns out to have the same pattern as that of *University Education*, statistically significant in all models with a negative sign. However, *Father's University Education* is a stronger explanatory variable than *University Education* in all models, as seen in their absolute values. The comparisons between the counterparts have interesting implications: First, the coefficients are interpreted into a weight reduction as much as about 6.1 and 3.13 kg for a respondent of average height for FSU and NFSU, respectively. Second, there

is a big difference between the absolute values of coefficients for Males and Females, 0.625 versus 1.666, or 1.82 versus 4.46 kg. It is not surprising to see the strong association between BMI and Father's education. The link between BMI and father's university education may not be direct, but could provide clarity if we put more pieces of information together.

These results confirm the relationship between father's education and BMI as the previous studies (Greenlund et al., 1996). Meanwhile, the results of BMI estimation can be an indicator of life in transitional countries and the level of social-economic development in the comparison between transitional countries and within transitional countries.

Unemployed

Although *Unemployed* is statistically significant for the Full Sample, only Non-FSU and Females, are statistically significant with coefficients 0.459 and 0.805, respectively. It is possible that unemployment may lead to issues of being either underweight or obese for different subgroups, which could mask the impact (Hughes & Kumari, 2017). Our results generally indicate that the relationship between *Unemployed* and *BMI* is positive, but the results are not clear cut across the sub-samples. Unemployment may affect calorie intake as is the case in underdeveloped countries, and affect physical activities as is the case in developed countries, and finally, reduce or increase weight depending on the economic circumstances.

Urban Area

It is not a surprise that *Urban Area* is statistically significant with a negative sign for all the groups. It is worthy to mention that the coefficient for FSU is 2.17, or 6.1 kg for a person of average height, twice as that for Non-FSU. These results demonstrate that living in an urban area is a strong predictor for lower BMI. There are substantial differences in terms of economic conditions and social life between urban and rural areas in developing countries, known as the "dual economy." Given these results, the rural–urban difference in Non-FSU countries is smaller than that in FSU countries in terms of the factors affecting BMI.

Household Size

Finally, *Household Size* has no association with BMI for all groups. Previous studies on developing countries indicated a strong association between children's weight and BMI for the reason that the number of children does matter for nutrition. This is the argument for family planning in many developing countries. The reason we include this variable is to test whether the transitional countries in Eastern Europe and the FSU countries experienced the same phenomenon. The results of our estimation indicate that this is not the case for these transitional countries.

Results from robust analysis

The results of robust analysis reported in Table 3 demonstrate a clear picture from which we can see a few indications: First, the coefficients of the quintiles of Household Consumptions consistently indicate a positive association between Household Consumptions and BMI. Second, the strength of these coefficients increases from the lowest quintile to the top quintile consistently: an insignificant low value of the coefficient for the second quintile and a

TABLE 3 Robust analysis from OLS

Predictors	Model 7 OLS Full Sample	Model 8 OLS FSU	Model 9 OLS Non-FSU	Model 10 OLS Males	Model 11 OLS Females
First quintile of Household Consumptions (Reference)	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Second quintile of Household Consumptions	0.134	0.001	0.209	0.029	0.213
	(0.089)	(0.140)	(0.115)	(0.122)	(0.125)
Third quintile of Household Consumptions	0.318***	0.344*	0.288*	0.428***	0.262*
	(0.088)	(0.139)	(0.114)	(0.119)	(0.126)
Fourth quintile of Household Consumptions	0.397***	0.484***	0.316**	0.504***	0.299*
	(0.089)	(0.141)	(0.114)	(0.118)	(0.128)
Fifth quintile of Household Consumptions	0.584***	0.783***	0.443***	0.742***	0.477***
	(0.090)	(0.142)	(0.117)	(0.120)	(0.131)
Subjective Wealth	−0.026	0.029	−0.065**	−0.004	−0.057*
	(0.018)	(0.027)	(0.024)	(0.024)	(0.026)
Life Satisfaction	0.012	0.024	0.027	0.085*	−0.050
	(0.027)	(0.042)	(0.035)	(0.037)	(0.039)
Woman	−0.682***	−0.149	−1.033***		
	(0.054)	(0.087)	(0.069)		
Age	0.265***	0.269***	0.264***	0.196***	0.329***
	(0.010)	(0.016)	(0.013)	(0.014)	(0.014)
Squared Age	−0.002***	−0.002***	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Married	0.120	0.087	0.148	0.420***	0.203*
	(0.062)	(0.101)	(0.080)	(0.089)	(0.086)
Unhealthy	0.665***	0.752***	0.604***	−0.047	1.049***
	(0.086)	(0.135)	(0.111)	(0.124)	(0.117)
University Education	−0.295***	−0.326***	−0.287**	−0.152	−0.326***
	(0.067)	(0.096)	(0.094)	(0.093)	(0.095)
Father's University Education	−0.588***	−0.553**	−0.649***	−0.242	−0.896***
	(0.111)	(0.169)	(0.146)	(0.152)	(0.156)
Unemployment	0.326***	0.106	0.483***	0.062	0.599***
	(0.070)	(0.104)	(0.095)	(0.101)	(0.095)
Urban Area	−0.214***	−0.096	−0.292***	−0.196*	−0.289***
	(0.057)	(0.092)	(0.073)	(0.076)	(0.082)

(Continues)

TABLE 3 (Continued)

Predictors	Model 7 OLS Full Sample	Model 8 OLS FSU	Model 9 OLS Non-FSU	Model 10 OLS Males	Model 11 OLS Females
Household Size	−0.008	−0.015	0.010	−0.001	−0.004
	(0.021)	(0.028)	(0.032)	(0.028)	(0.031)
Country dummy included	Yes	Yes	Yes	Yes	Yes
F statistics	77.10***	45.03***	70.02***	23.96***	66.49***
N	27,424	11,003	16,421	12,684	14,740

Note: *SE*s are reported in parentheses.

Abbreviations: FSU, former Soviet Union; OLS, ordinary least square.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

significant highest value of the coefficient for the top quintile. The same pattern appears for the full sample, FSU, Non-FSU, male and female subsamples. It is worthy to mention that there are slight differences between the FSU and Non-FSU, and between male and female samples: the association between Household Consumptions and BMI is stronger for FSU than that for Non-FSU, and for Males sample than that for Female sample. A linear trend-line fitting graph is provided in Appendix 1.

Another test is the issue of nonlinearity for Age. We treat Age as a quadratic curve by adding a variable of Squared Age in this robust test, the coefficients of Age range from 0.196 to 0.329 for the five samples and the coefficients of Age Squared are around 0.002 for these samples. With these specifications, if we assume all other dependent variables are constant, BMI is a function of the combined effects of Age and Age Squared: $BMI = 0.265 \times Age - 0.0020\, Age^2$, a moderate concave curve with a peak at Age = 66.25 calculated from these coefficients, taking the results from the Full sample for example. This indicates that BMI increased as people became older, only after Age reaches the peak point, 66.25 years old, then reduced with Age. It is interesting to see that the peak points of BMI are at 64.05, 66.00, 61.25, and 68.54 years old for the FSU countries, non-FSU countries, Males, and Females, respectively. This finding reflects the weight loss in the senior stage, also reflects the difference in life expectancy of the population for these four groups.

SUMMARY AND CONCLUSIONS

Numerous studies on the social determinants of obesity have been completed in the last decades. An issue that emerges is that a given factor, for example, the relationship between income or Household Consumptions and BMI, may present conflicting results depending on the social-economic context. The purpose of this study is to examine the determinants of BMI, especially Household Consumptions, of 27 transitional countries using the newly available data of the 2016 Life in Transitions Survey. We break the sample down into four sub-datasets: the FSU, non-FSU, Males, and Females for the purpose of comparison. The estimation results confirm our prediction of most of the explanatory variables and display a picture for the life in these transitional countries, as well as the differences between the two blocks of countries, the FSU and the non-FSU Eastern European countries more than two decades after the falling of the Iron Curtain. The findings are as follows:

(1) Household Consumptions has a strong and positive correlation with BMI across all the sub-datasets, both the former Soviet Blocks and other transitional countries, Males and Females. This is an indicator that the transitional countries included in this study still display the same pattern as that of developing countries. Further evidence for this assertion is that the negative association between living in an urban area and BMI is an indicator of the urban-rural difference.

The focus of this study is the relationship between household consumptions and BMI. The results indicate a positive relationship, and results from the robust analysis clearly demonstrate an increasing effect of household consumptions on BMI, from the lowest quintile to the highest quintile consistently. These straightforward style results cast an interesting but bothersome case. Obviously, these results do not reflect what appears in the developed economies, even not in some developing countries. It is puzzling why people with the highest level of household consumptions have the highest level of BMI in these transitional countries. It could be speculated that the relationship between household consumption and BMI can be a better indicator than the GDP for the well-being of people in a country.

(2) There are differences in factors associated with BMI between Males and Females. We have two ways to examine the relationship between being a woman and BMI, as a variable and as a group. First, as a variable, being a woman is negatively associated with BMI. Second, as a group, although Males and Females generally follow similar patterns regarding the relationship between BMI and social-economic status, the results indicate that women's BMI is more sensitive to social status than males in these transitional countries.

(3) Having a university education is a strong factor that is negatively associated with BMI. Although it is not universally true in all circumstances, the possession of knowledge about health, self-disciplined and higher social status, as well as a means to provide a healthy lifestyle all contribute to achieving a healthy body weight. There are important policy implications for the role of investing in education to gain knowledge of health-related issues, resulting in a positive impact on public health conditions.

(4) Father's education has a strong impact on reducing BMI, even stronger than that of the university education of the respondents themselves. This indicates the long-lasting influence of education. This may also imply a low social mobility or educational stratification.

(5) There are some differences between the former Soviet Blocks and other transitional countries in terms of the impacts of social status on BMI. Compared with other transitional countries, the BMI of the respondents of FSU countries was more sensitive to social-economic status. For example, the impact of Household Consumptions on BMI is about four times for respondents of Soviet Union countries than that of other transitional countries. This may imply there are differences in social development beyond economic measurements such as GDP.

(6) The robust analysis that treats age as a quadratic curve function presents interesting findings. These findings suggest a concave curve function between BMI and age: BMI increased as people became older, and reduced after Age reached the peak point. The peak points appeared differently between the FSU countries and non-FSU countries (64.05 vs. 66.00 years old) and between Males and Females (61.25 vs. 68.54 years old). These findings imply that the relationship between BMI and age is a biological phenomenon as well as a social issue.

(7) Finally, a few limitations, as mentioned earlier, could also be the areas for further study. First, explaining the results from the estimations of the relationship between BMI and Household Consumptions is challenging, which needs a well-defined analytical framework and additional information. Second, the subjective assessment of wealth is negatively associated with BMI, the opposite way as that of Household Consumptions. Although we

believe that household consumptions are a more reliable measurement than subjective assessment measurements, exploring this phenomenon could be interesting.

The estimation in this study displays a specific picture of life in transition: how individuals' BMI is related to their social-economic status, 25 years after the transition. The general impression is that these transitional countries still fall under a pattern similar to that in developing countries. Among these transitional countries, the FSU countries are more similar to the developing country model. The results of estimation provide implications for an integrated policy in dealing with issues of public health.

Meanwhile, the relationship between social and economic status and BMI can be an indicator of the "actual social economic status" which is not reported in the self-reported survey questions. As one of the purposes of this study, we can see how far these transitional countries have gone on the road of transition.

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

ETHICS STATEMENT

The authors declare that human ethics approval was not needed for this study.

REFERENCES

Asiseh, F., & Yao, J. (2016). Family income and body mass index—What have we learned from China. *Health Economics Review*, *6*(52), 1–10. https://doi.org/10.1186/s13561-016-0129-z

Averett, S., Laura, A., & Julia, S. (2013). In sickness and in health: An examination of relationship status and health using data from the Canadian National Public Health Survey. *Review of Economics of the Household*, *11*(4), 599–633.

Benson, R., von Hippel, P., & Lynch, J. (2018). Does more education cause lower BMI, or do lower-BMI individuals become more educated? Evidence from the National Longitudinal Survey of Youth 1979. *Social Science & Medicine*, *211*, 370–377.

Bishwajit, G. (2017). Household wealth status and overweight and obesity among adult women in Bangladesh and Nepal. *Obesity Science and Practice*, *3*(2), 185–192.

Chen, A. Y., & Escarce, J. J. (2010). Family structure and childhood obesity. *Preventing Chronic Disease*, *7*(3), A50.

Chen, A. Y., & Escarce, J. J. (2014). Family structure and childhood obesity: An analysis through 8th grade. *Maternal Child Health Journal*, *18*, 1772–1777.

Dang, A., & Meenakshi, J. V. (2017). *The nutrition transition and the intra-household double burden of malnutrition in India* (Asian Development Bank Institute [ADBI] Working Paper, No. 725). https://www.econstor.eu/handle/10419/163229

Datar, A. (2017). The more the heavier? Family size and childhood obesity in the U.S. *Social Science & Medicine*, *180*(C), 143–151.

Drewnowski, A. (2010). The cost of US foods as related to their nutritive value. *American Journal of Clinical Nutrition*, *92*(5), 1181–1188.

European Bank for Reconstruction and Development (EBRD). (2016). *Life in Transition after the crisis*.

Finkelstein, E. A., Ruhm, C. J., & Kosa, K. M. (2005). Economic causes and consequences of obesity. *Annual Review of Public Health*, *26*, 239–257.

Fraser Institute (FI). (2019). Economic Freedom of the World: 2019 Annual Report.

Greenlund, K. J., Liu, K., Dyer, A. R., Kiefe, C. I., Burke, G. L., & Yunis, C. (1996). Body mass index in young adults: Associations with parental body size and education in the CARDIA Study. *American Journal of Public Health*, *86*(4), 480–485.

Helble, M., & Sato, A. (2018). *Wealthy but unhealthy: Overweight and obesity in Asia and the Pacific: Trends, costs, and policies for better health*. Asian Development Bank Institute.

Hughes, A., & Kumari, M. (2017). Unemployment, underweight, and obesity: Findings from Understanding Society (UKHLS). *Preventive Medicine*, *97*, 19–25.

Jeffrey, R., & Rick, A. M. (2002). Cross-sectional and longitudinal associations between body mass index and marriage-related factors. *Obesity Research*, *10*, 809–815.

Kim, T. J., & von dem Knesebeck, O. (2018). Income and obesity: What is the direction of the relationship? A systematic review and meta-analysis. *BMJ Open*, *8*(1), e019862.

Kozieł, S., Halina, K., & Ulijaszek, S. J. (2000). Parental education, body mass index and prevalence of obesity among 14-year-old boys between 1987 and 1997 in Wrocław, Poland. *European Journal of Epidemiology*, *16*, 1163–1167.

Kuroki, M. (2016). Life satisfaction, overweightness and obesity. *International Journal of Wellbeing*, *6*(2), 93–110.

Luan, H., Ramsay, D., & Fuller, D. (2019). Household income, active travel, and their interacting impact on body mass index in a sample of urban Canadians: A Bayesian spatial analysis. *International Journal of Health Geographics*, *18*(1), 4. https://doi.org/10.1186/s12942-019-0168-x

McKay, C. M., Bell-Ellison, B. A., Wallace, K., & Ferron, J. M. (2007). A multilevel study of the associations between economic and social context, stage of adolescence, and physical activity and body mass index. *Pediatrics*, *119*(S1), 584–591.

McLaren, L. (2007). Socioeconomic status and obesity. *Epidemiologic Reviews*, *29*(1), 29–48.

Mirowsky, J., & Ross, C. E. (2013). *Education, social status, and health*. Aldine de Gruyter

Mohammad, K., Leila Jamshidi, K. N., & Hosseini, S. (2013). Relationship between physical activity and family size with index of BMI-for-age in Iran Girl Guidance Schools, 2010-2011. *World Applied Sciences Journal*, *22*(10), 1426–1430.

Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S., & Marks, J. S. (2001). Prevalence of obesity, diabetes, and obesity-related health risk factors. *Journal of the American Medical Association*, *289*(1), 76–79.

National Task Force on the Prevention and Treatment of Obesity (NTCPTO). (2000). Overweight, obesity, and health risk. *Archives of Internal Medicine*, *160*(7), 898–904.

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., Mullany, E. C., Biryukov, S., Abbafati, C., Abera, S. F., Abraham, J. P., Abu-Rmeileh, N. M., Achoki, T., AlBuhairan, F. S., Alemu, Z. A., Alfonso, R., Ali, M. K., Ali, R., Guzman, N. A., … Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. *Lancet*, *384*, 766–781.

Perry, H. M., Morley, J. E., Horowitz, M., Kaiser, F. E., Miller, D. K., & Wittert, G. (1997). Body composition and age in African-American and Caucasian women: Relationship to plasma leptin levels. *Metabolism: Clinical and Experimental*, *46*(12), 1399–1405.

Popkin, B. M. (1999). Urbanization, lifestyle changes and the nutrition transition. *World Development*, *27*(11), 1905–1916.

Popkin, B. M. (2006). Technology, transport, globalization and the nutrition transition food policy. *Food Policy*, *31*(6), 554–569.

Silver, A. J., Guillen, C. P., Kahl, M. J., & Morley, J. E. (1993). Effect of aging on body fat. *Journal of the American Geriatrics Society*, *41*(3), 211–213.

Sobal, J. (1991). Obesity and socioeconomic status: A framework for examining relationships between physical and social attributes. *Medical Anthropology*, *13*, 231–247.

Sobal, J., Rauschenbach, B., & Frongillo, E. (1992). Marital status, fatness, and obesity. *Social Science & Medicine*, *35*, 915–923.

Sobal, J., & Stunkard, A. J. (1989). Socioeconomic status and obesity: A review of the literature. *Psychological Bulletin*, *105*(2), 260–275.

Teachman, J. (2016). Body weight, marital status, and changes in marital status. *Journal of Family Issues*, *37*(1), 74–96.

Umberson, D. (1992). Gender, marital status, and the social control of health behavior. *Social Science & Medicine*, *34*(8), 907–917.

Umberson, D., Hui, L., & Daniel, P. (2009). Marital status, marital transitions, and body weight. *Journal of Health and Social Behavior*, *50*(3), 327–343.

Villar, J. G., & Climent Quintana-Domeque, C. (2009). Income and body mass index in Europe. *Economics of Human Biology*, *7*, 73–83.

Weinstein, A. R., Sesso, H. D., Lee, I. M., Cook, N. R., Manson, J. A. E., & Michael Gaziano, J. (2004). Relationship of physical activity vs body mass index with type 2 diabetes in women. *Journal of the American Medical Association*, *292*(10), 1188–1194. https://doi.org/10.1001/jama.292.10.1188

WHO. (2006). *Obesity in Europe*. https://www.euro.who.int/obesity

AUTHOR BIOGRAPHIES

Lida Fan, PhD, is an Associate Professor at School of Social Work, Lakehead University, Canada.

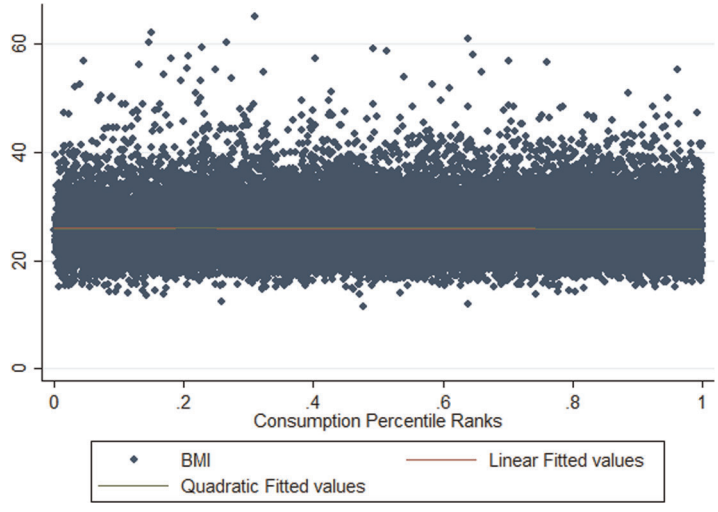
Nazim Habibov, PhD, is a Full Professor at School of Social Work, University of Windsor, Canada.

Rong Luo, PhD, is a Learning Specialist at Leddy Library, University of Windsor, Canada.

Alena Auchynnikava is a Masters Student at School of Social Work, University of Windsor, Canada.

How to cite this article: Fan, L., Habibov, N., Luo, R., & Auchynnikava, A. (2021). Exploring the implications of the relationship between BMI and household consumptions for countries in transition. *World Medical & Health Policy*. 13, 328–348. https://doi.org/10.1002/wmh3.451

APPENDIX 1: SCATTER PLOT AND TREND LINES OF BMI AND PERCENTILE RANKS OF HOUSEHOLD CONSUMPTIONS



World Medical and Health Policy

Do More Female Politicians Translate Into Better Health Outcomes? Gender Representation and Infant Mortality in Argentine Provinces

Santiago Lujan Cunial

To what extent does the gender of politicians relate to health outcomes? This article investigates the political economy of health in Argentina (1983–2017), by focusing on the gender of politicians in Argentine provinces and its relationship with subnational political competition. By applying a panel data analysis with province-fixed effects, the article finds that overall increasing women's political representation is associated with a reduction of the rate of infant mortality. The article also shows that an increase in women's representation relates to a higher reduction of infant mortality under more competitive regimes. As a possible explanation for the inverse relationship between women's representation and infant mortality, the analysis discusses two channels through which women's representation may translate into better health outcomes: the sanction of laws aimed at health issues and the allocation of state budgets towards health.

KEY WORDS: gender, infant mortality, political competition

Introduction

Improvement of health indicators is among the most important contemporary issues. Yet, systematic inequalities in health remain a pressing political issue (Carpenter, 2012). Health policy is embedded in the social determinants of health: more important for the health of the population as a whole are the social, political, and economic conditions that make people ill in the first place (Wilkinson & Marmot, 2003). This article investigates the political economy of health in Argentina by focusing on the gender of politicians in Argentine provinces and its relationship with infant deaths (0–1 years old) per 1,000 live births, under different political contexts.

The increase in the number of women holding legislative seats is among the most significant social trends of recent decades: women's average share of parliamentary membership doubled between 1995 and 2015 (Clayton & Zetterberg, 2018). Argentina was the first country to adopt mandatory legislative quotas in 1991. Law 24,012 generated a "contagion effect" (Jones, 1998) on Argentine provinces: during the 1990s and the 2000s, all legislatures sanctioned their own female quotas. Some provinces moved into legislatures with more than 50 percent of their representatives being women; others remained with less than 30 percent of their legislative

doi: 10.1002/wmh3.411

seats being held by women. This article analyzes how these changes relate to the rate of infant mortality in each jurisdiction.

The literature on descriptive and substantive representation has documented that women have different preferences than men (Erickson, 1997; Lloren & Rosset, 2017; Lovenduski & Norris, 2003) that are translated into different policies when they have access to legislative seats. This literature suggests that female politicians are more likely to contribute to public health improvements as they are more likely to favor social issues than men. Empirical evidence, yet, is somewhat mixed. Although there are studies in favor of this relationship (Bhalotra & Clots-Figueras, 2014; Bolzendahl & Brooks, 2007; Chen, 2010; Macmillan, Shofia, & Sigle, 2018; Ozdamar, 2017), others stress that the effect of women's representation is embedded in social contexts (Boehmer & Williamson, 1996; Clots-Figueras, 2012). This article extends the literature on gender representation by (i) investigating the relationship between women's participation in legislatures and subnational infant mortality in Argentina, and (ii) analyzing how the political competitiveness of the electoral systems moderates this association. Politicians create policy and influence social life by interpreting needs and directing resources on issues that matter to them (Pitkin, 1967, p. 148). Yet, political conditions both facilitate and inhibit such processes, as they introduce important contingencies for the efforts of female legislators to affect change (Macmillan et al., 2018, p. 1911). Although preferences of women towards health may differ from those of men, the extent to which they are translated into policies depend on the political environment of the district.

The article employs a panel data analysis with fixed effects at the provincial level, covering a 34-year period (1983–2017) in Argentina. It finds that increasing women's political representation is associated with a reduction in the rate of infant mortality in Argentine provinces and that increasing the level of political competition relates to an increase in the number of infant deaths. The article also shows that an increase in women's representation relates to a higher reduction of infant mortality under more competitive regimes. Women representatives in Argentine provinces, hence, seem to be a "counterweight" of political competition when considering their association with health. As a possible explanation for the inverse relationship between the share of legislative seats held by women and infant mortality, the analysis discusses two channels through which women representation may translate into better health outcomes in Argentine provinces: the sanction of laws aimed at health issues and the allocation of state budgets to health. It suggests that subnational polities with higher percentages of women in legislatures sanction more laws on maternal and child health, but they also reveal lower percentages of their budget allocated to health.

Women in Politics and Health: A Review of the Literature

The literature on women's representation stresses that the political participation of women should be seen as a powerful, evidence-based policy lever (Chant, 2016, p. 2). The fact that increasing the share of women in parliament affects population health is explained by the presumed link between descriptive and

substantive representation. According to this assumption, there are different interests between men and women that affect the content of policies (Miller, 2008). This literature indicates that, on average, female candidates are more likely to favor social issues than men. Their common argument is that women are more likely than men to invest in children and favor redistribution, and they give priority to public policies related to their traditional roles as caregivers in the family and society (Alesina & La Ferrara, 2005; Chattopadhyay & Duflo, 2004). Therefore, the main argument that justifies the increase in the active involvement of women in politics highlights the substantial difference that women bring to the political process.

Regarding health, differences between men and women may translate into different policies, and, in consequence, in different health outcomes. Some authors find that increased women's representation is associated with improvements in health indicators (Boehmer & Williamson, 1996; Swiss, Fallon, & Burgos, 2012). Yet, the literature tends to focus on the analysis of national polities and developed countries, while the analysis of subnational regions is scarcer. In order to fill overcome this gap, the article first tests the following hypothesis for the Argentine case:

Hypothesis 1: *Increases in the percentage of women in subnational legislatures are associated with decreases in infant mortality.*

There is an increasing consensus on the positive relationship between competitive regimes—usually framed in terms of democratic versus non-democratic regimes—and health outcomes (Besley & Kudamatsu, 2006; McGuire, 2010; Vollmer & Ziegler, 2009; Wang, Mechkova, & Andersson, 2018). Political competition has been thought to encourage population health by incentivizing politicians to provide public goods and services (Gerring, Thacker, & Alfaro, 2012, p. 2), and exercising the necessary pressure on them to be proactive (Bellinger, 2018, p. 13). Hence, the electoral aspect of democracy is thought to have a substantial impact on human development (Gerring et al., 2012, p. 2). The key expectation is that more competitive political systems promote greater responsiveness to constituents' concerns and foster better population health (Swiss et al., 2012). This is because citizens are assumed to be retrospective voters who may electorally punish incumbents if they do not provide successful public goods—among which health is a salient one. With this in mind, politicians aim to provide better services to sustain the support of voters and remain in power.

If the relationship between competitive political regimes and health holds, then we might expect that the political environment in which women participate moderates their actions. In settings with more competitive systems of candidate recruitment, and greater opportunities to scrutinize policy proposals, we might expect increases in women's political representation to be more efficacious. This is because a competitive environment may promote greater responsiveness from the government. If a government is composed by a higher number of women, *ceteris paribus*, it ought to be more responsive to the female constituency. Alternatively, as Macmillan et al. (2018) suggest when democracy is not well functioning, many democratic apparatuses are either underdeveloped or missing. As a consequence,

one may expect that urgent health issues might not be included in the policy agenda of politicians. Thus, women representatives become a "substitute for" rather than a "complement of" democracy (Macmillan et al., 2018, p. 1912). Under less competitive electoral contexts, women's representation may have a positive association with health. But this relationship should be less significant as decisions are more centralized in certain party leaders.

Despite the feasibility of this assumption, approaches that include political environments as a moderator of the relationship between women's representation and health are scarce and results are misleading. Bhalotra and Clots-Figueras (2014) find that an increase in women's representation results in a higher reduction in neonatal mortality under more competitive states in India. Macmillan et al. (2018), conversely, find that a high level of female representation (30 percent or greater) has large negative associations with mortality in weak national democratic contexts. This article adds to the literature by testing the following hypothesis on the level of political competition of the subnational district women representatives belongs to:

Hypothesis 2: *Increases in the percentage of women in subnational legislatures are associated with a decrease of infant mortality to a larger extent in provinces characterized by a higher level of political competition*.

Health System, Women's Representation, and Subnational Polities in Argentina

Argentina is a federal country formed by 23 provinces and the City of Buenos Aires, all of which present different political, economic, and social characteristics. The decentralization of health services in the hands of provinces remains the guiding principle of health policy. Despite the fact that guidelines exist at the national level, each province has the prerogative to implement their own policies. In practice, Argentina shows a health system with uneven outcomes across provinces (see Figure 1).

This article intends to understand variation in health outcomes across provinces by introducing the role of women in subnational polities. Argentina was the first country to adopt mandatory legislative quotas in 1991. Law 24,012 obliged all political parties to incorporate 30 percent of women in their lists of candidates for national deputies. Law 24,012 generated a "contagion effect" (Jones, 1998) on Argentine provinces and during the 1990s and the 2000s, all of the 24 subnational legislatures sanctioned their own female quotas. Regarding the percentage of the quota, eighteen provinces established it in 30 percent of the total of candidates. Formosa and Santa Fe sanctioned female quotas of 1/3 of the party lists; Córdoba, Río Negro, and Santiago del Estero raised their female quotas to 50 percent. The last province to legislate gender quotas was Entre Ríos, which adopted a quota of 25 percent at the beginning of 2011. Yet, subnational electoral rules—proportional versus majority rules—and the frequency of elections—every 2 or 4 years—affect

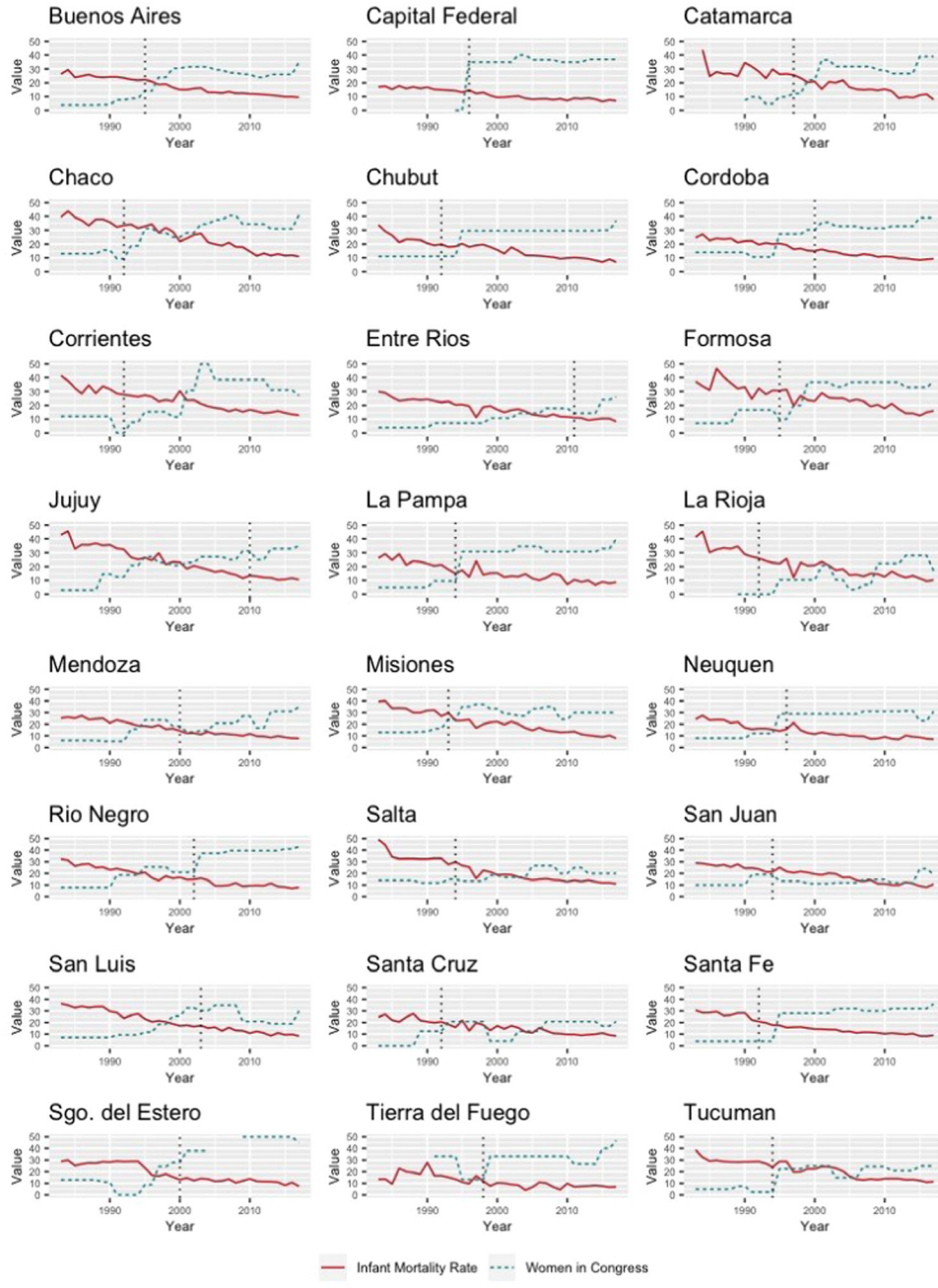


Figure 1 Infant Mortality in Argentina and Representation of Women in Congress at the Subnational Level (1983–2017).

how quotas translate into seats. Thus, the number of women with legislative seats varies significantly between jurisdictions (see Figure 1).

Additionally, this article measures the association between women's representation in subnational legislatures and infant mortality by taking into account the level of political competitiveness of the province. Since 1983, Argentina has enjoyed 36 uninterrupted years of democratic elections, the longest period of its history. Yet, not all provinces present the same level of electoral competition: some provincial regimes combine democratic institutions with practices that are clearly if subtly authoritarian (Gervasoni, 2010; Gibson, 2012; González, 2017). This, in turn, may affect women's ability to promote changes in the scope of health even more if the ways candidates are selected in Argentine parties are considered.

In Argentina, only two parties have obtained most of the main national, provincial, and municipal elective positions during the three decades of democracy: *Partido Justicialista* and *Unión Cívica Radical*. Despite this, in some provinces, there are cases of "successful" provincial parties, such as *Movimiento Popular Neuquino* (Neuquén), *Acción por Chaco* (Chaco), the *Partido Bloquista* (San Juan), and the *Movimiento Popular Fueguino* (Tierra del Fuego). Moreover, in Argentina, there have been two major types of methods of nomination of candidates for elective public office in the parties: the agreements between the party leadership and the competitive primary elections, with the first type prevailing over the second (Prats, 2012). The combination of non-competitive provinces, dominated by a few political parties, generates an institutional context in which women -like any other candidate- must respond to governors to be part of the election, which may block their proposals once they are in the legislature if they are not aligned with governors' preferences.

Conversely, it may also be the case that women's access to the legislature transforms ideas about representation, as Barnes and Holman (2020) suggest, thereby broadening the pool of eligible men for legislative positions and their preferences. If this holds, then, women's access to legislatures may redefine political cultures, challenge entrenched gendered norms, and restructure political party behavior -despite the central role of the governor. Argentina, therefore, constitutes a great case to test the association between women's representation at the subnational level and infant mortality, and to test the moderating effect of political competition.

Methods and Data

To test the relationship between women's representation and political competition on health outcomes, the article applies a panel data analysis. It estimates the following model by using both ordinary least squares (OLS) and province-fixed effects specifications:

$$H_{it} = \alpha_{it} + \beta_1 WP_{it} + \beta_2 PC_{it} + \beta_3 WP \times PC_{it} + \beta_4 X_{it} + \epsilon_{it},$$

Where health outcomes H in the ith Argentinian province in tth year, was assumed to be a function of (i) the percentage of women in the subnational parliament (WP), (ii) the level of subnational political competition (PC), and (iii) the interaction between them. Health outcomes were measured as the provincial infant mortality rate, that is, the number of deaths of children under 1 year of age per 1,000 live births of each of the 23 Argentinian provinces and the City of Buenos Aires from 1983 to 2017. Infant mortality has many virtues as a summary measure of population health. As levels of infant mortality reflect decades of heterogeneous policies and social contexts, changes over time are much more helpful in identifying circumstances that both reduce infant mortality and are amenable to influence through public action (McGuire, 2020). Most studies on the relationship between polities and infant mortality have analyzed infant mortality data compiled by international agencies beginning in the 1970s. This article uses an original data set of infant mortality rates at subnational levels compiled from archives from the Ministry of Health of Argentina and complemented by information from subnational Ministries of Health.

Women's representation was measured as the percentage of seats held by women in subnational legislatures in Argentina. In cases of bicameral legislatures, this article focuses on the Chamber of Deputies. The data span the 1983–2017 period in Argentina, and it was taken from the websites of each subnational legislature. As policies take time to have an effect on the status quo, women's representation was measured by using the percentage of women in the current year and by lagging the indicator by 1–6 years. The subnational political competition encompasses contested elections. This paper uses as an indicator for contestation, the margin of victory of the chief of the executive, measured as the difference of vote share of the winning gubernatorial candidate and the vote share of the second-place candidate (see Figure 2). Data were multiplied by −1 to make it easier to read -that is, increases in the value mean more political competition. The data span the 1983–2017 period in Argentina and were retrieved from the website of the National Electoral Observatory. As in the case of women's representation, the political competition was also lagged by 1–6 years.

The gender of a competitively elected leader and health policy outcomes may be correlated with some unobserved confounders. The article attempts to control for and minimize the risks of confounding by using fixed effects at the provincial level, as well as including important covariates and adding provincial linear time trends ($1983 = 1,\ 1985 = 2, \ldots 2017 = 34$). These models allow controlling for variables that cannot be directly measured, by using each unit of observation—that is, each province—as its own control (Allison, 2009, p. 3). By including fixed effects, the models are controlling for the average differences across provinces in unobservable predictors. Although with the available observational data it remains impossible to rule out all other potential confounders, it can be argued that fixed effects models are able to provide evidence of the relationship between women's representation, political competition, and population health. Models were controlled by a number of covariates, such as levels of illiteracy, levels of urbanization, the share of women participation in

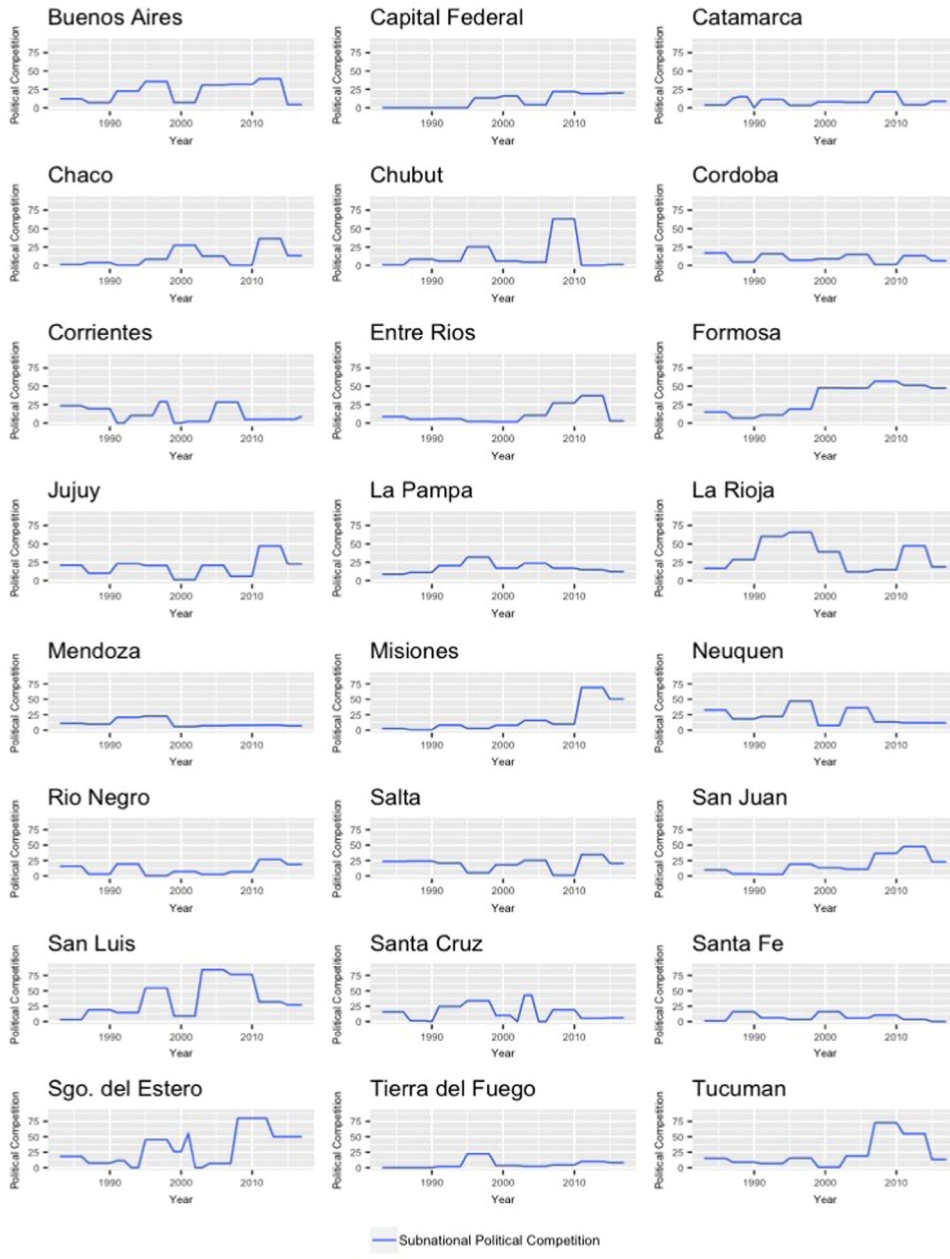


Figure 2 Margin of Victory at the Subnational Level in Argentina (1983–2017).

the labor market, the level of consumption of electricity—as a proxy of GDP—, the ideology of government, the alignment of national and subnational governments, if there was a female governor, and geographical variables (see Table A1 for the summary statistics of the main variables).

Infant Mortality Outcomes

The data shows a negative correlation between the percentage of women in subnational parliaments and the rate of provincial infant mortality (Figure A1). OLS estimates presented in Table 1, add to this relationship. After controlling for socioeconomic, geographical, and political variables, an increase of one in the percentage of seats held by women in the legislature is associated with a decrease of 0.25 points (SE = 0.01) in the number of infant deaths. OLS coefficients, however, may be biased by a number of omitted variables and by the fact that there are year trending factors at the provincial level that reduce infant mortality -i.e. the introduction of new technologies. When the variable that captures the year trend of infant mortality is added, the negative relationship between women's representation in the legislature and the rate of infant mortality persists and remains statistically significant. Column C in table one shows that the association is reduced to 0.06 (SE = 0.01). Without considering the level of political competition of the province, increasing the seats held by women up to 10 percent of the provincial legislature is associated with a decrease of almost 0.6 points in the rate of infant

Table 1. Women's Representation and Infant Mortality, Argentine Provinces (1983–2017)

	Infant Mortality			
	A	B	C	D
% of Women in Legislature	−0.446***	−0.253***	−0.057***	−0.033**
	(0.019)	(0.014)	(0.014)	(0.015)
Illiteracy		1.488***	0.815***	0.658***
		(0.084)	(0.074)	(0.136)
Urbanization		0.073**	0.136***	0.041
		(0.029)	(0.023)	(0.056)
Alignment with National Govt.		−1.049***	−0.572**	−0.941***
		(0.315)	(0.249)	(0.247)
Ideology: Peronismo		0.364	0.600**	−0.408
		(0.321)	(0.253)	(0.275)
Majoritarian Government		−0.366	−0.935***	−0.388
		(0.403)	(0.319)	(0.290)
Female Governor		−1.309*	0.263	0.514
		(0.742)	(0.590)	(0.561)
Consumption of Electricity		−2.353***	−2.469***	−5.174***
		(0.408)	(0.322)	(1.245)
Employed Women		−12.847***	4.730*	4.109
		(3.113)	(2.599)	(2.502)
Constant	27.883***	43.517***	36.871***	49.115***
	(0.445)	(4.341)	(3.437)	(5.647)
Geographic controls	No	Yes	Yes	No
Year trend	No	No	Yes	Yes
Fixed effects	No	No	No	Yes
Observations	815	700	700	700
R^2	0.411	0.769	0.857	0.902

*$p < .1$.
**$p < .05$.
***$p < .01$.

mortality -that is, a decrease of almost 3.2 percent of the mean rate of infant mortality of the sample.

Another possibility is that OLS coefficients are biased by certain endogenous characteristics of the province. Column D shows the results of the model including province-fixed effects. Here, increasing the percentage of women in the legislature is associated with a reduction of 0.03 percentage points (SE = 0.02) in the rate of infant mortality at the subnational level. In other words, having 55 percent of the seats of the legislature held by women—that is, the highest number in the sample—, is associated with a reduction of 1.87 in the number of infant deaths (which is 9.9 percent of the mean of the rate of infant mortality). These results provide evidence for hypothesis one: increases in the percentage of women in subnational legislatures decrease the rate of infant mortality.

Although increasing the percentage of women in provincial legislatures is associated with a reduction in the rate of infant mortality, increasing the level of political competition is related to an increase in the number of infant deaths. Table 2 shows that when controlling for other covariates and including province-fixed effects, increasing one point in the level of political competition of the province is

Table 2. Political Competition and Infant Mortality, Argentine Provinces (1983–2017)

	Infant Mortality			
	A	B	C	D
Political Competition	0.070***	0.037***	0.008	0.014**
	(0.017)	(0.011)	(0.007)	(0.007)
Illiteracy		1.724***	0.716***	0.578***
		(0.101)	(0.074)	(0.134)
Urbanization		0.048	0.136***	0.012
		(0.036)	(0.023)	(0.053)
Alignment with National Govt.		−0.941**	−0.602**	−1.039***
		(0.384)	(0.252)	(0.249)
Ideology: Peronismo		1.675***	0.855***	−0.351
		(0.391)	(0.257)	(0.280)
Majoritarian Government		0.036	−0.902***	−0.228
		(0.510)	(0.335)	(0.300)
Female Governor		−3.971***	0.107	0.559
		(0.905)	(0.607)	(0.572)
Consumption of Electricity		−3.829***	−2.775***	−5.877***
		(0.500)	(0.329)	(1.255)
Employed Women		−19.871***	7.046***	6.204**
		(3.918)	(2.711)	(2.549)
Constant	20.037***	52.053***	37.961***	51.586***
	(0.409)	(5.345)	(3.526)	(5.648)
Geographic controls	No	Yes	Yes	No
Year trend	No	No	Yes	Yes
Fixed effects	No	No	No	Yes
Observations	840	706	706	706
R^2	0.020	0.658	0.854	0.902

*$p < .1$.
**$p < .05$.
***$p < .01$.

related to an increase in the rate of infant mortality of 0.14 points (SE = 0.01). Although these results contradict the expectations of literature on regimes and health, they partially add to the argument made by González (2017), who finds that social spending increases the more electorally secure governors are and the longer they have been in office. As more secure governors spend more money on social services, less competitive provinces may indeed show better health outcomes. Alternatively, these results may be due to the fact that more contested provinces may also show more alternation in power. This may harm the possibility of adopting stable health policies, and, thus, increase the number of infant deaths. Unluckily, the available data do not allow to test these hypotheses.

The association between women's representation and the rate of infant mortality persists when controlling for the level of political competition at the provincial level (Table 3). Columns C and D show the results of both models that include the year trend in infant mortality and fixed effects, respectively. Higher levels of political competition indeed increase the rate of infant mortality at the provincial level: a one-unit increase in political competition—that is, a reduction of the margin of victory by one percentage point—is related to an increase of infant mortality of 0.042 (SE = 0.14) and of 0.049 (SE = 0.13) points, respectively, when the percentage of women in the legislature is 0. Models also indicate that when the level of competition is equal to 0, increasing the share of women in provincial legislatures is related to reductions in infant mortality ($\hat{\beta} = -0.09$ and $\hat{\beta} = -0.06$ points, respectively). This relationship is higher under more political contexts: the interaction between female representation and political competition remains negative and statistically significant ($\hat{\beta} = -0.001$ and SE = 0.0005), which seems to suggest that the net association between women's representation and infant mortality is not independent of the political environment of the province. These results add to those of Bhalotra and Clots-Figueras (2014): an increase

Table 3. Women's Representation, Political Competition, and Infant Mortality, Argentine Provinces (1983–2017)

	Infant Mortality			
	A	B	C	D
% of Women in Legislature	−0.534***	−0.307***	−0.087***	−0.061***
	(0.026)	(0.018)	(0.018)	(0.018)
Political Competition	0.152***	0.085***	0.042***	0.049***
	(0.028)	(0.018)	(0.015)	(0.014)
Women × Competition	−0.005***	−0.003***	−0.001***	−0.001***
	(0.001)	(0.001)	(0.0005)	(0.0005)
Constant	30.296***	46.102***	38.218***	50.644***
	(0.619)	(4.325)	(3.468)	(5.706)
Control variables	No	Yes	Yes	Yes
Year trend	No	No	Yes	Yes
Fixed effects	No	No	No	Yes
Observations	815	700	700	700
R^2	0.432	0.777	0.859	0.904

*$p < .1$.
**$p < .05$.
***$p < .01$.

in women's representation relates to a higher reduction of infant mortality under more competitive regimes.

Figures 3 and 4—based on Hainmueller, Mummolo, and Xu (2019)—illustrate this point: in less competitive provinces, the relationship between women's representation and infant mortality has no clear pattern. Yet, when the level of political competition increases and the margin of victory between parties is less than 20 percent points, increasing the share of seats held by women is related to a decrease in the rate of infant mortality at the subnational level. When the margin of victory gets closer to zero, the negative association between women's representation and infant mortality becomes steeper. Table 4 shows predicted values of the estimated association between different values of women's representation and political competition with infant mortality. Increasing the share of women in the legislature up to 50 percent in contexts in which the margin of victory is 10 percent is associated with a decrease of 2.55 units in the rate of infant mortality. Yet, the same increase in women's representation in a context with the margin of victory is 30 percent is associated with a decrease of 1.55 units in the rate of infant mortality. This adds evidence to the second hypothesis of the article: a higher number of women holding seats in legislatures has a higher negative association with infant mortality in more competitive provinces. Yet, women representatives in Argentine provinces seem to be, not a "substitute for" nor a "complement of" democracy (Macmillan et al., 2018), but a "counterweight" of high levels of political competition.

A possible explanation of this relationship might be related to the role of governors in deciding who is part of the party list and the stability of policies in Argentine provinces. González (2017) finds that social spending increases, the more

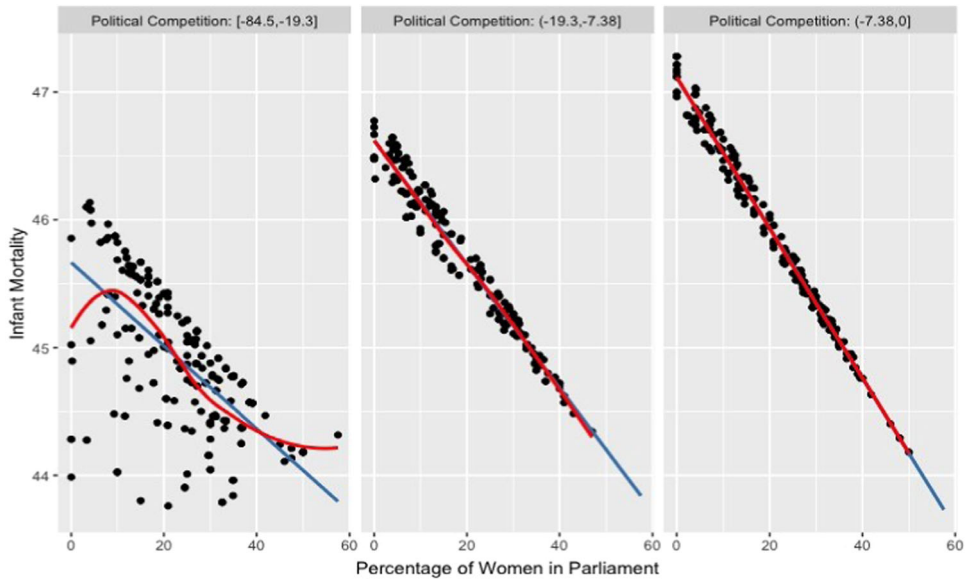


Figure 3 Women's Representation and Infant Mortality by Levels of Political Competition (Fixed Effects) (Argentina Provinces, 1983–2017).

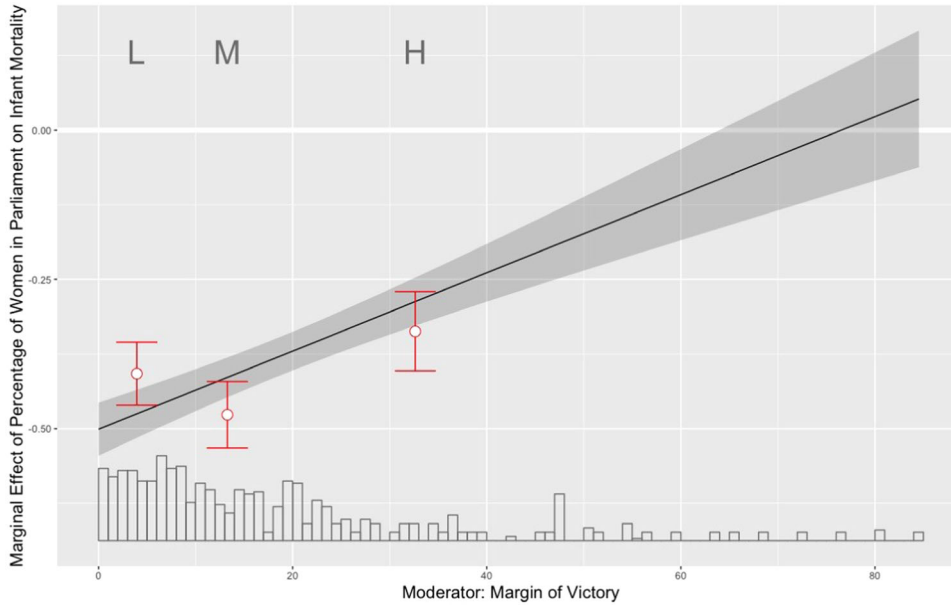


Figure 4 Women's Representation and Infant Mortality by Levels of Political Competition (Fixed Effects) (Argentina Provinces, 1983–2017).

electorally secure governors are and the longer they have been in office in each province in Argentina. This may be explained by the fact that governors with strong political support are under less pressure from their coalition partners to engage in particularistic spending and have more control of the bureaucracy and greater freedom to decide how to spend the budget (González, 2017, p. 115). In contexts of more secure governors, the effect of increasing the number of seats held by women disappears. This, because the reduction of infant mortality can be explained by the stability of the government and its policies. Less competitive governments indeed may invest more in social pressing issues, as secure political environments reduce transaction costs (De Mesquita, Smith, Morrow, & Siverson, 2005). More secure governors need to spend less on private goods and are able to distribute public goods to a wider group of voters since doing so produces greater electoral benefits (González, 2017, p. 98). Conversely, in contexts of more alternation, increasing the number of women in the legislature may provide a solution to overcome unstable policies.

So far, models have tested the association between an increase in women's political representation and raw infant mortality in the birth year. However, timing mediates the association between women's representation and infant mortality. Table A2 presents the results of fixed effects models considering the percentage of legislative seats held by women in $t-1$, $t-2$, $t-3$, $t-4$, $t-5$, and $t-6$, respectively. Results show that there is a significant relationship between lagged women's representation on infant mortality when the variable is lagged by 1, 3, and 6 years ($\hat{\beta} = -0.050$, $\hat{\beta} = -0.039$, and $\hat{\beta} = -0.048$ points, respectively). This stands in consonance to Bhalotra and Clots-Figueras (2014),

who find that increases in women's political representation in the two years preceding birth reduce neonatal mortality. This may be due to the fact that (i) female politicians in provinces may advocate for more health policies during their first year in their seat, but also during provincial and national electoral periods (which correspond to $t-1$ and $t-3$); and (ii) once implemented, policies take time to be implemented. The first of these topics will be discussed in the next section.

Table A3 runs the models by adding region fixed effects, controlling for other variables (like provincial GDP, the number of public employees, and the number of health services), and by removing Capital Federal (the most developed territory of the country) of the sample. When including fixed effects by region, an increase of one in the percentage of seats held by women is associated with a decrease of the rate of infant mortality of 0.03 (SE = 0.015). In the model that removed Capital Federal from the sample, an increase of one in the percentage of seats held by women is associated with a decrease of the rate of infant mortality of 0.04 (SE = 0.014). Finally, when adding other covariates, the effect is almost zero and non-significant ($\hat{\beta} = 0.001$). Yet, this may be explained by the fact that the number of observations is significantly reduced ($n = 248$).

Overall this article finds evidence in favor of the relationship between women's political representation and the decrease in the rate of infant mortality. Moreover, it also talks to the literature that argues for the positive relationship between political competitiveness and health outcomes. The political competition was found to be positively associated with the level of infant mortality in Argentine provinces. Yet, when including the variable on the political competition at the subnational level, the estimate of women's representation becomes higher. Women representatives in Argentine provinces seem to be a "counterweight" of political competition when considering their relationship with population health.

Discussion: Channels Between Women Representation and Health Outcomes

Why would higher percentages of legislative seats held by women translate into lower rates of infant mortality? Studies that analyze the changes driven by women's representation in the context of developing regions find that legislatures with a higher number of women tend to invest more in health (Bhalotra & Clots-Figueras, 2014; Boehmer & Williamson, 1996; Swiss et al., 2012). For the case of Argentina, Jones (1997) shows that the gender of national deputies matters in sanctioning issues in the areas concerns women's rights, families, and children. As regards Argentine provinces, Barnes (2012, p. 503) finds that gender does indeed influence legislative preferences. The author demonstrates that gender differences are present within political parties in approximately 90 percent of the legislative chambers of her sample while stressing that "women work together on issues that affect women." However, Barnes does not test if increasing women's representation leads to a higher number of laws on issues that matter to women—like health. More recently, Barnes and Holman (2020) find that quota adoption in Argentinian sub-national legislatures has a strong positive association with both the number of women represented and the professional and personal diversity of their members—

Table 4. Expected Rate of Infant Mortality Under Different Contexts Considering a Model With Fixed Effects and Year Trend

% of Women	Margin of Victory	Raw Estimate % of Women	Raw Estimate Margin of Victory	Interaction	Expected Estimate of % of Women	Expected Estimate of Margin of Victory
50	0	−3.05	0	0	−3.05	0
50	−10	−3.05	−0.49	0.5	−2.55	0.01
50	−20	−3.05	−0.98	1	−2.05	0.02
50	−30	−3.05	−1.47	1.5	−1.55	0.03
50	−40	−3.05	−1.96	2	−1.05	0.04
40	0	−2.44	0	0	−2.44	0
40	−10	−2.44	−0.49	0.4	−2.04	−0.09
40	−20	−2.44	−0.98	0.8	−1.64	−0.18
40	−30	−2.44	−1.47	1.2	−1.24	−0.27
40	−40	−2.44	−1.96	1.6	−0.84	−0.36
30	0	−1.83	0	0	−1.83	0
30	−10	−1.83	−0.49	0.3	−1.53	−0.19
30	−20	−1.83	−0.98	0.6	−1.23	−0.38
30	−30	−1.83	−1.47	0.9	−0.93	−0.57
30	−40	−1.83	−1.96	1.2	−0.63	−0.76
20	0	−1.22	0	0	−1.22	0
20	−10	−1.22	−0.49	0.2	−1.02	−0.29
20	−20	−1.22	−0.98	0.4	−0.82	−0.58
20	−30	−1.22	−1.47	0.6	−0.62	−0.87
20	−40	−1.22	−1.96	0.8	−0.42	−1.16
10	0	−0.61	0	0	−0.61	0
10	−10	−0.61	−0.49	0.1	−0.51	−0.39
10	−20	−0.61	−0.98	0.2	−0.41	−0.78
10	−30	−0.61	−1.47	0.3	−0.31	−1.17
10	−40	−0.61	−1.96	0.4	−0.21	−1.56
0	−10	0	−0.49	0	0	−0.49
0	−20	0	−0.98	0	0	−0.98
0	−30	0	−1.47	0	0	−1.47
0	−40	0	−1.96	0	0	−1.96

including men. They find that women's access to the legislature transforms ideas about representation, thereby broadening the pool of eligible men for legislative positions. This, in turn, would also drive changes in the legislative priorities and preferences of chambers as a whole.

This section tests two of the assumptions made by the literature that may relate to women's representation and population health. First, it focuses on whether women's participation in Argentine provinces is related to health through the increase of funds invested in public health. This assumption underlies the idea that increasing the amount of money spent on public health is a sufficient condition to improve health indicators as public funds are spent on health care programs. Expenditure on health was measured as the percentage of the provincial budget destined for health services. Data was gathered from the website of the Ministry of Economy of Argentina and it was available for the period 1984 through 2017.

Second, the article analyzes if changes in the gender composition of provincial legislatures are associated with more policies on maternal and children health. If women have different preferences than men, then legislatures' mean preferences toward health issues should change depending on their gender composition. Laws on health were measured as the number of laws aimed at solving maternal and child health issues sanctioned in each province per year. Data were collected from webpages of each subnational legislature in Argentina. After downloading all of the laws sanctioned during the period 1983–2017, every law that was targeted to solve specific diseases or more general health problems (like unplanned pregnancies or infant deaths) was coded as one and zero otherwise. After coding this variable, each of the laws aimed at solving maternal and child health issues was coded as 1 and 0 otherwise. Among these laws, both policies towards specific health and medical issues (such as neonatal checkups), and social assistance of the mother (like child allowances) were considered.

Table 5 displays the results of OLS estimates related to the association between women in parliament and health expenditure, including political and socio-economic control variables, and fixed effects by province. In the four models, increasing the percentage of women in the subnational legislature is negatively associated with the percentage of the public budget allocated to health services. For

Table 5. Lagged Women's Representation and Political Competition and Health Expenditure, Argentine Provinces (1984–2017, Fixed Effects)

	Dependent Variable: Percentage of Budget on Health			
	A	B	C	D
% of Women in Legislature	−0.045***			
	(0.010)			
Political Competition	0.001			
	(0.005)			
% of Women in Legislature ($t-1$)		−0.023**		
		(0.011)		
Political Competition ($t-1$)		0.008*		
		(0.005)		
% of Women in Legislature ($t-2$)			−0.007	
			(0.011)	
Political Competition ($t-2$)			−0.004	
			(0.005)	
% of Women in Legislature ($t-3$)				−0.034**
				(0.010)
Political Competition ($t-3$)				−0.004
				(0.005)
Constant	2.197	6.712*	5.388	2.548
	(3.873)	(3.803)	(3.932)	(3.997)
Control variables	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Observations	693	688	682	688
R^2	0.726	0.734	0.718	0.721

*$p < .1$.
**$p < .05$.
***$p < .01$.

instance, increasing one percent the share of legislative seats held by women is associated with a decrease of 0.05 percentage points in the level of health expenditure in the same year budget (SE = 0.01) and 0.02 percentage points in the next year budget (SE = 0.011). These results are in contrast with most of the literature on women's representation and health outcomes that finds a positive effect of female representation on health spending (Bhalotra & Clots-Figueras, 2014; Clayton & Zetterberg, 2018).

As regards the second channel, Table 6 shows that the mean of laws on health increased when more women are in subnational legislatures. For instance, legislatures with 1 to 10 percent of their seats held by women sanctioned a mean of 3.91 laws on health. Conversely, legislatures with 31 to 40 percent sanctioned a mean of 8.83 laws on health—that is, more than the double of laws. This mean is reduced in chambers with more than 40 percent of women. However, it is worth noting that only two provinces in a few periods showed this distribution of seats. Table A4 shows the p values related to the t tests comparing means of laws on health by a group of legislatures. Results show that all differences are significant ($p < .05$) except for those comparing chambers with 31–40 percent to those with more than 40 percent of women. The same pattern replicates when considering the number of laws on social assistance and maternal and child issues—while other health laws associated to health professionals or institutions, in general, do not follow this trend. For instance, legislatures with 1–10 percent of their seats held by women sanctioned a mean of 0.28 laws on social assistance and 0.29 of laws on maternal and child diseases. Conversely, legislatures with 31–40 percent of their seats held by women sanctioned a mean of 0.71 laws on social assistance and 0.98 of laws on maternal and child diseases.

In line with this, the fixed effects model (Table 7) displays that increasing the number of women representatives in the legislature has a positive relationship with the number of laws aimed at solving health problems when the variable is not lagged ($\hat{\beta} = 0.014$ and SE = 0.005). Results remain positive and significant when the variable is lagged by two and three years, respectively ($\hat{\beta} = 0.017$ and $\hat{\beta} = 0.012$). Moreover, while women's representation has a significant positive relationship with the number of laws approved by the legislature, the level of political competition has a non-significant association when the variable is not lagged or lagged by one year. This provides evidence to the literature arguing in favor of different legislative preferences depending on

Table 6. Mean of Laws Sanctioned by Subnational Legislatures by Year (by Type of Law)

% of Women in Legislature	Mean of Laws on Health	Mean of Laws on Social Assistance	Mean of Laws on Maternal/ Child Diseases	Mean of Laws on Health Professionals	Mean of Laws on Health Institutions
0%	3.20	0.28	0.11	0.56	0.22
1% to 10%	3.92	0.28	0.29	1.15	0.28
11% to 20%	5.34	0.53	0.56	0.95	0.38
21% to 30%	6.95	0.60	0.85	0.88	0.32
31% to 40%	9.50	0.71	0.98	1.05	0.35
More than 40%	8.00	0.73	1.18	0.82	0.45

Table 7. Lagged Women's Representation and Political Competition and Laws on Health Sanctioned, Argentina Provinces (1983–2017, Fixed Effects)

	Number of Laws on Maternal and Children Health Sanctioned			
	A	B	C	D
% of Women in Legislature	0.014***			
	(0.005)			
Political Competition	0.001			
	(0.002)			
% of Women in Legislature ($t-1$)		0.006		
		(0.005)		
Political Competition ($t-1$)		0.004		
		(0.002)		
% of Women in Legislature ($t-2$)			0.017***	
			(0.005)	
Political Competition ($t-2$)			0.008***	
			(0.002)	
% of Women in Legislature ($t-3$)				0.012**
				(0.005)
Political Competition ($t-3$)				0.004*
				(0.002)
Constant	0.769	−0.472	1.271	0.315
	(1.803)	(1.804)	(1.772)	(1.830)
Control variables	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes
Observations	705	695	694	701
R^2	0.181	0.181	0.196	0.181

*$p < .1$.
**$p < .05$.
***$p < .01$.

the gender of the representatives in Argentina (Barnes, 2012; Jones, 1997): having more women in provincial legislatures indeed changes the mean preferences of the Chamber towards health issues. However, these results do not tell if changes in priorities towards health are driven by more diverse men legislators (as Barnes & Holman, 2020 would suggest), or just by changing the dynamic of negotiation with the chambers.

The evidence suggests that Argentine provinces with more women holding legislative seats are prone to sanction more laws towards health issues, but they show lower percentages of their budgets aimed at funding health services. Yet, that women's representation has a positive association with the number of laws sanctioned but not on health expenditure might be explained by the fact that budgets are negotiated before governors sent them to the legislature. Moreover, as the budget is aimed at health services and not health in general, it may be the case that women prefer to reallocate the budget to social assistance or education—that is, other social services that are linked to health outcomes. Moreover, the positive association with the number of laws that are sanctioned may be more relevant than the budget allocated to health. This, because laws can actually reallocate public funds to specific health problems. In turn, this may have a more substantive effect on infant mortality than the percentage of the budget that is destined to health services.

Conclusion

Improving population health is at the core of the goals of developing countries. In this sense, understanding social and political factors that positively affect health remains crucial. This article investigated whether women's political representation in subnational legislatures in Argentina is related to health outcomes for individuals in the districts they are elected from. The article identifies significant negative associations between women's representation and lower infant mortality rates. It also showed a consistent positive association between political competition and the number of infant deaths. It also found that higher levels of political competition boost the association between women's representation and infant mortality. Where the level of political competition is high, the relationship between women's representation and infant mortality becomes higher.

The findings of this article speak to the body of work on political variables and social outcomes in relation to health. Waves of democratization brought increased expectations that competitive elections would make governments more attentive and responsive to the welfare of their people, creating better services and improving health. According to this literature, competitive regimes are assumed to perform better in health than non-competitive ones. This article added to this idea by analyzing both subnational political competition and the gender distribution of legislative seats at the provincial level. The article stated that the distributional effect of electoral environments is mediated by the characteristics -and, possibly, the preferences of those who are elected to office. Yet, the probability of women's preferences being actually translated into policies also differ depending on the political environment. Overall, results suggest that the interaction between women's representation and political competition results in a synergic environment that improves population health. Indeed, women representatives in Argentine provinces seem to be a "counterweight" of political competition when considering their effects on population health. Yet, it is worth noting that results do not entail that political competition is a factor that threatens health. In Argentine provinces, alternation in power may imply continuous changes in policies which, in turn, may affect health indicators.

Results also showed that women participation in politics can improve the quality of life of citizens by fostering the adoption of policies that may have a direct impact on health—such as vaccination campaigns—, or other policies that may have an indirect effect on health by guaranteeing other social rights—such as a minimum income for pregnant women. These results have important implications for health policy. In addition to policy measures to eradicate poverty and promote equitable economic development to improve the socioeconomic position of populations, specific policies aimed at promoting the representation and participation of women in politics should also be implemented. This not only because of the normative aspect of gender representation but also because of its effects on social policy design. Even if women's representation may not translate into more net budget to health services, it may serve as a tool to redirect public funds to specific goals.

Notes

Conflicts of interest: None declared.

Corresponding author: Santiago Lujan Cunial, scunial@sas.upenn.edu

Santiago Lujan Cunial is a PhD Student in Comparative Politics at the University of Pennsylvania.

References

Alesina, Alberto, and Eliana La Ferrara. 2005. "Preferences for Redistribution in the Land of Opportunities." *Journal of Public Economics* 89 (5–6): 897–931.

Allison, Paul. 2009. *Fixed Effects Regression Models*, 160. California: SAGE Publications.

Barnes, Tiffany. 2012. "Gender and Legislative Preferences: Evidence From the Argentine Provinces." *Politics & Gender* 8 (4): 483–507.

Barnes, Tiffany, and Myria Holman. 2020. "Gender Quotas, Women's Representation, and Legislative Diversity." *The Journal of Politics* 82: 1271–86. https://doi.org/10.1086/708336

Bellinger, Nisha. 2018. "Democracy and Infant Mortality Within India: From Whether to Why." *European Political Science Review* 10 (1): 3–28.

Besley, Timothy, and Masayuki Kudamatsu. 2006. "Health and Democracy." *The American Economic Review* 96 (2): 313–318.

Bhalotra, Sonia, and Irma Clots-Figueras. 2014. "Health and the Political Agency of Women." *American Economic Journal: Economic Policy* 6 (2): 164–97.

Boehmer, Ulrike, and John Williamson. 1996. "The Impact of Women's Status on Infant Mortality Rate: A Cross-National Analysis." *Social Indicators Research* 37 (3): 333–60.

Bolzendahl, Catherine, and Clem Brooks. 2007. "Women's Political Representation and Welfare State Spending in 12 Capitalist Democracies." *Social Forces* 85 (4): 1509–34.

Carpenter, Daniel. 2012. "Is Health Politics Different?" *Annual Review of Political Science* 15 (1): 287–311.

Chant, Sylvia. 2016. "Women, Girls and World Poverty: Empowerment, Equality or Essentialism?" *International Development Planning Review* 38 (1): 1–24.

Chattopadhyay, Raghabendra, and Esther Duflo. 2004. "Women as Policy Makers: Evidence From a Randomized Policy Experiment in India." *Econometrica* 72 (5): 1409–43.

Chen, Li-Ju. 2010. "Do Gender Quotas Influence Women's Representation and Policies?" *The European Journal of Comparative Economics* 7 (1): 13–60.

Clayton, Amanda, and Par Zetterberg. 2018. "Quota Shocks: Electoral Gender Quotas and Government Spending Priorities Worldwide." *The Journal of Politics* 80 (3): 916–32.

Clots-Figueras, Irma. 2012. "Are Female Leaders Good for Education? Evidence From India." *American Economic Journal: Applied Economics* 4 (1): 212–44.

De Mesquita, Bruce, Alastair Smith, James Morrow, and Randolph Siverson. 2005. *The Logic of Political Survival*, Boston: MIT Press.

Erickson, Lynda. 1997. "Might More Women Make a Difference? Gender, Party and Ideology Among Canada's Parliamentary Candidates." *Canadian Journal of Political Science/Revue canadienne de science politique* 30 (4): 663–88.

Gerring, John, Strom Thacker, and Rodrigo Alfaro. 2012. "Democracy and Human Development." *The Journal of Politics* 74 (1): 1–17.

Gervasoni, Carlos. 2010. "Measuring Variance in Subnational Regimes: Results From an Expert-Based Operationalization of Democracy in the Argentine Provinces." *Journal of Politics in Latin America* 2 (2): 13–52.

Gibson, Edward. 2012. *Boundary Control: Subnational Authoritarianism in Democratic Countries*, New York: Cambridge University Press.

González, Lucas. 2017. "Electoral Competition and Social Spending in the Argentine Provinces." *Journal of Politics in Latin America* 9 (1): 91–124.

Hainmueller, J., J. Mummolo, and Y. Xu. 2019. "How Much Should We Trust Estimates From Multiplicative Interaction Models? Simple Tools to Improve Empirical Practice." *Political Analysis* 27 (2): 163–92.

Jones, Mark. 1997. "Legislator Gender and Legislator Policy Priorities in the Argentine Chamber of Deputies and the United States House of Representatives." *Policy Studies Journal* 25 (4): 613–29.

——— 1998. "Gender Quotas, Electoral Laws, and the Election of Women: Lessons From the Argentine Provinces." *Comparative Political Studies* 31 (1): 3–21.

Lloren, Anouk, and Jan Rosset. 2017. "Gendered Policy Preferences? Candidates' Views on Political Issues in a Comparative Perspective." *Comparative European Politics* 15 (6): 944–68.

Lovenduski, Joni, and Pippa Norris. 2003. "Westminster Women: The Politics of Presence." *Political Studies* 51 (1): 84–102.

Macmillan, Ross, Naila Shofia, and Wendy Sigle. 2018. "Gender and the Politics of Death: Female Representation, Political and Developmental Context, and Population Health in a Cross-National Panel." *Demography* 55 (5): 1905–34.

McGuire, James. 2010. *Wealth, Health, and Democracy in East Asia and Latin America*, New York: Cambridge University Press.

——— 2020. *Democracy and Population Health*, New York: Cambridge University Press.

Miller, Grant. 2008. "Women's Suffrage, Political Responsiveness, and Child Survival in American History." *The Quarterly Journal of Economics* 123 (3): 1287–327.

Ozdamar, Oznur. 2017. "Gendered Economic Policy Making: The Case of Public Expenditures on Family Allowances." *Economics: The Open-Access, Open-Assessment E-Journal* 11 (2017-8): 1–28.

Pitkin, Hannah. 1967. *The concept of representation*, California: University of California Press.

Prats, Mariana. 2012. "Contradiciendo pronósticos:¡ No hay descentralización ni inclusión que valga! La selección de candidatos en los partidos políticos de Argentina." *América Latina Hoy* 62: 103–30.

Swiss, Lian, Kathleen Fallon, and Giovani Burgos. 2012. "Does Critical Mass Matter? Women's Political Representation and Child Health in Developing Countries." *Social Forces* 91 (2): 531–58.

Vollmer, Sebastian, and Maria Ziegler. 2009. *Political Institutions and Human Development—Does Democracy Fulfil Its 'Constructive' and 'instrumental' role?*. The World Bank.

Wang, Yi-Ting, Valeriya Mechkova, and Frida Andersson. 2018. "Does Democracy Enhance Health? New Empirical Evidence 1900–2012." *Political Research Quarterly* 72 (3): 554–69.

Wilkinson, Richard, and Michael Marmot. 2003. *Social Determinants of Health: The Solid Facts*, World Health Organization.

Appendix A

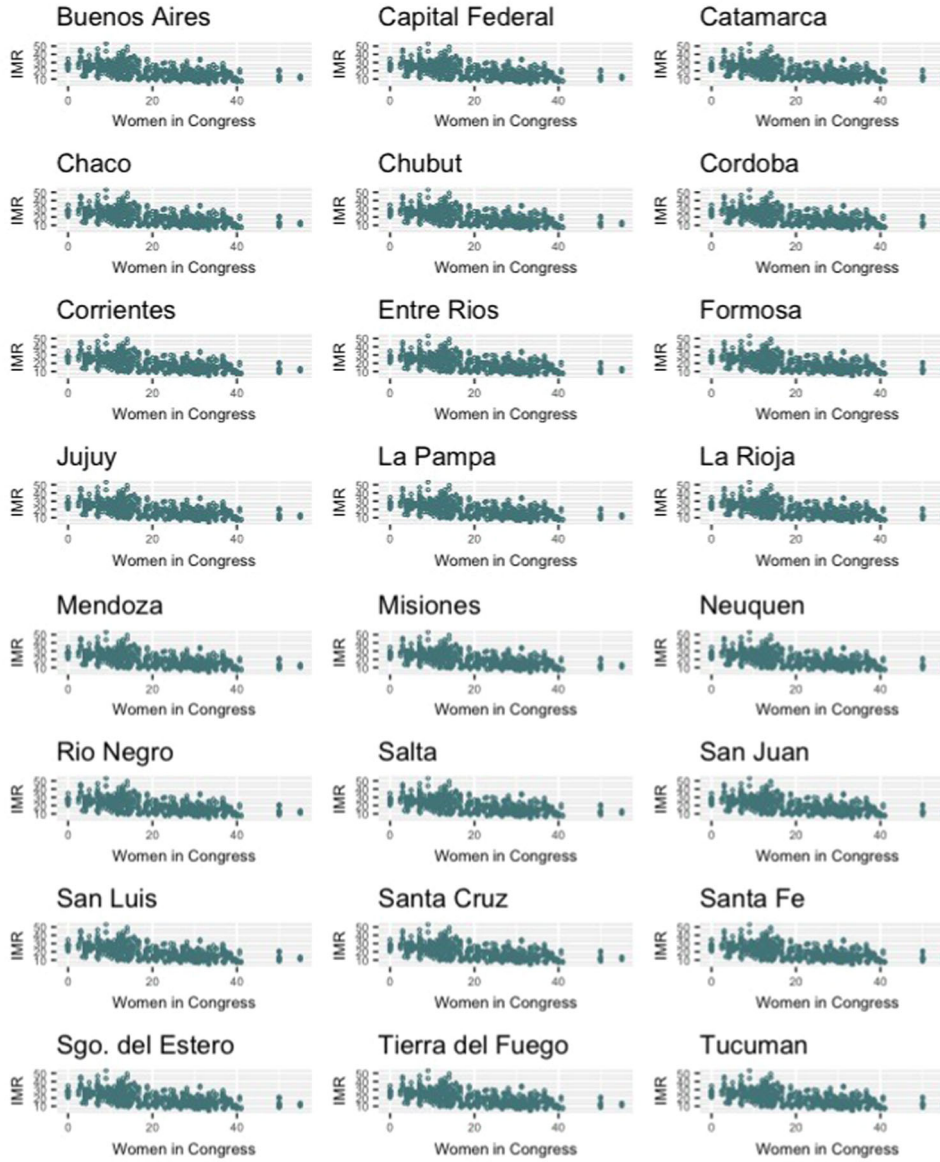


Figure A1 Correlation Between Infant Mortality and Representation of Women in Congress at the Subnational Level in Argentina (1983–2017).

Table A1. Descriptive Statistics of Main Variables of Interest

Variable	Observations	Mean	SD	Minimum	Maximum
Infant Mortality	840	18.82	8.36	8.41	53.25
Log of Infant Mortality	838	2.83	0.45	1.42	3.98
Percentage of Women in Legislature	815	20.52	11.76	0	57.5
Political Competition	840	−17.52	17.29	−84.54	0
Child Mortality (1–4 years)	839	0.86	0.57	0	4.20
Health Budget	809	10.62	3.49	2.44	29.50
Laws on Health	814	6.38	5.52	0	37.00
Urbanization	840	82.33	10.16	50.44	100.00
Illiteracy	838	4.45	3.12	0.50	17.70
Consumption of Electricity	812	6.04	0.54	4.58	7.60
Ratio of Employed Women	775	0.92	0.05	0.75	1.00
Latitude	840	33.02	7.71	24.11	54.47
Distance from Capital City	840	922.5	513.68	0.00	2376.1
Female Governor	818	0.048	0.21	0.00	1.00
Ideology of government: Peronismo	840	0.56	0.50	0.00	1.00
Alignment with National Government	839	0.55	0.50	0.00	1.00
Majoritarian government	826	0.83	0.38	0.00	1.00

Table A2. Lagged Women's Representation and Political Competition on Infant Mortality, Argentine Provinces (1983–2017, Fixed Effects)

	Dependent variable: Infant Mortality					
	A	B	C	D	E	F
% of Women in Legislature ($t-1$)	−0.050***					
	(0.015)					
% of Women in Legislature ($t-2$)		−0.009				
		(0.015)				
% of Women in Legislature ($t-3$)			−0.039***			
			(0.015)			
% of Women in Legislature ($t-4$)				−0.016		
				(0.015)		
Percentage of Women in Legislature ($t-5$)					−0.004	
					(0.015)	
Percentage of Women in Legislature ($t-6$)						−0.048***
						(0.015)
Constant	58.439***	53.284***	52.942***	57.802***	53.005***	53.182***
	(5.438)	(5.562)	(5.591)	(5.349)	(5.538)	(5.546)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Year trend	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	732	731	739	731	731	734
R^2	0.906	0.894	0.903	0.907	0.894	0.904

Note:
*$p < .1$.
**$p < .05$.
***$p < .01$.

Table A3. Robustness Check: Women' Representation and Political Competition and Infant Mortality, Argentine Provinces (1983–2017)

	Dependent Variable: Infant Mortality		
	Region Fixed Effects	Other Covariates	Without Capital Federal
% of Women in Parliament	−0.034**	0.001	−0.044***
	(0.015)	(0.024)	(0.014)
Constant	49.670***	58.594***	40.423***
	(6.000)	(16.890)	(4.713)
Observations	700	248	724
R^2	0.902	0.844	0.902

Note:
*$p < .1$.
**$p < .05$.
***$p < .01$.

Table A4. p Values of t Tests Comparing Means of Laws on Health Sanctioned by Subnational Legislatures by Year

% of Women in Legislature	0%	1% to 10%	11% to 20%	21% to 30%	31% to 40%	More than 40%
0%	1	0.20	0.00	0.00	0.00	0.00
1% to 10%	0.20	1	0.00	0.00	0.00	0.00
11% to 20%	0.00	0.00	1	0.00	0.00	0.02
21% to 30%	0.00	0.00	0.00	1	0.00	0.35
31% to 40%	0.00	0.00	0.00	0.00	1	0.21
More than 40%	0.00	0.00	0.02	0.35	0.21	1

World Medical and Health Policy

A Call for the World Health Organization to Create International Classification of Disease Diagnostic Codes for Post-Intensive Care Syndrome in the Age of COVID-19

Brian C. Peach, Michael Valenti, and Mary Lou Sole

Post-intensive care syndrome (PICS), a condition found in survivors of critical illness, is characterized by persistent physical, cognitive, and psychological sequelae that impact the quality of life after discharge from an intensive care unit (ICU). At present, there are no International Classification of Disease (ICD) billing codes for this condition. Without financial alignment, clinicians cannot diagnose PICS, hindering tracking of its prevalence and impeding policy development for this condition. Clinicians should be screening for PICS in all survivors of critical illness, particularly those with acute respiratory distress syndrome (ARDS). Results from single-center studies suggest over 75 percent of ARDS survivors develop PICS. With nearly 5 percent of patients with COVID-19 requiring ICU admission for ARDS, it is important for clinicians to be able to diagnose PICS in survivors, and researchers to be able to track it. Member states should impress upon the World Health Organization to create ICD-10 codes for PICS.

KEY WORDS: post-intensive care syndrome, acute respiratory distress syndrome, COVID-19, cognitive impairment, anxiety, depression, ICD-10, World Health Organization

Introduction

Increasingly, clinicians have begun to recognize a cluster of concerning symptoms in patients who survive an intensive care unit (ICU) admission. Despite overcoming the stressors of critical illness, survivors are often left living with physical, cognitive, and psychological sequelae experienced weeks to months after their discharge. These aftereffects profoundly impact survivors' quality of life long after their discharges from ICUs (Mikkelsen et al., 2012; Sidiras et al., 2019). Dr. Derek C. Angus, an internationally-recognized sepsis researcher, described these sequelae as "a hidden public health disaster" (Angus, 2010, p. 1833).

In 2010, at a stakeholder's conference convened by the Society of Critical Care Medicine (SCCM), the symptom cluster was named post-intensive care syndrome (PICS) (Needham et al., 2012). The SCCM defined PICS as "new or worsening impairment of cognition, mental health, or physical function after critical illness and persisting beyond the acute care hospitalization" (Needham et al., 2012, p. 505). The prevalence of PICS is poorly understood because, at present, the International

doi: 10.1002/wmh3.401

Classification of Diseases-10 (ICD-10) diagnostic codes do not exist for this condition. The lack of ICD-10 codes is hindering epidemiologic investigation of this condition. Without these codes, it is difficult to determine which survivors developed this condition and to track their clinical course.

Critical care and primary care clinicians and researchers worldwide recognize the existence of this condition, and are growing increasingly concerned inadequate attention is being directed to timely identification of PICS and rehabilitative efforts to address long-term impairments after critical illness (Busico et al., 2019; Colbenson, Johnson, & Wilson, 2019; Inoue et al., 2019). In 2014, a second SCCM stakeholders conference was held to pinpoint strategies and resources for raising awareness and education, to understand and address barriers to clinical practice, and to identify research gaps and resources (Elliot et al., 2014). This condition has received significantly more attention in the literature, but a gap persists between research and adoption of best practices aimed at assessment and treatment of this condition after discharge from the ICU.

Etiology

The etiology of PICS is believed to be multifactorial and is associated with certain inflammatory conditions like sepsis (Angus, 2010; Iwashyna, Ely, Smith, & Langa, 2010) and acute respiratory distress syndrome (ARDS) (Herridge et al., 2003; Mikkelsen et al., 2009; Rothenhäusler, Ehrentraut, Stoll, Schelling, & Kapfhammer, 2001). Notably, the COVID-19 virus is known to trigger COVID-19 ARDS, an atypical ARDS that like the traditional condition results in patients needing mechanical ventilation and other ICU-level care (Gattinoni et al., 2020; Gibson, Qin, & Puah, 2020; Li & Ma, 2020). Protracted admissions in ICU settings, mechanical ventilation requirements, the administration of steroid and sedative medications, use of restraints, poor glycemic control, prolonged immobility, and pre-existing comorbid conditions have all been associated with the development of PICS (Karnatovskaia et al., 2019; Needham et al., 2012; Sivanathan et al., 2019). Certain populations such as older adults, people of a minority race and/or with a mental illness, and survivors with a history of transplantation, neurological, and hepatic diseases are at the greatest risk of developing this condition (Needham et al., 2012; Riegel et al., 2019).

Symptomatology

Cognitive and psychological sequelae of PICS include anxiety, depression, agitation, insomnia, nightmares, social disengagement, impaired ability to complete activities of daily living, and cognitive impairment (Iwashyna et al., 2010; Karnatovskaia et al., 2019; Mikkelsen et al., 2009; Needham et al., 2012; Sidiras et al., 2019). Depression alone can have serious implications on long-term health. One study reported depression after critical illness is associated with a 47 percent increased risk of dying within the first 2 years following discharge from an ICU (Hatch et al., 2018). Cognitive impairment is an umbrella term that encompasses

impaired attention, memory, processing speed, executive function, and visuospatial ability (Mikkelsen et al., 2009; Needham et al., 2012). A study of ARDS patients 12 months after recovery from critical illness found 55 percent ($n = 41$) tested positive for some degree of cognitive impairment (Mikkelsen et al., 2012).

In addition, survivors report muscle weakness, impaired handgrip, and nerve pain 6 months after discharge (Iwashyna et al., 2010; Sidiras et al., 2019). This symptomatology is likely attributable in part to mitochondrial dysfunction after critical illness, as well as treatment effects, prolonged immobility, and disruption of the circadian rhythm (Needham et al., 2012; Owen et al., 2019). The ICU length of stay may play a role in the number or severity of symptoms. Survivors of severe sepsis without a prior history of functional limitations are reported to develop on average, 1.57 new limitations (Iwashyna et al., 2010). Patients with mild/moderate limitations before sepsis had an increase of 1.5 additional limitations after sepsis, and they persisted for up to 8 years of follow-up (Iwashyna et al., 2010). By contrast, no significant changes were noted in non-sepsis general hospitalizations.

Implications

PICS can impact survivors' ability to work and their quality of life (Herridge et al., 2003; Norman et al., 2016; Wintermann, Petrowski, Weidner, Strauß, & Rosendahl, 2019). A study of 34 survivors of critical illness reported that 44.1 percent ($n = 15$) remained hospitalized for 3 months after discharge from the ICU, and of the remaining 19 respondents, only 1 (5.3 percent) was able to return to their previous employment (Heydon, Wibrow, Jacques, Sonawane, & Anstey, 2019). Sixteen of the 18 survivors (88.9 percent) who were unable to return to work indicated this was related to their critical illness (Heydon et al., 2019). In a 2019 systematic review with meta-analysis, the estimates across studies for return to employment among those employed before critical illness were 33 percent (95% confidence interval [CI], 21%–48%), 55 percent (95% CI, 45%–64%), and 56 percent (95% CI, 45%–66%) at 3, 6, and 12 months, respectively (McPeake et al., 2019). A second systematic review and meta-analysis reported similar results at the 3- and 12-month marks, and found the return to work prevalence from 42 to 60 months was 68 percent (95% CI, 51%–85%) (Kamdar et al., 2020). Impairments that prevent survivors from returning to work include decreased pulmonary function, reduced strength of respiratory and extremity muscles, reduced 6-minute walk test distance, and limited ability to perform activities of daily living (ADLs), instrumental ADLs, and drive (Ohtake et al., 2018). Survivors' inability to return back to their careers can lead to a serious role crisis (Sidiras, et al., 2019).

Additionally, an inability to work can be financially devastating for survivors and their families. In the Heydon et al. (2019) study, 35.3 percent of respondents of a 3-month survey ($n = 12$) indicated they were having financial difficulties as a result of their illness (Heydon et al., 2019). In another study, 34 percent of ARDS survivors reported receiving new disability payments 2 years after their hospitalization (Hopkins et al., 2005). The economic impact of PICS has not been quantified

but is likely tremendous given the reports from single-center studies of survivors who develop this condition.

The financial burden of mild cognitive impairment alone is estimated at $15,022 per patient per year, and $34,515 for severe cognitive impairment (Rockwood et al., 2002). Cognitive impairment is just one domain of PICS. Cognitive impairment plus comorbid depression is associated with a fourfold increase (odds ratio [OR] = 3.02) in activities of daily living limitations, and increased odds of hospitalization (OR = 1.53) and nursing home admission (OR = 3.34) (Xiang & An, 2015). This has serious financial implications for survivors, insurers, and health-care systems.

Some survivors do not recover to their previous state of health, despite extensive rehabilitation. One study reported persistently low quality of life 3 and 6 months post-discharge (Sidiras et al., 2019). Three months post-discharge, patients reported decreased physical abilities and energy levels, and unusual emotional reactions ($p < .05$). In addition to these sequelae, patients reported greater pain, sleep disturbances, and social isolation 6 months after their discharge (Sidiras et al., 2019). Another multicenter study reported 64 percent of participants exhibited symptoms consistent with PICS at 3 months and 56 percent at 12 months after discharge (Marra et al., 2018).

Impact on Children and Families

PICS is not exclusive to adults but may be present in over one-third of pediatric patients (PICS-P) surviving ICU admissions (Bronner, Knoester, Bos, Last, & Grootenhuis, 2008; Pinto, Rhinesmith, Kim, Ladner, & Pollack, 2017). Subclinical PTSD was reported in 36.5 percent ($n = 10$) of pediatric critical illness survivors, and PTSD in 17.9 percent ($n = 5$) (Bronner et al., 2008). PICS-P may impact children's ability to achieve important growth and development milestones. Additionally, families are known to experience depression, anxiety, and post-traumatic stress disorder symptomatology that matches with that seen in patients after discharge from ICUs (Azoulay et al., 2005; Petrinec & Martin, 2018). The family condition has been labeled PICS-F (see Table 1). One study completed 90 days after ICU discharge, found 47 percent ($n = 66$) of family members exhibited signs of post-traumatic stress syndrome, 39 percent ($n = 55$) showed signs of anxiety, and 29 percent ($n = 41$) demonstrated signs of depression. No significant differences were found between relatives of survivors and non-survivors of critical illness (Matt, Schwarzkopf, Reinhart, Konig, & Hartog, 2017). A previous history of anxiety, depression, and post-traumatic stress disorder may predict symptom

Table 1. Comparison of Three Classifications of Post-Intensive Care Syndrome (PICS)

Conditions	Description
PICS	Post-intensive care syndrome seen in *adult* survivors of critical illness
PICS-P	Post-intensive care syndrome seen in *pediatric* survivors of critical illness
PICS-F	Post-intensive care syndrome seen in *family members* of adult or pediatric survivors of critical illness

severity and prevalence in family members with PICS-F (Petrinec & Martin, 2018). Bronner et al. (2008) found maternal PTSD was the strongest predictor for child PTSD.

The Case for ICD-10 Codes

The absence of ICD-10 diagnostic codes for PICS, PICS-P, and PICS-F makes investigating the epidemiology of these conditions on national and international scales impossible. Without diagnostic codes, providers are forced to code individual manifestations (e.g., anxiety, depression, insomnia), which makes tracking the prevalence of PICS on a large scale impossible. The results of the single- and few multicenter studies that have been published are alarming. A study of 55 consecutive survivors of ARDS reported 100 percent of survivors exhibited neurological or behavioral decline that impacted their quality of life after discharge (Hopkins et al., 1999). Another study of 43 survivors from two academic medical ICUs found 83.7 percent ($n = 36$) exhibited symptoms consistent with PICS (95% CI, 69.3%–93.2%) (Maley et al., 2016). Being able to diagnose and code patients with PICS, PICS-P, or PICS-F is an initial step in building the science, and will enable the development of evidence-based treatment interventions. An understanding of predictors would enable clinicians to better screen for the PICS conditions, and target preventative interventions toward those likely to develop one.

The PICS epidemic is likely to worsen with the current COVID-19 viral pandemic, as patients are being admitted to ICUs for an ARDS-like illness, and have protracted ICU admissions that usually involve mechanical ventilation and sedation infusions. The long-term complications of a COVID-19 infection are unknown, but it is reasonable to assume these patients will be at high risk for PICS, given the similarities in severity of illness and treatment course. As of January 1, 2021, there have been over 80 million cases worldwide, and at least 5 percent will require an ICU admission to manage their condition (Centers for Disease Control and Prevention, 2020; Grasselli, Pesenti, & Cecconi, 2020; Johns Hopkins University and Medicine, 2020).

Understanding the prevalence of diseases and conditions like PICS, PICS-P, and PICS-F is needed for allocation of public health funds for screening and treatment, but also for government agencies to determine their research priorities. The lack of ICD-10 codes impedes policy development. To date, PICS, PICS-P, and PICS-F have received minimal research funding globally and remain understudied, despite their reported large personal and economic impact on critical illness survivors and their families. Their burden on international health-care systems is likely great, but currently unrecognized. Most studies of these conditions have been conducted in single centers or systems in a small number of countries, limiting the generalizability of findings. Data from these studies suggest the PICS conditions may be unrealized epidemics, like the vaping-related acute lung injury (VALI) reported in 2019 by world news outlets. Conditions like VALI and PICS can be understudied for a long period of time without ICD-10 codes.

Beyond hindering epidemiological investigations, the absence of ICD-10 codes for PICS is a disincentive to care coordination in outpatient settings, and effective post-acute treatment.

Providers are not incentivized to complete assessments, because, without ICD-10 codes, they cannot bill for them. All providers should have heightened awareness about this condition and should be assessing for manifestations during patient visits after ICU admission. Primary care providers should be able to screen for sequelae of PICS, PICS-P, or PICS-F and diagnose it if ICD-10 codes exist, or be willing to refer patients to a psychiatric provider who could make the diagnosis. One recent study found ICU survivors who exhibit symptoms of PICS have more visits with primary care providers than patients with similar characteristics in the general population (van Beusekom et al., 2019).

At a recent SCCM consensus conference on the prediction and identification of long-term impairments after critical illness, experts made recommendations on screening adults for post-discharge impairments (Mikkelsen et al., 2020). Recommendations included serial assessments within 2–4 weeks of hospital discharge using the Montreal Cognitive Assessment test, Hospital Anxiety and Depression Scale, 6-minute walk, Impact of Events Scale-Revised (IES-R) to assess for PTSD, and/or the EuroQol-5D-5L to assess the quality of life (Mikkelsen et al., 2020). The best tool for studying PTSD symptoms in survivors of critical illness remains a point of dispute in the literature. Besides the IES-R, other tools frequently used for patient assessment include the Clinician-Administered Post-Traumatic Stress Disorder Scale, Post-Traumatic Stress Disorder Checklist—Civilian V5, Post-Traumatic Stress Syndrome 14-Question Inventory, Post-Traumatic Stress Disorder Checklist—Civilian V17, Structured Clinical Interview, the Posttraumatic Stress Diagnostic Scale, the Post-Traumatic Stress Syndrome 10-Question Inventory, the Trauma Screening Questionnaire, and the Davidson Trauma Scale (Righy et al., 2019). Regardless of the tools selected, assessments of survivors of critical illness are important and should be completed by primary care physicians in coordination with psychologists, rehabilitation, and neurology providers (when cognitive impairment is detected). Without ICD-10 codes, it is impossible for providers to adopt the SCCM experts' recommendations, as there is no administrative or financial alignment.

The World Health Organization (WHO) is responsible for managing the International Classification of Diseases—10th edition, used by hospitals in over 100 countries (World Health Organization [WHO], 2019). According to the WHO (2019), 70 percent of the world's health expenditures ($3.5 billion USD) are appropriated using the ICD codes, making them crucial for diagnosis and billing of diseases. It is imperative that member countries petition the WHO to create diagnostic/billing codes for the PICS conditions. These codes are critically important for researchers to develop the science underlying these conditions, for policymakers to recognize funding priorities, and for providers to assess for PICS in adult and pediatric ICU survivors and their family members.

Brian C. Peach, PhD, is an assistant professor at the University of Central Florida College of Nursing.

Michael Valenti, PhD, RN, is an assistant professor at the University of Central Florida College of Nursing.

Mary Lou Sole, PhD, RN, CCNS, CNL, FAAN, FCCM, is the Dean, Orlando Health Endowed Chair in Nursing, and a Pegasus Professor at the University of Central Florida College of Nursing.

Notes

Conflicts of interest: None declared.
Corresponding author: Brian C. Peach, brian.peach@ucf.edu

References

Angus, Derek C. 2010. "The Lingering Consequences of Sepsis: A Hidden Public Health Disaster?" *JAMA* 304: 1833–34. https://doi.org/10.1001/jama.2010.1546

Azoulay, Elie, Frédéric Pochard, Nancy Kentish-Barnes, Sylvie Chevret, Jérôme Aboab, Christophe Adrie, Djilali Annane et al. 2005. "Risk of Post-traumatic Stress Symptoms in Family Members of Intensive Care Unit Patients." *American Journal of Respiratory and Critical Care Medicine* 171 (9): 987–94. https://doi.org/10.1164/rccm.2004091295OC

Bronner, Madelon B., Hendrika Knoester, Albert P. Bos, Bob F. Last, and Martha A. Grootenhuis. 2008. "Post-traumatic Stress Disorder (PTSD) in Children After Paediatric Intensive Care Treatment Compared to Children Who Survived a Major Fire Disaster." *Child and Adolescent Psychiatry and Mental Health* 2 (1): 9. https://doi.org/10.1186/1753-20002-9

Busico, Marina, Andrea das Neves, Francesco Carini, Marisa Pedace, Dario Villalba, Carolina Foster, Jose García Urrutia et al. 2019. "Follow-up Program After Intensive Care Discharge." *Medicina Intensiva* 43 (4): 243–54. https://doi.org/10.1016/j.medin.2018.12.005

Centers for Disease Control and Prevention. 2020. *Coronavirus Disease 2019 (COVID-19)*. [Online]. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html. Accessed January 15, 2021.

Colbenson, Gretchen A., Annie Johnson, and Michael E. Wilson. 2019. "Post-Intensive Care Syndrome: Impact, Prevention, and Management." *Breathe* 15 (2): 98–101. https://doi.org/10.1183/20734735.0013-2019

Elliott, Doug, Judy E. Davidson, Maurene A. Harvey, Anita Bemis-Dougherty, Ramona O. Hopkins, Theodore J. Iwashyna, Jason Wagner et al. 2014. "Exploring the Scope of Post Intensive Care Syndrome Therapy and Care: Engagement of Non-critical Care Providers and Survivors in a Second Stakeholders Meeting." *Critical Care Medicine* 42 (12): 2518–26. https://doi.org/10.1097/CCM.0000000000000525

Gattinoni, Luciano, Davide Chiumello, Pietro Caironi, Mattia Busana, Federica Romitti, Luca Brazzi, and Luigi Camporota. 2020. "COVID-19 Pneumonia: Different Respiratory Treatments for Different Phenotypes?" *Intensive Care Medicine* 46: 1099–102. https://doi.org/10.1007/s00134-020-06033-2

Gibson, Peter G., Ling Qin, and Ser Hon Puah. 2020. "COVID-19 Acute Respiratory Distress Syndrome (ARDS): Clinical Features and Differences From Typical Pre-COVID-19 ARDS." *The Medical Journal of Australia* 213: 54–6. https://doi.org/10.5694/mja2.50674

Grasselli, Giacomo, Antonio Pesenti, and Maurizio Cecconi. 2020. "Critical Care Utilization for the COVID-19 Outbreak in Lombardy, Italy." *JAMA* 323 (16): 1545–46.

Hatch, Robert, Young Duncan, Vicki Barber, John Griffiths, David A. Harrison, and Peter Watkinson. 2018. "Anxiety, Depression, and Post Traumatic Stress Disorder After Critical Illness: A UK-wide Prospective Cohort Study." *Critical Care* 22 (1): 310. https://doi.org/10.1186/s13054-018-2223-6

Herridge, Margaret S., Angela M. Cheung, Catherine M. Tansey, Andrea Matte Martyn, Natalia Diaz-Granados, Fatma Al-Saidi, Andrew B. Cooper et al. 2003. "One Year Outcomes in Survivors of the Acute Respiratory Distress Syndrome." *New England Journal of Medicine* 348 (8): 683–93.

Heydon, Edward, Bradley Wibrow, Angela Jacques, Ravikiran Sonawane, and Matthew Anstey. 2019. "The Needs of Patients With Post-intensive Care Syndrome: A Prospective, Observational Study." *Australian Critical Care* 33 (2): 116–22. https://doi.org/10.1016/j.aucc.2019.04.002

Hopkins, Ramona O., Lindell K. Weaver, Dave Collingridge, R. Bruce Parkinson, Karen J. Chan, and James F. Orme, Jr. 2005. "Two-year Cognitive, Emotional, and Quality-of-life Outcomes in Acute Respiratory Distress Syndrome." *American Journal of Respiratory and Critical Care Medicine* 171 (4): 340–47. https://doi.org/10.1164/rccm.200406-763OC

Hopkins, Ramona O., Lindell K. Weaver, Donna Pope, James F. Orme, Erin D. Bigler, and Valerie Larson-Lohr. 1999. "Neuropsychological Sequelae and Impaired Health Status in Survivors of Severe Acute Respiratory Distress Syndrome." *American Journal of Respiratory and Critical Care Medicine* 160 (1): 50–6. https://doi.org/10.1164/ajrccm.160.1.9708059

Inoue, Shigeaki, Junji Hatakeyama, Yutaka Kondo, Toru Hifumi, Hideaki Sakuramoto, Tatsuya Kawasaki, Shunsuke Taito et al. 2019. "Post Intensive Care Syndrome: It's Pathophysiology, Prevention, and Future Directions." *Acute Medicine and Surgery* 6 (3): 233–46. https://doi.org/10.1002/ams2.415

Iwashyna, Theodore J., Eugene Wesley Ely, Dylan M. Smith, and Kenneth M. Langa. 2010. "Long-term Cognitive Impairment and Functional Disability Among Survivors of Severe Sepsis." *JAMA* 304: 1787–94. https://doi.org/10.1001/jama.2010.1553

Johns Hopkins University and Medicine. 2020. *COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)*. [Online]. https://coronavirus.jhu.edu/map.html. Accessed July 1, 2020.

Kamdar, Biren B., Rajat Suri, Mary R. Suchyta, Kyle F. Digrande, Kyla D. Sherwood, Elizabeth Colantuoni, Victor D. Dinglas, Dale M. Needham, and Ramona O. Hopkins. 2020. "Return to Work After Critical Illness: A Systematic Review and Meta-analysis." *Thorax* 75 (1): 17–27. https://doi.org/10.1136/thoraxjnl-2019-213803

Karnatovskaia, Lioudmila V., Phillip J. Schulte, Kemuel L. Philbrick, Margaret M. Johnson, Brenda K. Anderson, Ognjen Gajic, and Matthew M. Clark. 2019. "Psychocognitive sequelae of critical illness and correlation with 3 months follow up." *Journal of Critical Care* 52: 166–71. https://doi.org/10.1016/j.jcrc.2019.04.028

Li, Xu, and Xiaochun Ma. 2020. "Acute Respiratory Failure in COVID-19: Is it "typical" ARDS?" *Critical Care* 24 (1): 198. https://doi.org/10.1186/s13054-020-02911-9

Maley, Jason H., Isabel Brewster, Iris Mayoral, Renata Siruckova, Sarah Adams, Kelley A. McGraw, Angela A. Piech, Michael Detsky, and Mark E. Mikkelsen. 2016. "Resilience in Survivors of Critical Illness in the Context of the Survivors' Experience and Recovery." *Annuals of the American Thoracic Society* 13 (8): 1351–60. https://doi.org/10.1513/AnnalsATS.201511-782OC

Marra, Annachiara, Pratik P. Pandharipande, Timothy D. Girard, Mayur B. Patel, Christopher G. Hughes, James C. Jackson, Jennifer L. Thompson, Rameela Chandrasekhar, and Eugene Wesley Ely. 2018. "Co-occurrence of Post-intensive Care Syndrome Problems Among 406 Survivors of Critical Illness." *Critical Care Medicine* 46 (9): 1393–401. https://doi.org/10.1097/CCM.0000000000003218

Matt, Bastian, Daniel Schwarzkopf, Konrad Reinhart, Christian Konig, and Christiane S. Hartog. 2017. "Relatives' Perception of Stressors and Psychological Outcomes- Results From a Survey Study." *Journal of Critical Care* 39: 172–77. https://doi.org/10.1016/j.jcrc.2017.02.036

McPeake, Joanne, Mark E. Mikkelsen, Tara Quasim, Elizabeth Hibbert, Paul Cannon, Martin Shaw, Jane Ankori, Theodore J. Iwashyna, and Kimberley J. Haines. 2019. "Return to Employment After Critical Illness and Its Association With Psychosocial Outcomes. A Systematic Review and Meta-analysis." *Annals of the American Thoracic Society* 16 (10): 1304–11. https://doi.org/10.1513/AnnalsATS.201903-248OC

Mikkelsen, Mark E., Jason D. Christie, Paul N. Lanken, Rosette C. Biester, B. Taylor Thompson, Scarlett L. Bellamy, A. Russell Localio, Ejigayehu Demissie, Ramona O. Hopkins, and Derek C. Angus. 2012. "The Adult Respiratory Distress Syndrome Cognitive Outcomes Study: Long-term Neuropsychological Function in Survivors of Acute Lung Injury." *American Journal of Respiratory and Critical Care Medicine* 185 (12): 1307–15. https://doi.org/10.1164/rccm.201111-2025OC

Mikkelsen, Mark E., William H. Shull, Rosette C. Biester, Darren B. Taichman, Sarah Lynch, Ejigayehu Demissie, John Hansen-Flaschen, and Jason D. Christie. 2009. "Cognitive, Mood, and Quality of

Life Impairments in a Select Population of ARDS Survivors." *Respirology* 14: 76–82. https://doi.org/10.1111/j.1440-1843.2008.01419.x

Mikkelsen, Mark E., Mary Still, Brian J. Anderson, O. Joseph Bienvenu, Martin T. Brodsky, Nathan Brummel, Brad Butcher et al. 2020. "Society of Critical Care Medicine's International Consensus Conference on Prediction and Identification of Long-term Impairments After Critical Illness." *Critical Care Medicine* 48 (11): 1670–79. https://doi.org/10.1097/CCM.0000000000004586

Needham, Dale M., Judy Davidson, Henry Cohen, Ramona O. Hopkins, Craig Weinert, Hannah Wunsch, Christine Zawistowski et al. 2012. "Improving Long-term Outcomes After Discharge From Intensive Care Unit: Report From a Stakeholder's Conference." *Critical Care Medicine* 40 (2): 502–9. https://doi.org/10.1097/CCM.0b013e318232da75

Norman, Brett C., James C. Jackson, John A. Graves, Timothy D. Girard, Pratik P. Pandharipande, Nathan E. Brummel, Li Wang et al. 2016. "Employment Outcomes After Critical Illness: An Analysis of the BRAIN-ICU Cohort." *Critical Care Medicine* 44 (11): 2003–9. https://doi.org/10.1097/CCM.0000000000001849

Ohtake, Patricia J., Alan C. Lee, Jacqueline C. Scott, Rana S. Hinman, Naeem A. Ali, Carl R. Hinkson, Dale M. Needham et al. 2018. "Physical Impairments Associated With Post Intensive Care Syndrome: Systematic Review Based on the World Health Organization." *Physical Therapy* 98 (8): 631–45. https://doi.org/10.1093/ptj/pzy059

Owen, Allison M., Samir P. Patel, Jeffrey D. Smith, Beverly K. Balasuriya, Stephanie F. Mori, Gregory S. Hawk, Arnold J. Stromberg et al. 2019. "Chronic Muscle Weakness and Mitochondrial Dysfunction in the Absence of Sustained Atrophy in a Preclinical Sepsis Model." *eLife* 8: e49920. https://doi.org/10.7554/eLife.49920

Petrinec, Amy B., and Bradley R. Martin. 2018. "Post-intensive Care Syndrome Symptoms and Health Related Quality of Life in Family Decision-makers of Critically Ill Patients." *Palliative & Supportive Care* 16 (6): 719–24. https://doi.org/10.1017/S1478951517001043

Pinto, Neethi P., Elizabeth W. Rhinesmith, Tae Yeon Kim, Peter H. Ladner, and Murray M. Pollack. 2017. "Long-term Function After Pediatric Critical Illness: Results From the Survivor Outcomes study." *Pediatric Critical Care Medicine* 18 (3): e122–30. https://doi.org/10.1097/PCC.0000000000001070

Riegel, Barbara, Liming Huang, Mark E. Mikkelsen, Ann Kutney-Lee, Alexandra L. Hanlon, Christopher M. Murtaugh, and Kathryn H. Bowles. 2019. "Early Post-intensive Care Syndrome Among Older Adult Sepsis Survivors Receiving Home Care." *Journal of the American Geriatrics Society* 67 (3): 520–26. https://doi.org/10.1111/jgs.15691

Righy, Cassia, Regis Goulart Rosa, Rodrigo Teixeira Amancio da Silva, Renata Kochhann, Celina Borges Migliavaca, Caroline Cabral Robinson, Stefania Pigatto Teche et al. 2019. "Prevalence of Post-traumatic Stress Disorder Symptoms in Adult Critical Care Survivors: A Systematic Review and Meta-analysis." *Critical Care* 23 (1): 213. https://doi.org/10.1186/s13054-019-2489-3

Rockwood, Kenneth, Murray Brown, Heather Merry, Ingrid Sketris, John Fisk, and Vascular Cognitive Impairment Investigators of the Canadian Study of Health and Aging. 2002. "Societal Costs of Vascular Cognitive Impairment in Older Adults." *Stroke* 33 (6): 1605–9. https://doi.org/10.1161/01.str.0000017878.85274.44

Rothenhäusler, Hans B., Singrid Ehrentraut, Christian Stoll, Gustav Schelling, and Hans P. Kapfhammer. 2001. "The Relationship Between Cognitive Performance and Employment and Health Status in Long Term Survivors of the Acute Respiratory Distress Syndrome: Results of an Exploratory Study." *General Hospital Psychiatry* 23 (2): 90–6. https://doi.org/10.1016/s0163-8343(01)00123-2

Sidiras, Georgios, Irini Patsaki, Eleftherios Karatzanos, Maria Dakoutrou, Alexandros Kouvarakos, Georgios Mitsiou, Christina Routsi et al. 2019. "Long Term Follow-up of Quality of Life and Functional Ability in Patients With ICU Acquired Weakness—A Post hoc Analysis." *Journal of Critical Care* 53: 223–30. https://doi.org/10.1016/j.jcrc.2019.06.022

Sivanathan, Lavarnan, Hannah Wunsch, Simone Vigod, Andrea Hill, Ruxandra Pinto, and Damon C. Scales. 2019. "Mental Illness After Admission to an Intensive Care Unit." *Intensive Care Medicine* 45 (11): 1550–1558. https://doi.org/10.1007/s00134-019-05752-5

van Beusekom, Ilse, Ferishta Bakhshi-Raiez, Nicolette F. de Keizer, Marike van der Schaaf, Fabian Termorshuizen, and Dave A. Dongelmans. 2019. "Dutch ICU Survivors Have More Consultations With General Practitioners Before and After ICU Admission Compared to a Matched Control

Group From the General Population." *PLoS One* 14 (5): e0217225. https://doi.org/10.1371/journal.pone.0217225

Wintermann, Gloria-Beatrice, Katja Petrowski, Kerstin Weidner, Bernhard Strauß, and Jenny Rosendahl. 2019. "Impact of Post-traumatic Stress Symptoms on the Health-related Quality of Life in a Cohort Study With Chronically Critically Ill Patients and Their Partners: Age Matters." *Critical Care* 23 (1): 39. https://doi.org/10.1186/s13054-019-2321-0

World Health Organization [WHO]. 2019. *International Classification of Diseases (ICD) Information Sheet*. [Online]. https://www.who.int/classifications/icd/factsheet/en/. Accessed July 1, 2020.

Xiang, Xiaoling, and Ruopeng An. 2015. "The Impact of Cognitive Impairment and Comorbid Depression on Disability, Health Care Utilization, and Costs." *Psychiatric Services* 66 (11): 1245–48. https://doi.org/10.1176/appi.ps.201400511

Received: 13 July 2020 | Revised: 12 December 2020 | Accepted: 11 January 2021

DOI: 10.1002/wmh3.431

COMMENTARY

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Fighting a war without weapons? Lessons from the COVID-19 outbreak

Evangelos Vasileiou

Department of Financial and Management Engineering, University of the Aegean, Chios, Greece

Correspondence
Evangelos Vasileiou, Department of Financial and Management Engineering, University of the Aegean, 45 Kountougioti str, Chios 82100, Greece.
Email: e.vasileiou@ba.aegean.gr

Abstract

The recent pandemic of COVID-19 revealed that a highly transmissible virus threatens all humanity because extensive mobility, migration, and millions of passengers who travel worldwide shape our globalized environment and make containment of a virus more difficult. In a war between humans and viruses, we should have the necessary weapons, such as masks, gloves, ventilators, and so forth. However, during the COVID-19 outbreak, there was a shortage of this basic medical and personal protective equipment (MAPPE), even for the health workers. This note focuses on this issue and suggests that a global organization, which stores and renews basic MAPPE would be beneficial in the fight against the next pandemic and that such an organization can be established without significantly increasing the public expenses of the countries.

KEYWORDS

COVID-19, globalization, health-care systems, pandemic, PPE

INTRODUCTION

The year 2020 will be remembered as the year of the COVID-19 pandemic outbreak. By November 30, 2020, more than 62 million confirmed cases had been recorded globally and more than 1.45 million of these patients have died.[1] To reduce the spread of the virus throughout the world, several restrictions were imposed by government authorities, such as mobility restrictions, social distance measures, and lockdowns. This unprecedented global health crisis and the protective measures taken to slow the spread of the disease generated a blend of negative economic (Almond & Mazumder, 2005; Keogh-Brown et al., 2010), psychological (Kumar & Nayar, 2020), and social (Bonaccorsi et al., 2020) consequences.

These extreme conditions would lead to blame games (Roy et al., 2020), and a characteristic conflict took place during the early stages of the pandemic outbreak between the U.S President and the World Health Organization (WHO). President Trump accused WHO for "…severely mismanaging and covering up the spread of the coronavirus,"[2] while the Director-General of the WHO Tedros Adhanom Ghebreyesus said that WHO "…declared the international emergency at the right time when there were only 82 cases outside of

China and no deaths and the rest of the world had enough time to respond."[3] Afterward, several conspiracy theories on the origin of the virus emerged (Nie, 2020).

This note does not take a side in these conflicts. Many studies have been presented in the international literature, in several fields of study, from health and medicine to logistics and socioeconomics, and suggest policies to resolve deficiencies and correct omissions that were revealed during the COVID-19 pandemic. Instead, this note focuses on an issue that emerged during the early stages of the pandemic: the significant shortage of basic Medical and Personal Protective Equipment, such as masks, gloves, ventilators (hereafter "MAPPE").

A BRIEF TIMELINE OF THE COVID-19 OUTBREAK AND OUR MOTIVATION FOR THE STUDY

A brief timeline of the COVID-19 outbreak is the following: on December 31, 2019, the WHO China Country Office was informed of clustered cases of unknown etiology pneumonia in Wuhan City, China. The Chinese authorities identified a new type of coronavirus and the WHO named the novel coronavirus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the disease coronavirus disease (COVID-19).[4] On January 30, 2020, WHO declared the outbreak a Public Health Emergency of International Concern, and on March 11, COVID-19 was declared a pandemic.[5]

In the early stages of the COVID-19 outbreak, many politicians and government authorities declared that "we are at war with an invisible enemy," but, at the same time, there were alarming reports about critical shortages of basic weapons: MAPPE.[6–9]

To illustrate this paradox, I use a Google Trends code that enables me to present the Google Searches Index from all over the world for the terms "Coronavirus," "Medical Masks," and "Medical Masks Shortage" (Figure 1). The "Coronavirus" index is used as a fear sentiment index (Vasileiou, 2020) in which higher index indicates higher fear. A basic MAPPE is a medical mask, which is a highly recommended protective measure against the spread of the virus. However, as Figure 1 shows, when the searches for the medical masks were at

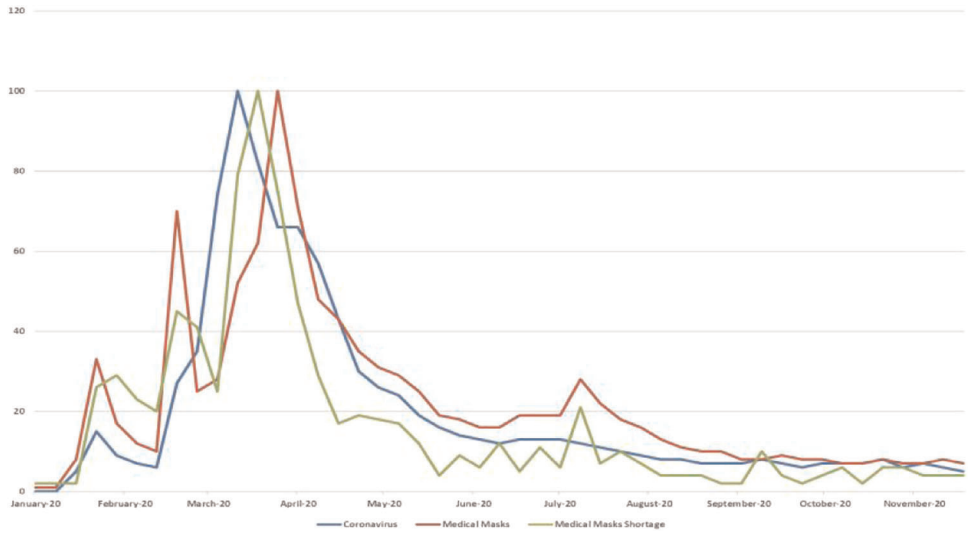


FIGURE 1 Google Trends searches

their highest levels there was a shortage in the market, which means that during the early stages we did not have the weapons to fight the invisible enemy.

The COVID-19 outbreak echoed a 2015 TED speech in which Bill Gates warned of the strong likelihood of a future pandemic outbreak, and the fact that humanity needs an army for a war against germs, that is, "A Global Alert and Response System," which aims to:

- strengthen health systems in poor countries,
- create a medical corps,
- run germ games, and
- step up research development (Gate, 2015).

However, as Gates notes, the budgetary requirements of such a system were unknown. Like Gates, we cannot estimate the budget of such an organization, but we can present a policy that could resolve the MAPPE shortage without significant costs to national and international budgets, and which would prove beneficial for the entire world.

NEED FOR MEDICAL AND BASIC PERSONAL PROTECTION EQUIPMENT: WHY THERE WAS A SHORTAGE AND WHAT WE SHOULD LEARN FROM THE COVID-19 PANDEMIC

COVID-19 showed that it is too difficult to increase the production of basic MAPPE equipment, such as masks, gloves, ventilators, in the midst of an emergent pandemic.[10–14] Moreover, when the pandemic hits a country that accounts for a large share of the global production of this equipment, supply chains collapse. For instance, China, which is a major global producer of masks, was the first country to suffer from the new disease during the first months of 2020.[15] For this reason, management of MAPPE supplies was even harder than it would have been if the disease had broken out in another country. How can we address this problem? Part of the solution could be a MAPPE stock, which would enable us to respond to the increased demand for medical equipment when cases increase, and this way give time to industries to produce more MAPPE.

Therefore, at least one of the following should be done: (i) the production of basic MAPPE should not be over-reliant on a specific country, (ii) national MAPPE stockpiles should be established, and/or (iii) a global reserve should be readily available for use when and where it is needed. (i) and (ii) should be explored by governments around the globe as they involve various socioeconomic parameters, which are specific to each individual country, a fact that adds complexity to the analysis of such efforts and goes beyond this note's scope. (iii)—though seemingly more complex—can prove more reliable and sustainable than the others.

Additionally, COVID-19 was a hard lesson for humanity because the risk of a pandemic had been underestimated and humanity was not ready to effectively respond to these extreme health stress conditions. As Gates mentions in his speech, many countries have reserves in military weapons, but they do not have enough reserves in "medical weapons," such as masks, ventilators, or gloves for a war against a virus. Otherwise, we will encounter significant shortages in the future as supplies will again outpace demand, jeopardizing humanity's efforts to contain the spread of contagious viruses.

Moreover, our experience with COVID-19 revealed that the shortage of basic MAPPE was apparent during the COVID-19 outbreak and had a significant impact not only on citizens but also on health-care workers (Ming et al., 2020).[16–18] It is like sending our troops to war without the appropriate equipment. Failing to protect health-care workers not only

constitutes a moral failure but it also puts immense pressure on health-care systems, which are then forced to deal with a surge in patients while understaffed.

Therefore, it is clear that a MAPPE reserve should exist, but why did it not? As mentioned above, one reason is that the likelihood or severity of a pandemic was underestimated even though there were documented warnings about the dangers of a pandemic before the emergence of COVID-19 (Jonas, 2013). A second argument could be associated with economic reasons, for example.

- the cost of the surplus equipment, which may be significantly high for some poor countries to afford, and
- a national stockpile strategy may be neglected even in wealthy countries when an economic recession comes and/or contractionary fiscal policies need to be implemented.

A third reason could be associated with poor management: for example, there were countries that had tried to have a MAPPE reserve, but during the COVID-19 pandemic there was news concerning national repositories, which had not been renewed. As a result, when the crisis broke out, this equipment had expired.[19]

The COVID-19 outbreak may give us many lessons regarding the cost of a pandemic, ways to avoid a virus spread, and policies on how to respond rapidly in similar situations in the future. Any policy on medical stock equipment should be feasible and sustainable because we do not know exactly when and where a new life-threatening virus will emerge, so we must always be prepared. Swift action is required no matter what the economic conditions are.

Therefore, the following question arises when we consider the events that unfolded during the initial stages of the COVID-19 pandemic: Should the MAPPE reserve be national or international? A possible argument could be that similarly to national security, for which each country has its own army equipment, each country should be responsible for its own national medical equipment stockpile. However, there are certain disadvantages to this approach.

Beyond the economic and administrative issues surrounding a sustainable national MAPPE, the COVID-19 experience shows that during pandemics we should act together as a global community and not as individual countries. In a globalized environment with global mobility and migration, a highly transmissible virus could travel around the world in a matter of days (Vasileiou et al., 2020). In such a case, even the strong health-care systems of advanced economies, for example, the United States, France, the United Kingdom, Spain, Italy, and so forth, cannot respond effectively[20] and no national reserve is adequate if a country is badly hit by a pandemic. Therefore, a strategic plan to build a large MAPPE reserve that will be both affordable and sustainable might have a greater chance of success under the auspices of a joint international effort rather than a single country.

What will happen if the next pandemic emerges in a low-income country? Should other countries let these people fight against the virus on their own? Additionally, a virus can easily spread beyond national borders and a national emergency can quickly escalate to an international one. A global and immediate response is required to ensure that an outbreak is effectively contained at a local level before the spread becomes uncontrollable.

What happened during the early stages of the COVID-19 outbreak? Was there solidarity? Reports concerning bans on the export of medical equipment,[21,22] and accusations of "modern piracy"[23] show that the MAPPE shortage not only undermined the efforts to fight the pandemic, but also the solidarity that globalization requires.[24]

COULD A GLOBAL MEDICAL STOCK ORGANIZATION BE A SOLUTION?

The necessity of a MAPPE reserve has been presented above, and in this section, we present our suggestions for an international and sustainable MAPPE reserve that could resolve all the aforementioned drawbacks. Thus, the reserve should:

- be global, and belong to all countries because when an emergency arises, there are urgent needs that a single country reserve will not be able to meet,
- be easily transported when and where it is needed, which means that it should be ready for use in any battlefield against viruses, just like the army,
- satisfy certain specifications and should not be old and outdated; thus, it should not be stored in a repository for a long time because in case of emergency we will not only need quantity, but also quality, and
- be sustainable and unaffected by economic cycles.

As the recent COVID-19 experience has revealed that the cost of a pandemic is very high and certainly higher than the cost that such a stockpile requires. Therefore, securing initial funding from a coalition of governments should be identified as a priority after the end of the current pandemic[25] and significant information about the needs in MAPPE during the early stages of the COVID-19 pandemic can help us estimate the cost of a global MAPPE reserve. How and how much should each country contribute to this fund? Several criteria may be set, for example, a country's population, its status as an advanced, emerging, or developing economy, GDP per capita in USD multiplied by its population, and so forth, to find the best solution regarding how much each country should contribute to the MAPPE stock depending on their economic power.

The next issue is to find a solution for the optimal renewal of the MAPPE. Our suggestion is the following: a "first in, first out" procedure should be followed to avoid expiration costs, especially for medical equipment that has a short service life. How can this be achieved? The member countries of this organization will "buy" medical equipment from the organization to meet part of the regular needs of their health-care systems.[26] With the money from these transactions, the organization will renew its stock (Figure 2 presents an example of the suggested procedure). This way, countries will have the necessary equipment to cover part

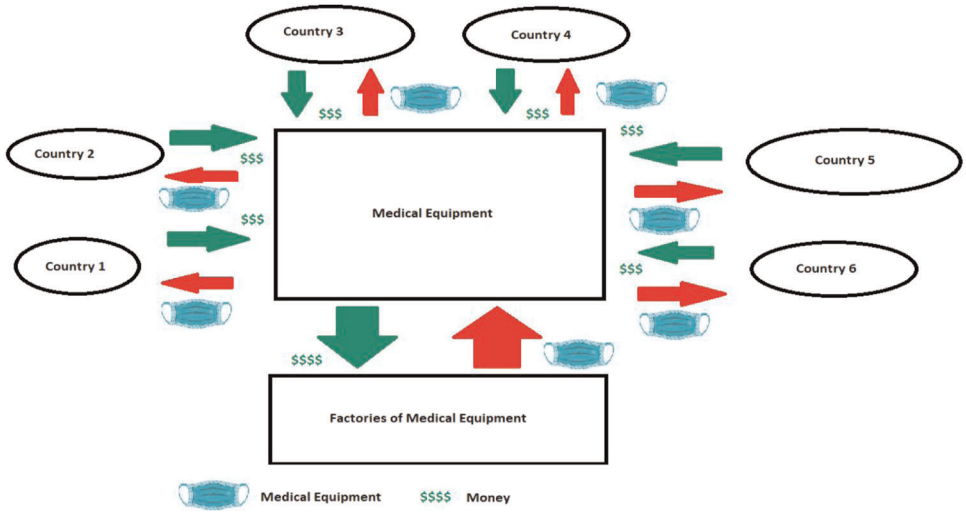


FIGURE 2 A Global Medical Stock Organization and its "First In, First Out" process to renew equipment

of their regular needs and, at the same time, there will be a modern and ready to ship global stock of medical equipment to meet any sudden surge in demand.

The cost for the maintenance of the global MAPPE surplus for an organization, which will work in this way will not be high. Our intention is to avoid presenting economic data that cannot be measured in most detail and the real economic cost of COVID-19 will be estimated in the future. However, the costs involved in setting up and running the suggested organization will not be prohibitive, especially when we consider the fact that the measures already taken to mitigate the economic impact of the pandemic include generous stimulus packages: in the United States alone, a $2 trillion stimulus pack has already been announced,[27] and the European Central Bank (ECB) also announced a €750 billion Pandemic Emergency Purchase Programme (PEPP),[28] while a sharp recession is expected for the following year(s).

If the aim is to protect the economy from a future pandemic, this organization should not be considered a cost, but it should be viewed as insurance/investment because it will help contain the spread of an emerging pathogen by providing medical equipment when the crisis arises and hence lessen the effects of infectious disease on the economy. In the future, we should not send health workers to war against a virus without MAPPE because they are the first line of defense on the battlefield.

We do not claim that the suggested organization will eliminate the total cost of the pandemic, but it will act as a shield in the battle against a virus: it will provide more safety at a low cost and it will save more lives. Additionally, the creation of such an organization emphasizes the need for solidarity among nations and promotes international cooperation in our globalized world. A global surplus means that countries will not need to introduce bans, and there will be no need for "modern piracy" because the repository will give some time to the industries to produce increased volumes of the required equipment.

CONCLUSIONS

The COVID-19 pandemic, like all crises, may prove to be a useful lesson for all of us if we study the data and the facts carefully. This pandemic has demonstrated that in the globalized contemporary environment we live in, with many economic relationships between the countries, the battle is between humanity and viruses. A highly transmissible virus can travel fast around the world because of population mobility and hundreds of thousands of flights every day.[29] Global issues need a global response because if a virus is not contained and spreads beyond its place of origin, such as SARS-Cov-2, it can become a pandemic.

The pandemic revealed many deficiencies, and in this study, we choose to focus on the shortage of basic MAPPE, which was observed during the COVID-19 outbreak, for example, masks, gloves, and ventilators. Humanity did not have the required "medical weapons" in the war against SARS-CoV-2, even though it invests enormous amounts in military weapons it might never use (Gates, 2015).

Why don't we invest in medical weapons? As we present in this paper, it is very difficult for each country individually to maintain a significant surplus in modern medical equipment in the long run. The needs are enormous when a pandemic breaks out and it is not easy to ramp up production of medical equipment and PPE or modify production lines at short notice. As a result, precious time is lost. A surplus of MAPPE would make it easier to ensure equitable distribution of supplies and help curb the spread of a virus, thus minimizing the impact of a pandemic. The cost for this surplus may be huge for a single country to bear and the suggested design for a global MAPPE reserve does not involve increased cost.

If global leaders decide to build a global organization, which stores medical equipment and renews this equipment using the "first in, first out" approach, the cost for the global economy will be significantly low relative to the global GDP. However, the benefits will be

major: a crucial surplus of MAPPE to help fight a future pandemic and minimize an international health risk, as well as messages of solidarity among the nations of the world. Such an organization could contribute to a more stable economic environment because it will reduce the economic risk caused by health risk, but most importantly it will save lives.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest.

ENDNOTES

[1]According to Johns Hopkins Coronavirus Resource Center: https://coronavirus.jhu.edu/map.html.

[2]https://www.cnbc.com/2020/04/14/trump-calls-for-halt-to-us-funding-for-world-health-organization-amid-coronavirus-outbreak.html

[3]https://www.livemint.com/news/world/covid-19-will-be-with-us-for-a-long-time-and-can-easily-ignite-who-11587572606311.html

[4]Some highlights from the Novel Coronavirus (2019-nCoV) SITUATION REPORT—1 (World Health Organization): https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200121-sitrep-1-2019-ncov.pdf.

[5]https://www.who.int/westernpacific/emergencies/covid-19

[6]https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/faqs-shortages-surgical-masks-and-gowns-during-covid-19-pandemic

[7]https://www.ecdc.europa.eu/en/publications-data/cloth-masks-sterilisation-options-shortage-surgical-masks-respirators

[8]https://www.nytimes.com/2020/03/29/business/coronavirus-us-ventilator-shortage.html

[9]https://www.machinedesign.com/medical-design/article/21125385/global-medical-equipment-shortage-as-covid19-spreads

[10]https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/faqs-shortages-surgical-masks-and-gowns-during-covid-19-pandemic

[11]https://www.ecdc.europa.eu/en/publications-data/cloth-masks-sterilisation-options-shortage-surgical-masks-respirators

[12]https://www.machinedesign.com/medical-design/article/21125385/global-medical-equipment-shortage-as-covid19-spreads

[13]https://www.ft.com/content/5a2ffc78-6550-11ea-b3f3-fe4680ea68b5

[14]https://www.theverge.com/2020/4/15/21222219/general-motors-ventec-ventilators-ford-tesla-coronavirus-covid-19

[15]https://www.voanews.com/science-health/coronavirus-outbreak/world-depends-china-face-masks-can-country-deliver

[16]https://www.washingtonpost.com/health/mask-shortage-for-most-health-care-workers-extended-into-may-post-ipsos-poll-shows/2020/05/20/1ddbe588-9a21-11ea-ac72-3841fcc9b35f_story.html

[17]https://www.who.int/news-room/detail/03-03-2020-shortage-of-personal-protective-equipment-endangering-health-workers-worldwide

[18]https://www.euronews.com/2020/04/21/a-mostly-virtual-westminster-reopens-amidst-ppe-shortage-debacle

[19]https://globalnews.ca/news/6651402/ontario-coronavirus-masks-medical-supplies-expired/

[20]The death toll from COVID-19 is very high in the countries we mentioned as you can see in several COVID-19 databases.

[21]https://www.nytimes.com/2020/03/07/business/eu-exports-medical-equipment.html, https://abcnews.go.com/Health/wireStory/scramble-virus-supplies-strains-global-solidarity-69958117

[22]http://www.wcoomd.org/en/topics/facilitation/activities-and-programmes/natural-disaster/list-of-countries-coronavirus.aspx

[23]https://www.bbc.com/news/world-52161995

[24]A pandemic is global and hence a global response is needed. This is a matter of values that reflects concerns about the world and society we want to live in. For example, if COVID-19 emerged in a poor country and this county

did not have enough MAPPE reserves due to economic issues, would it be an acceptable solution to let the death toll increase because of lack of protective measures?

[25]Many organizations have been established after crisis periods, for example, International Monetary Fund and World Bank after World War II.

[26]Member countries will review the quality of the equipment.

[27]https://edition.cnn.com/2020/03/25/politics/stimulus-package-details-coronavirus/index.html

[28]https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200318_1%7E3949d6f266.en.html

[29]https://www.flightradar24.com/data/statistics

REFERENCES

Almond, D., & Mazumder, B. (2005). The 1918 influenza pandemic and subsequent health outcomes: An analysis of SIPP data. *American Economic Review*, *95*(2), 258–262. https://doi.org/10.1257/000282805774669943

Bonaccorsi, G., Pierri, F., Cinelli, M., Flori, A., Galeazzi, A., Porcelli, F., Schmidt, A. L., Valensise, C. M., Scala, A., Quattrociocchi, W., & Pammolli, F. (2020). Economic and social consequences of human mobility restrictions under COVID-19. *Proceedings of the National Academy of Sciences of the United States of America*, *117*(27), 15530–15535. https://doi.org/10.1073/pnas.2007658117

Gates, B. (2015). *The next outbreak? We're not ready*. TED. https://www.ted.com/talks/bill_gates_the_next_outbreak_we_re_not_ready?language=en

Jonas, O. (2013). *Pandemic risk*. World Bank. https://openknowledge.worldbank.org/handle/10986/16343

Keogh-Brown, M. R., Wren-Lewis, S., Edmunds, W. J., Beutels, P., & Smith, R. D. (2010). The possible macroeconomic impact on the UK of an influenza pandemic. *Health Economics*, *19*(11), 1345–1360. https://doi.org/10.1002/hec.1554

Kumar, A., & Nayar, K. R. (2020). COVID 19 and its mental health consequences. *Journal of Mental Health*, *1–2*, 817–818. https://doi.org/10.1080/09638237.2020.1757052

Ming, X., Ray, C., & Bandari, M. (2020). Beyond the PPE shortage: Improperly fitting personal protective equipment and COVID-19 transmission among health care professionals. *Hospital Practice*, *48*(5), 246–247. https://doi.org/10.1080/21548331.2020.1802172

Nie, J.-B. (2020). In the shadow of biological warfare: Conspiracy theories on the origins of COVID-19 and enhancing global governance of biosafety as a matter of urgency. *Journal of Bioethical Inquiry*, *17*(4), 567–574. https://doi.org/10.1007/s11673-020-10025-8

Roy, M., Moreau, N., Rousseau, C., Mercier, A., Wilson, A., & Atlani-Duault, L. (2020). Ebola and localized blame on social media: Analysis of Twitter and Facebook conversations during the 2014–2015 Ebola epidemic. *Culture, Medicine and Psychiatry*, *44*(1), 56–79. https://doi.org/10.1007/s11013-019-09635-8

Vasileiou, E. (2020). Behavioral finance and market efficiency in the time of the COVID-19 pandemic: Does fear drive the market? *International Review of Applied Economics*, *35*(2), 224–241. https://doi.org/10.1080/02692171.2020.1864301

Vasileiou, E., Samitas, A., Karagiannaki, M., & Dandu, J. (2020). Health risk and the efficient market hypothesis in the time of COVID-19. *International Review of Applied Economics*, *35*(2), 210–223. https://doi.org/10.1080/02692171.2020.1864299

AUTHOR BIOGRAPHY

Evangelos Vasileiou, Ph.D, is an Assistant Professor at the University of the Aegean, School of Engineering, Department of Financial and Management Engineering, Chios, Greece.

How to cite this article: Vasileiou, E. (2021). Fighting a war without weapons? Lessons from the COVID-19 outbreak. *World Medical & Health Policy*. 13, 383–390. https://doi.org/10.1002/wmh3.431

World Medical and Health Policy

BOOK REVIEW

Alice C. Hill, and Leonardo Martinez-Diaz, *Building A Resilient Tomorrow: How to Prepare for the Coming Climate Disruption.* New York: Oxford University Press, 2020. pp. 250. ISBN: 978-0-19-090934-5.

At this writing, a pandemic continues to slam into countries with the speed and lethal impact of a natural disaster. Unlike most disasters, this crisis strikes the entire world at once. Global climate change, though less immediate, shares some similarities with the COVID-19 contagion. Climate change is also a global health, humanitarian, and economic crisis that contributes to the death, illness, and poverty of those most vulnerable to extreme heat, vector-borne disease, floods, drought, cyclonic winds, invasive pests, and other climate-related risks. Both the climate challenge and this pandemic underscore our common vulnerability. Moreover, *neither* are *Black Swan* events. Scientists have warned us for years about both. We are reminded again of our habitual discounting of both the lessons of the past and the science-based scenarios of the future.

Building A Resilient Tomorrow: How to Prepare for the Coming Climate Disruption examines major challenges presented by global climate change and the corresponding need to build *climate resilience* in the face of these risks. Climate resilience is a continual process of identifying, avoiding, managing, and withstanding the many risks posed by climate change. The subject of resilience is growing in importance as our current greenhouse gas emissions trajectory continues to far exceed the pathway needed to avoid destabilizing increases in temperature. Even with rapid and dramatic reductions in emissions, we are likely locked into many decades of escalating climate risk and extreme weather.

Alice Hill is a senior fellow for climate policy at the Council on Foreign Relations. She was previously a special assistant to President Obama and director at the National Security Council for policy on climate resilience policy and catastrophic risks, including biological threats. In 2009 Hill led planning at the U.S. Department of Homeland Security on climate adaptation, and catastrophic biological and chemical threats, including pandemics. Earlier in her career, she led white-collar crime prosecution in the Los Angeles U.S. Attorney's office. Leonardo Martinez-Diaz is the Global Director, Sustainable Finance Center of the World Resources Institute, where he leads engagement on sustainable finance. Previously, he was with the U.S. Department of the Treasury as Deputy Assistant Secretary for Energy

doi: 10.1002/wmh3.424

and Environment, responsible for overseeing multilateral climate and environmental funds, work on climate finance, and leading on climate change elements of international negotiations.

This book covers expansive territory in 10 brief chapters, exploring such diverse issues as how and where to build in an age of changing climate, the legal and market implications of climate risks, climate change and national security, climate risks and inequality, and decisions on relocating people and settlements among other topics. A chapter on the importance of maintaining free, openly sourced climate and weather data in the United States and the development of climate analytics is highly relevant for the assessment of climate impacts on human health. This data is also critical for evaluating the value at risk of many types of assets and property in the face of climate hazards.

The authors succeed in shedding light on a complex subject while avoiding the narrative quicksand of technical jargon. Their use of clear and timely examples of climate risks and related opportunities for resilience building will be of interest to both the specialist and general reader. Although the book acknowledges the critical nexus between science and policy, it steers clear of deep digressions on both. At the same time, the authors sidestep the temptation to render apocalyptic pronouncements that afflict many publications with "climate" in the title. As compared with most other books on climate resilience, this volume offers the reader an accessible and thought-provoking survey of this complex and wide-ranging challenge.

In the chapter entitled "Harden the Healthcare System, and Make it Smarter," the authors underscore the health challenges posed by climate change. For example, extreme heat is currently the greatest climate-driven health threat, killing more people than any other natural hazard. In one instance in 2010, a heatwave in the Indian city of Ahmedabad reached 116°F (47°C), causing 1,300 deaths. Vector-borne diseases are increasing and expanding their ranges as temperatures rise, mosquitoes migrate and carry the Zika virus, Dengue, West Nile, and Chikungunya, while other vector-borne diseases are spread through ticks and fleas.

Climate change threatens water security, access to clean water and increases exposure to water-borne diseases, including those spread through bacteria and toxins produced by algae. Cholera, still a significant public health threat in poor countries, is exacerbated by flooding that spreads the bacteria. Climate change also threatens food security, given that increasing heat, drought, flooding, and invasive pests lower crop yields and weaken entire food chains from production, storage, transport, processing to consumption. The authors note that rising temperatures are also linked to deteriorating mental health, evidenced in part by increased psychiatric admissions and suicides during periods of extreme temperature. Climate-related disasters take an emotional toll, about half of the Americans who endured Hurricane Katrina developed some type of anxiety or mood disorder.

Hill and Martinez-Diaz assert that overlooking the impact of climate hazards on health-care infrastructure places lives at risk. For instance, the loss of power without adequate backup generators can kill patients. In a Florida nursing home after Hurricane Irma, the loss of power knocked out air conditioning, causing inside temperatures to rise as high as 100°F (38°C). Compounded by a delayed

evacuation, the heat caused the death of 12 people. After Irma, the U.S. Congress mandated training for local governments and utilities in order to prepare for increasing power losses in medical facilities and nursing homes resulting from extreme weather. The authors cite resilience measures put in place by the vast Texas Medical Center in Houston after Tropical Storm Allison, installing watertight flood doors, widened drainage culverts, elevated electrical and pump systems, a flood alert system, and increased training among other measures (pp. 140–141).

This book came to press just before the global COVID-19 outbreak. However, passages on climate-related health risks bear a striking resemblance to much of the current discourse on pandemics and are prescient: "Once an oncoming health threat is identified, public health practitioners should have the capacity to mobilize resources to address it, including providing the public with the information it needs to take precautions" (p. 142). On the need for early detection, the authors observe that: "Early-warning systems that communicate information about an impending [climate-related] disease outbreak can also save lives by giving both government authorities and the public time to take preventive action. Some researchers even dream about the creation of a global early-warning system for *infectious disease*" (p. 143, italics added).

Hill and Martinez-Diaz conclude their chapter on health by advocating greater disease surveillance, predictive capabilities, early-warning systems, and the use of climate vulnerability assessments by medical facilities. They further recommend investing in resilience retrofits and upgrades and urge that medical, nursing and public health education incorporate climate change into core curricula. Finally, they see value-added in a collaboration between federal and private partners to create a cadre of "climate-science translators" who will help state and local governments to evaluate climate risks and devise effective resilience strategies (pp. 210–211). The concluding chapter notes the glaring retrograde movement of the current U.S. administration with respect to long-accepted tenets of climate science and pragmatic policy, but do not dwell on this, preferring to position their recommendations for public action as forward-looking at present, but absolutely necessary.

In Chapter 3, "Making Markets Work for Resilience," the authors provide a concise overview of the current movement toward greater climate risk disclosure and its market implications, the impact of climate risk on the bond market, municipal credit ratings, and developments in the insurance industry among other trends. This chapter effectively conveys the mounting pressure on market actors to disclose climate risks and the potential costs of inaction on resilience. This reviewer's experience with companies that sell technologies, services, and products to help buyers better manage their climate risks suggests that the "smart money" in business is already embarking on multitudinous actions to build resilience. This resilience-building is not driven by policy, but by the recognition that climate risks threaten current and future private properties and assets, operational continuity, supply chains, and other business considerations.

Furthermore, private actors rarely use climate jargon to describe resilience building, unlike the "green" actions taken to reduce or "mitigate" the emissions of greenhouse gases. Instead, they use the language of business to report activities related to resilience: finance, risk management, product development, etc. Con-

sequently, most private work on resilience does not get counted as formal "climate resilience" by policymakers. Even so, as climate risks worsen, the demand for all kinds of solutions will only increase. Resilience is a big business now and one destined to grow larger—but a business that still remains hidden in plain sight.

In many sectors, entrepreneurs, nimble companies, and investors recognize the business potential in rising heat, drought, flooding, vector born disease, sea-level rise, cyclonic winds, and other threats. This includes health care, where new vaccines, pharmaceuticals, preventive measures, protocols, and products to protect against vector-borne diseases delivered by mosquitoes and other pests will be needed, as will several measures against extreme heat and more resilient healthcare facilities among other solutions.

Finally, the authors give short shrift to the Paris Agreement on climate change (pp. 90–91). The volume was written during the latter days of the Trump administration, which had pulled out of the agreement. But given the high-level attention paid to Paris outside of the United States their views on this agreement would be interesting. Perhaps the authors do not think that Paris plays a significant role in climate resilience, or they believe it is flawed, we do not know. But their view on what impact, if any, Paris might have on resilience would be an interesting addition to the discussion.

In summary, the authors have succeeded in providing an excellent overview of major developments in the growing field of climate resilience. They have done so in a manner that is accessible to a wide spectrum of readers—no easy feat. They make a convincing case that climate resilience is a growth area, and one of increasing importance to medicine and public health.

Steven R. Wilson
Senior Advisor, The Climate Service (https://www.theclimateservice.com)

DOI: 10.1002/wmh3.453

BOOK REVIEW

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Tales of two planets: Stories of climate change and inequality in a divided world

Edited by J. Freeman

Penguin Books, 2020, 320 pp. ISBN 9780143133926 (paperback).

Building on his earlier work on the experiences of income inequality, John Freeman, focuses on climate change and inequality in his new book. Climate change and inequality are inextricably interlinked and currently have become a crucial global crisis. Freeman has brought together diverse voices that depict ways in which a disastrous mix of pre-existing inequalities and climate change are impacting the everyday life of millions of marginalized and vulnerable communities. An ensemble of writers shares their stories and poems depicting the complexity of climate change and inequality. Many of the stories are from the places at the frontline of climate change, from countries like Bangladesh, India, Pakistan, Indonesia, Kenya, and Haiti. Although divided by their region, they share the same existential threats: Resource exploitation, global warming, inequalities, and environmental degradation. The book, with the help of the contributing authors, highlights the multifaceted and multidimensional nature of climate change.

One of the biggest injustices inherent in climate change is that those least responsible face its disproportionate impacts. Gaël Faye writes that the carbon footprint of the people in Burundi is much less than the average American, the worst impacts, however, are experienced by the vulnerable population of Burundi. The book also calls attention to the unsustainable developmental measures undertaken by the developing countries at the expense of the marginalised and the "unimagined communities" (Nixon, 2011, p. 150), which further fuels climate change and widens the gap between the rich and the poor. Anuradha Roy states an example of India's Uttarakhand where villages submerged to construct a dam providing electricity to the capital city of New Delhi. People on the margins remain invisible from this quest to become a developed nation, which was the case with the city of Beirut in Lina Mounzer's essay.

Diego Osorno states that the mode of resistance for the Raramuri communities in Mexico, much like the indigenous communities across the world, involves leaving their native place; to obtain their autonomy from the hegemonic capitalist world-economy, which has taken away their lands, forests, and water. Many from places (like Bangladesh, Turkey, Syria, and Haiti) under environmental distress move to new countries. For them, life after leaving and coming to a new country includes fighting another threat emanating from this world economy—climate change. Sulaiman Addonia rightly points out that for the refugees "standing up for the earth has been part of fighting for (his) existence" (p. 92). As they voice their concerns for their communities and their indigenous rights and what is to become of them due to environmental pressures, they face contempt, as evidence by the way voices questioning the status quo are dealt with by the Chinese authorities in Ian Teh's work. Similarly, in Edwidge Danticat's essay, the Haitian government violently responded to the protests, organised by the locals, against the corrupt practices by private players and state

authority. People on the frontline of climate change, despite their hardships, also have much to teach us, especially resilience when faced with some of the most devastating impacts of climate change. From Ligaya Mishan's writing on the ecologically fragile island of Hawai'i and its people, we can understand that disasters have become an inseparable part of their identity. Yet, they persevere and fight and somehow continue to help each other even when faced with extreme climatic events. Tahmima Anam's work on Bangladesh points out that though the developed world cannot fathom the impacts of climate change, people from the developing world can see the future. They have the resilience to cope, in their own ways, with climate adversities. When the catastrophe strikes, the whole world would look up to the people on the frontline, and learn to develop resilience.

Belongingness, identity, and homelessness are repetitive themes throughout the collection. Displacement is one of the most significant impacts of climate change, as people are now increasingly forced to leave their homes. Burhan Sönmez gives a personal account of environmental vulnerabilities in his village in Turkey, resulting in a dwindling population. Yet, the displaced and the dispossessed are not part of any national debate. They remain invisible and largely undocumented, as evident from the accounts of the plight of the displaced population in Mohammed Hanif's work from Pakistan. But displacement is not just limited to the physical movement; it also includes people who are now being "displaced without moving" (Nixon, 2011, p. 19), as they become "resource dispossessed" (Sainath, 1996, p. 72). They are losing their home, land, and environment and its very characteristics that made it inhabitable in the first place. Years of violence against Riachuelo in Argentina has made it unfit to sustain life. Though the rich have moved away, the marginalized continue to live there and use its polluted water, writes Mariana Enriquez. In Eduardo Halfon's essay, Lake Amatitlan in Guatemala once provided livelihoods to the indigenous people but has now transformed into a water body with floating garbage. Underneath these narratives, lies melancholy, nostalgia, and distress; a longing for going back to the planet that was.

Some of the collection's works (Sayaka Murata's *Survival* and Krys Lee's *The Imperiled*) take a futuristic approach, thereby weakening the argument that climate change is not a distant threat, but a current reality. However, works depicting writers' personal experiences (Edwidge Danticat's *Machandiz* and Tahmima Anam's *The Unfortunate Place*), with the impacts of climate change, make up for it. Many of us, particularly from the developing world, do not have to go very far to witness the stories and the essays in the book playing out in the real world. However, for the people from the developed world, the lack of engagement with the impacts of climate change in their region, would probably not hit the chord. Nonetheless, in the current age of extremes, the collection is timely and brings us face to face to the repercussions of our actions and inactions. It attempts to provide a holistic understanding of climate change and inequality and gives us a picture of what would happen if left unaddressed. What makes this work powerful is the plurality of the voices from the places that are under acute stress. This book is not just a testimony for millions of people already living with the impacts of climate change, but it is an expression of hope that stories of those on the frontline will help those from the other half of the world to understand the problems and move them to act.

Reviewed by Ayushi Rai

Indian Institute of Technology, Gandhinagar, India

REFERENCES

Nixon, R. (2011). *Slow violence and the environmentalism of the poor*. Harvard University Press.
Sainath, P. (1996). *Everybody loves a good drought: Stories from India's poorest districts*. Penguin Books.

World Medical and Health Policy

BOOK REVIEW

Friel Sharon. ***Climate Change and the People's Health. New York, NY: Oxford University Press, 2019.***

The Earth's environment has changed over the past 50 years from the closing of the ozone hole in May 2020 (McRae, 2020) to the reduction of global emissions by 17 percent from the cessation of activities due to the COVID-19 pandemic in the early part of 2020 (Mooney et al., 2020). Emma Schymanski's concept of "exposome," which is the sum of all the environmental drivers of health and diseases: a combination of external factors (chemicals contained in the air, water, or food), and of internal components produced by our organism in response to various stress factors, captures the environmental influences that impact our health (University of Luxembourg, 2020).

Sharon Friel's "Climate Change and the People's Health" offers a more cogent argument to what human society can do, and offers a broader perspective on how we can move forward after the pandemic-driven natural experiment showed that human activity (or, inactivity, in this case) can make a difference. Nancy Krieger provides a historical look at environmental movements in the recent past and reiterates "…although the biologic may set the basis for the existence of humans and hence our social life, it is this social life that sets the path along which the biologic may flourish-or wilt" (p. xvi).

Friel's Introduction sees the book's contribution to the conversation with (i) how climate change interacts with and exacerbates existing health inequities, (ii) the "consumptagenic system—an integrated network of policies, processes, governance, and modes of understanding that fuel unhealthy, environmentally destructive production and consumption," and (iii) mobilizing effective action on climate change and health inequity requires a systems approach (pp. xxi–xxii).

Health inequity are those differences in health outcomes that are a consequence of unjust social arrangements, which are avoidable and may be remedied. These differences are not inevitable and the failure to avoid or remedy them can be seen as a failure of social justice (p. xxv).

Friel frames her perspective of how we impact our environment and climate by what we do to live. We develop systems of governance and industries that con-

doi: 10.1002/wmh3.386

tribute to the ill health of its citizens. Health inequities result, which negatively impact the climate and the environment as a whole. Health inequalities from the effects of climate change are most evident in the disparities seen in life expectancy, the incidence of premature death and disease. The divergence in life expectancy has been attributed to the incidence and impact of disease.

Extreme weather events (as extreme heat and natural disasters) and rising sea levels tend to impact poorer communities found in areas that are prone to catastrophic changes that result in indirect health risks. Mental health consequences from the loss of property, displacement, and migration are compounded by compromised physical health, Vector-borne diseases from temperature changes, humidity, and rainfall that make the environment more hospitable to disease hosts and vectors (pp. 36–47).

Chapter 2 looks at how humanity produces climate change that exacerbates health inequities. A consumptagenic system is "a network of policies, processes, and modes of understanding and governance that fuels unhealthy, inequitable, and environmentally destructive production and consumption" (p. 57). Friel sees the industrial food system and urbanization as major components of the consumptagenic system that fuel production and consumption that, in turn, contributes to global warming. Global warming, in turn, causes health inequities affecting people today (pp. 57, 58).

Operating on an international scale, these food systems apply the market-based economic system's approach to specialization, economies of scale and accumulation of capital to agriculture and food processing, distribution, and marketing. New technologies transform agricultural practices to more expensive food production with increased use of chemicals and vast amounts of water. The last half of Chapter 2 covers the impact of urbanization. More than half the world today live in cities that are responsible for three-quarters of the greenhouse gas (GHG) emissions that come from energy use. Commodities are not made and sold locally and goods and services are part of the global supply chain that require a lot of energy to function.

In Chapter 3, Friel explains how research, advocacy, and policy, through collaboration across disciplines, sectoral and policy silos can address environmental degradation, social justice, and health inequity. Systems thinking and mobilization of action to achieve targeted and effective outcomes would address the gaps Friel has identified about the impact of climate change on people's health. An interdisciplinary approach involving perspectives from public health, climate science, system science, political science, economics, and public administration are needed to provide evidence to address the interrelationship between climate change, social conditions, and health inequities as well as how they act as shared drivers in a consumptagenic system.

Finally, Friel's solutions require a change in the status quo by redressing inequities in power, money, and resources, as well as in people's daily living conditions. Two focus areas are the industrialized food system and urbanization that are comprehensively covered in Chapter 2. Change is possible when we address the systems that are erected. Systems depend on feedback to thrive, and changing

what goes into the feedback can change the system that will adapt to survive (pp. 113–146).

Bottom line: Those most impacted by climate change are the least able to address the impact it has on their lives. The health impact climate change has must be addressed by changing the consumptagenic system in place that perpetuates itself through consumption despite environmental costs.

The author hopes to reach public health professionals, policymakers, scientists, economists, etc., who would be interested in collaborating in an integrated way to address the problems of health inequities brought about by climate change (p. xxii). This book will provide a scientific foundation for such collaboration and would also make an excellent complementary textbook to public health and sociology courses that deal with environmental health, climate change, and social inequity and health determinants. It is also a useful guide for those in urban planning and organizations working on reducing the impact of climate change on society.

Betty C. Jung[1,2]
[1]*Adjunct Lecturer, Department of Public HealthSouthern Connecticut State University*
[2]*Director, Public Health Expertise Network of Mentors*

References

McRae, Mike. 2020. "That Unusually Large Ozone Hole Over the Arctic Closed Up Again" [Online]. https://www.sciencealert.com/the-unusually-large-hole-in-the-ozone-layer-over-the-arctic-has-closed-itself-up-again. Accessed May 22, 2020.

Mooney, Chris, Brady Dennis, and John Muyskens. 2020. "Global Emissions Plunged an Unprecedented 17 Percent During the Coronavirus Pandemic" [Online]. https://www.washingtonpost.com/climate-environment/2020/05/19/greenhouse-emissions-coronavirus/?arc404=true. Accessed May 22, 2020.

University of Luxembourg. 2020. "The Exposome: When Our Environment Drives Health and Disease" [Online]. https://wwwen.uni.lu/university/news/slideshow/the_exposome_when_our_environment_drives_health_and_disease. Accessed May 22, 2020.

World Medical and Health Policy

Book Review

Chigudu, Simukai. ***The Political Life of an Epidemic: Cholera, Crisis, and Citizenship in Zimbabwe. Cambridge: Cambridge University Press, 2020. $99.99. pp. 346. Hardback. ISBN 9781108773928.***

A 2008–09 cholera outbreak in Zimbabwe resulted in nearly 100,000 infections and more than 4,000 deaths. A cholera epidemic of this scale is unusual outside of conflict and natural disaster settings, as the disease is easily treatable and preventable through public sanitation and access to clean water. In *The Political Life of an Epidemic*, Simukai Chigudu argues that the 2008–09 epidemic was not an unpredictable public health emergency, but rather the flashpoint of a longer-term political-economic crisis. Chigudu, a physician-turned-social-scientist, breaks from traditional studies of cholera by focusing on what the epidemic teaches us about the politics of urban health, humanitarian aid, and citizenship in postcolonial African states.

From the unequal structuring of urban space in the making of Zimbabwe's capital under British colonialism to the postcolonial ruling party's struggle to maintain authority following a number of political and economic crises during the 2000s, Chigudu illustrates the ways in which the epidemic was historically and politically produced. For Chigudu, the epidemic was "man-made," reflecting a complex interplay of the geopolitics of urban governance, failed infrastructure, and social life in Harare. Chigudu's focus on epidemics as a "social-political disasters" (Chigudu, p. 13) raises important questions for public health as to how we make sense of and respond to root causes of epidemics. Chidgudu's most exciting contribution is in illuminating the ways survivors' experiences of the disaster created new forms of political consciousness.

Chapter 1 provides a historical overview of Harare's uneven development as a former colonial city, then as a post-independence battleground for political power, drawing our attention to the way urban poor are continually the hardest hit by political struggle. During 1800–1900s, Harare developed through a basis of racial segregation and spatial inequality whereby colonizers sought to create a hygienic urban environment favorable to white settlers while simultaneously controlling the labor, movement, and access of "African natives." Following a long liberation

doi: 10.1002/wmh3.410

movement, in 1979, ZANU(PF) ushered in a politics of nation-building through development and strong public service delivery especially in health and education. Despite significant social improvements during the 1980s, economic decline during the 1990s severely decreased the quality of urban life. Overcrowding, poor nutrition and sanitation, and rising reliance on informal economies weakened the credibility of the government. Chapter two details how the collapse of the health and water system during the 2000s created a "perfect storm" configuration for a cholera outbreak. By tracing the historical and political-economic factors that influenced the outbreak—including intersecting issues of colonialism, struggles over postcolonial development and national unification, and international policies that premised financing on the neoliberal restructuring of public welfare programs—Chigudu writes against deterministic framings of "failed African states" to a more critical understanding of how the cholera crisis developed out of complex internal and external political decisions.

Chigudu's second major focus is on cholera's ontological politics, "the politics of what is real and how these different realities co-exist and collide with each other" (Chigudu, p. 22). Conflicting narratives about the nature and causes of the outbreak reflected discordant political agendas and weakened emergency response. Chigudu argues that the ruling party sought to command the narrative through a patriotic lens that blamed the crisis on interference by neo-colonial and imperial Western interests. This created a delay in proclaiming the outbreak an emergency and calling upon international relief, to which the opposition party drew grounds for critique by charging misgovernance by the ruling party. Medical missionaries and humanitarian organizations attempted to depoliticize the narrative by framing the emergency in terms of a "salvation agenda" that garnered support and action by appealing to religious and moral claims of witnessing human suffering. Chidgudu argues ultimately the salvation narrative mobilized a short-term response, however, this narrow temporal framing of a public health emergency did nothing to address the long-term, structural needs.

Chigudu forces us to think about how health crises impact the material lives and subject formations of survivors. The fifth chapter focuses on Harare township residents' insistence on committing the violence and everyday suffering during the epidemic to historical memory. In their criticisms of the emergency response and how competing political agendas worsened already difficult realities of everyday life, Chigudu locates a complex understanding of cholera's multiple ontologies from a grassroots viewpoint of historical and political consciousness, rather than a narrative of victimization. This consciousness resulted in new expectations and claims-making among township residents to the state based on how the epidemic shifted their understanding of their rights as citizens. We are left wanting to know more about what these new subjectivities open up in terms of social change in the wake of disasters.

Chigudu's book provides essential frameworks for the critical study of public health and is especially timely for making sense of our current geopolitical moment. This book provides intriguing questions about the political spaces of global health. What competing worldviews are shaping covid-19 response globally?

How will failed responses, like that of the United States, be committed to historical memory? Though the effects of pandemics are no doubt unevenly distributed, how might our collective experiences shape new visions for health justice?

Adrienne R. Hall MPH

World Medical and Health Policy

Book Review

Craig Rood. ***After Gun Violence: Deliberation and Memory in an Age of Political Gridlock*. Eau Claire, WI: Penn State University Press, 2019. pp. 200. Paperback. ISBN 978-0271083841.**

The United States' prioritization of individual liberty has become increasingly conspicuous in light of the COVID-19 pandemic and politicization of wearing masks. But this value of personal freedom—as is enshrined in our Constitution—has always been present in America's unique relationship with gun ownership. Nearly 40 percent of American adults live in a gun-owning household (Pew Research Center), and the United States collectively owns 46 percent of the world's civilian-owned firearms (Small Arms Survey 2018). Dishearteningly, gun violence has become commonplace in America: there are more mass shootings here than anywhere else on earth, the gun homicide rate is over 25 times greater than in other high-income countries, and the gun suicide rate is 8 times greater. Without a doubt, gun violence has become a threat to public health—mental, physical, and emotional—in communities and schools across the country, yet policy discourse on the topic has stalled for decades, with partisan rhetoric and interest groups preventing progress.

In this context—as well as with a particularly divisive election fast approaching—Dr. Craig Rood's *After Gun Violence* offers a timely and intriguing analysis of the interconnectedness of partisan rhetoric, individual liberty, and gridlocked gun debate in America. Written for the academically inclined and rhetorically curious, *After Gun Violence* is not a beginner's introduction to the gun debate. It is a focused narrative about how we as a society communicate about gun rights, including an in-depth analysis of key speeches from past and present Presidents of the National Rifle Association (NRA) and the United States. Through introspection and historical analysis, Rood tracks how America has imbued the arguments for gun rights and gun control with meaning, as well as how these views have become diametrically opposed to the point that little dialogue, much less political progress, has been possible in recent history. In this manner, the book in some ways serves as a case study for the increasingly divisive rhetoric that has widened the ideological gaps between American political parties.

Refreshingly, Rood is not a politician nor policy expert, and his book is not focused on delineating reforms in mental health resources, education, background checks, or

doi: 10.1002/wmh3.423

other related narratives often associated with gun policy and public health. Although he touches on these issues, laying bare his preferences for broad structural reforms, his proclivities instead lie in communication, where he has spent his career analyzing the use of language in divisive public issues. To this end, *After Gun Violence* differentiates itself from traditional, policy-based discussions of gun ownership in the United States, uniquely focusing on the language Americans use to respond to gun-related tragedy—how we pay our respects, define the underlying problem that allowed for the tragedy in the first place, and attempt to prevent future events through persuasive language. It is about how—through language—"the cycle of violence and inaction at the national level has been imprinted on our consciousness" (p. 140). Fortunately, according to Rood, "change is possible" (p. 140).

Rood uses the first of *After Gun Violence*'s neatly structured five sections to define public memory—"a shared sense of the past, fashioned from the symbolic resources of the community and subject to its particular history, hierarchies, and aspirations" (p. 24)—and its intertwined relationship with public debate. Though these definitions may read as dry and myopic to the non-rhetorician, they do provide an expansive framework within which gun debate (and other political debates marked by partisan stalemate) can be understood as social, historical, and rhetorical constructs.

The following three sections are dedicated to explaining three relationships between memory and debate: (i) the weight of the past—how a "particular argument or value is imbued with meaning and significance" (p. 134), (ii) the fleeting past—understanding the "structural and rhetorical forces that sustain inattention and forgetting, as well as the changes that might help circumvent them" (p. 134), and (iii) the implicit past—understanding how to "make implicit assumptions explicit and thus deliberate more openly and purposefully" (p. 134). To help readers understand these dense associations, Rood dissects the NRA's attempted establishment of the Second Amendment as a self-evident truth, President Barack Obama's repeated pleas to not let victims of gun violence die in vain, and how racism and white supremacy have altered both policy as well as the understanding of motives for gun violence depending on the shooter's skin color, even going so far as excusing violence in the case of police brutality. In employing these high-profile narratives as examples, Rood not only makes tangible his complicated, academic claims but also provides compelling storylines while breaking down banal, political promises that will undoubtedly serve as points of reflection during forthcoming Presidential debates.

Rood's niche rhetorical analysis of the gun debate may seem excessively narrow to the average reader, and *After Gun Violence* is precisely intended for academics who are interested in the intersection of rhetoric and divisive debate. To this end, rather than advocating for a specific set of policies (although Rood does acknowledge the need for broad, collective reform in education, employment, and mental health resources), the book concludes with a four-step process by which individuals—specifically, "scholars, educators, and rhetors" (p. 134), underscoring the book's academic intentions—may begin to bridge differences in opinion and move beyond gridlock: "practice openness with others, isolate the point of disagreement, search for the unstated, and adopt a historical perspective" (p. 134). These suggestions for going beyond gridlock are un-

mistakably rooted in Rood's experience as a rhetor, as he ultimately asserts that a thorough understanding of public memory—how it shapes individual opinions as well as societal narratives—is necessary for progress.

Perhaps more importantly, his suggestions assume that both sides will maintain the level of humility needed to actively listen to and attempt to understand the other side's argument—an increasingly unusual spectacle in today's divided political climate. This, however, is not a reason for despair. As Rood asserts: "Since little has changed, we assume that nothing will. We assume that the past predicts the future—or worse, that the cycle of violence and inaction is inescapable… The language and habits that we inherit are not the ones that we must perpetuate… Things can be otherwise" (pp. 140–141).

There could not be a more important time for a book like *After Gun Violence*—which connects the timely subjects of liberty, political discourse, and progress (or lack thereof). Although it was written with the specific intention of analyzing the gun debate through a rhetorical, academic lens, the lessons in *After Gun Violence* can be applied outside of the ivory tower and more broadly to issues beyond gun violence. For example, following George Floyd's murder at the hands of police and the subsequent surge in support for the Black Lives Matter movement, American citizens are increasingly calling on one another to educate themselves about the history and issues related to racial discrimination and gun violence—this requires both the listening skills to internalize others' point of view, as well as the communication skills to dive deeper and ask questions. Furthermore, the United States' inability to control the spread of COVID-19 has left many pleading for citizens to reassess the extent to which personal liberty and comfort should take precedence over collective wellbeing. Rood's expert analysis, timely examples, and apt suggestions—despite a slight textbook quality—provide an actionable framework for anyone seeking to move beyond gridlock in conversation with their peers or better understand the gravity of recycled clichés in political speeches and debates.

Peter Rentzepis
Zufall Health Center—Outreach Dover, NJ, USA

DOI: 10.1002/wmh3.455

BOOK REVIEW

WMHP WORLD MEDICAL & HEALTH POLICY WILEY

Citizen patient: Reforming health care for the sake of the patient not the system

Nortin Hadley

Chapel Hill: UNC Press, 2019. Paperback. 247 pp. ISBN 978-1469654669 (Hardback published 2013).

Nortin Hadley, a medical doctor and researcher, clearly cares about his patients. He cares about treating their illnesses, but more than that he cares about their holistic health—physical, emotional, and financial. *The Citizen Patient* offers his take on the U.S. healthcare system—an institution that he argues should be protecting and promoting patient health, but in its current form fails to do so.

Some of Hadler's concerns focus on well-known issues in American health care: Conflicts of interest between the pharmaceutical industry and clinicians; the quagmire of health service pricing; and the routine overtreatment of patients in the United States. The book also breaks down the nuances of medical research from biostatistics and epidemiology to the limitations of randomized control trials and peer review.

This book was originally published in 2013 but was reissued in paperback in 2019. As those familiar with the U.S. healthcare system know, there have been some major shifts in this period, mainly due to the implementation of the Patient Protection and Affordable Care Act (also known as the ACA or "Obamacare"), which though passed in 2010 was mainly implemented in 2014. The ACA addressed some of Hadler's concerns, such as shifts in culture to patient-centered care and empowering patients and their families to be more involved, which seems to align with his call for a brigade of citizen-patients. However, many of the issues he addresses (such as transparency of price-setting, the standards for setting evidence-based practice, and the self-reinforcing rhythms of peer-review) have only become more concerning.

Hadler is uniquely qualified to write this book, and at times it reads as much as a career retrospective as it does a critique of the healthcare system. He has been involved in clinical research and care in some capacity since he was a teenager. His career is impressive—from serving as attending rheumatologist at University of North Carolina hospitals and as faculty in the school of medicine and microbiology/immunology for more than 40 years. His body of research focuses on the impacts of society on health—from worker health to aging to overarching shortcomings of health systems. As a scholar with international work and research experience, he brings comparative insights to his critiques of the U.S. healthcare system.

Through all of this, however, Hadler's most important priority is the health of his patients. The crux of this book is that the U.S. healthcare system does not put patient health as the highest priority and it does not have rational practices around efficacy or evidence-based treatments. Instead the infrastructure is overly focused on treating patients even if the evidence suggests minimal impacts (such as back surgeries to address pain and fibromyalgia pharmaceutical regimens) and maximizing revenue (regardless of if the hospital or practice is profit or nonprofit). Many of the treatments that Hadler identifies as

wasteful are common practice, as mammogram screenings and the placement of stents to prevent heart attacks, so it would take a great shift in policy to change these practices.

Hadler critiques health administrators even more vehemently than healthcare providers. At times, the tone of this book is quite combative, evidencing a thorough disdain for all health administrators. Some of this is understandable, as Hadler is reflecting on a career of putting patients first and he has watched his institutions and the system choose different priorities. The framing of the book, however, often fails to acknowledge the big-hearted work of public and health administrators working to keep the lights on and navigate a complex system to provide care for both groups of people and specific conditions that will never generate more revenue than it costs to provide the service through a fine balancing act.

As Hadler points out, conflicts of interest inform people's perspectives, and I am no different. As an assistant professor in a Master of Health Administration program, I teach and work with health administrators. Though this may bias my take to be more generous to the work that health administrators do, it also means that I have the chance to see what difficult work they are doing. This has never been clearer than during the pandemic—health administrators have had to care for COVID19 patients while protecting patients and staff from the disease, balance worker safety with operating a healthcare facility, deal with drastic reductions in operating budgets—all while managing illness, death, and loss in the hospital and in their own communities and families. Though there is ample room for critique of the incentives that inform the practice of health administration, it is not fair to dismiss them wholesale.

In many ways, Hadler charges his brigade of citizen patients to go out and change health care because he does not see a way for this to happen from the inside. He argues that the only way the U.S. healthcare system will change is if the *populus* demands it. I appreciate this, but it is also discouraging to think that the inertia is so great within the system that it cannot be changed by those who are powerful inside of it (such as Hadler). Ultimately, Hadler puts the onus on people who are largely disempowered from making decisions about the healthcare system. When people shift from citizens to patients, it is typically at a moment of vulnerability. As the book notes, being a patient in this system is more than a full-time job. Patients are not only managing illness, but also trying to manage accessing health care, researching their own conditions, and deciphering medical billing. Adding political lobbyist to this list seems daunting.

That said, this book identifies many areas where the U.S. system fails. The COVID-19 pandemic has shown these weaknesses in stark terms. Though there have been some changes since the time this book was written, maybe this is the time that we can all imagine ourselves as patients and as citizens. Perhaps this is the time to revisit this book, couple it with new reflections coming out of pandemic, and use this momentum to rebuild the U.S. healthcare system with greater transparency, more rational evidence-based-practices, and a unified priority of patient health.

Kate Cartwright

School of Public Administration,
The University of New Mexico, Albuquerque, New Mexico, USA