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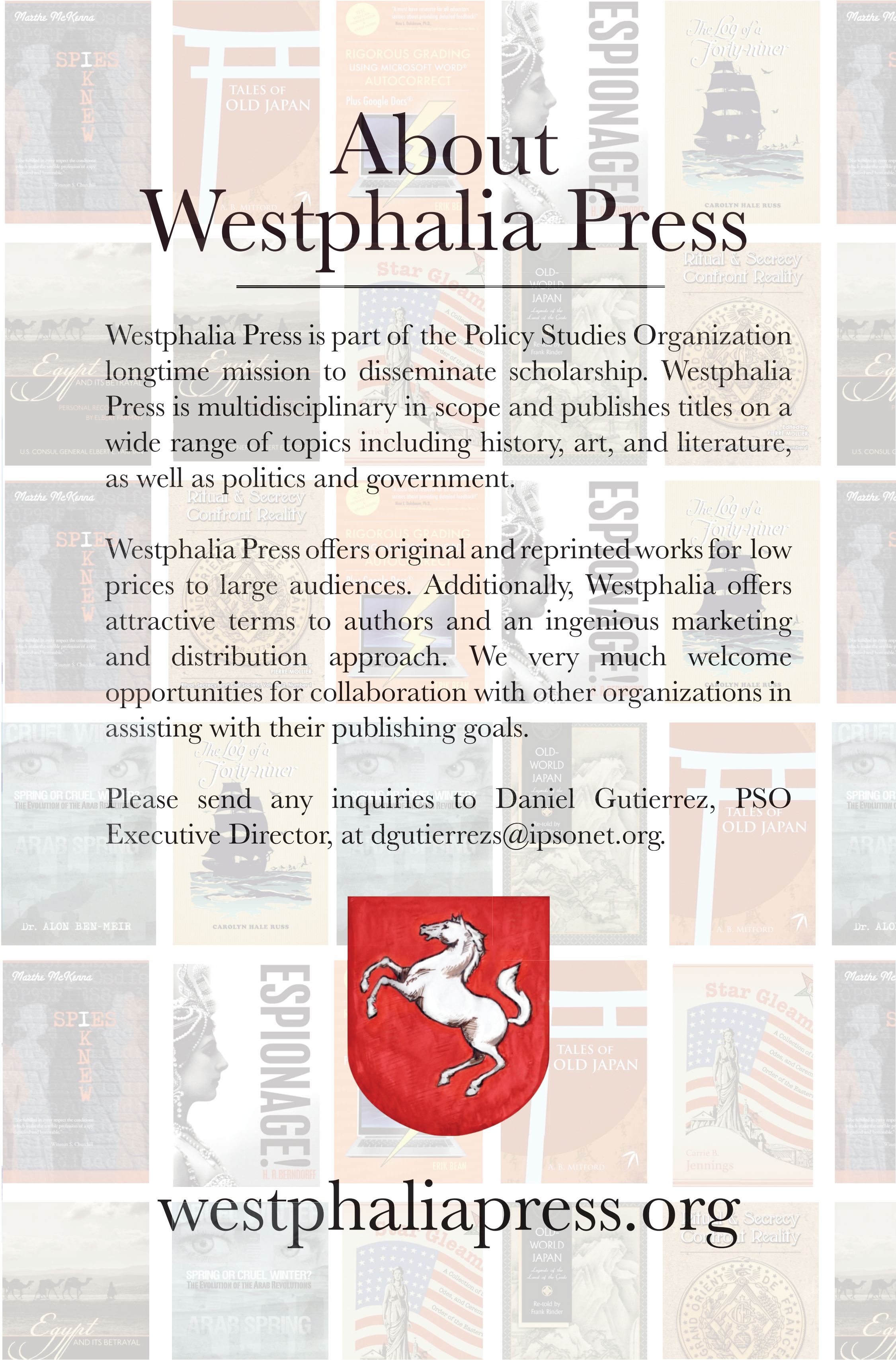

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RESEARCH ARTICLE

Factors associated with the implementation of a comprehensive tobacco cessation benefit among California Medicaid managed care plans

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Abstract

Although tobacco control efforts have been successful at reducing the rate of tobacco use in the general population, rates of use among low-income populations persist. As a leader in tobacco control efforts, the U.S. state of California recently issued regulations regarding comprehensive tobacco cessation service requirements for state Medicaid plans (i.e., Medi-Cal MCPs) providing health care to low-income Californians. This research aims to evaluate the potential factors associated with the adoption of a comprehensive tobacco control program among Medi-Cal's MCPs. In 2018, UC San Diego researchers distributed a survey to a listserv of 25 Medi-Cal MCP health educators, for a response rate of 96%. The survey was comprised of questions related to All Plan Letter (APL) implementation of tobacco cessation services and policies. Health educators were also recruited to participate in a semi-structured interview upon survey completion. Two years postrelease of the APL, Medi-Cal's MCPs demonstrate low implementation of tobacco cessation services and related policies, with only one MCP (5%) fully implementing all 10 core provisions. Five consistent patterns were identified as being associated with implementation: larger MCP enrollment and staffing, lower median household income, noncapitated provider payment, participation in county tobacco control meetings, and high-quality scores for preventive care and treatment of chronic disease. Small-sized MCPs have been slow in fully implementing tobacco cessation services. State policymakers and tobacco control stakeholders may consider providing support to small-sized MCPs to aid in their continued adoption of comprehensive tobacco cessation services. DHCS should also consider releasing guidance on how to engage in activities to ensure APL compliance.

KEYWORDS
Medicaid, policy, tobacco cessation

Key points

- Two years postrelease of APL 16-014, Medi-Cal's managed care plans (MCP) demonstrate low implementation of tobacco cessation services and related policies, with only one MCP (5%) fully implementing all 10 core provisions.
- Five consistent patterns were identified as being associated with implementation: larger MCP enrollment and staffing, lower median household income, noncapitated provider payment, participation in county tobacco control meetings, and high-quality scores for preventive care and treatment of chronic disease.
- The full adoption of a comprehensive tobacco control program will require collaboration and ongoing action from key stakeholders: MCPs, tobacco control, the California quitline, and close monitoring and enforcement by DHCS.

INTRODUCTION

Tobacco use remains the leading cause of preventable disease and premature mortality in the world and is responsible for more than eight million deaths per year (World Health Organization [WHO], 2022). Despite a steady decline in the adult smoking rate overall, higher-income countries like the United States, have seen a much larger drop in smoking rates compared to their lower-income counterparts (Dai et al., 2022). This pattern persists even within higher-income countries, where low-income populations have smoking rates much higher than the general population (Creamer et al., 2019). In the United States, people with low-incomes, pregnant women and infants, and children up to 18 years of age, are eligible for health insurance coverage through the publicly funded Medicaid program, with nearly 18% of Americans enrolled in Medicaid (The Commonwealth Fund, 2020). The adult smoking rate among the Medicaid population is more than double that of the commercially insured population (Creamer et al., 2019).

Guidelines developed by the United States Preventive Services Taskforce (USPSTF) recommend that all insurers, including Medicaid, provide smoking cessation treatment coverage without cost-sharing, including seven Food and Drug Administration (FDA)-approved pharmacotherapies and three counseling modalities (i.e., individual, group, and proactive telephone counseling) (Fiore et al., 1996, 2000, 2008). Despite the release of these evidence-based practices (EBPs), previous research indicates that state Medicaid programs have been slow to implement smoking cessation services over the past two decades (DiGuilio et al., 2018; Halpin et al., 2003, 2004, 2006, 2008; McMenamin et al., 2009, 2010, 2018; Schauffler et al., 2001). In response to this, the 2010 Patient Protection and Affordable Care Act (ACA) included four relevant provisions requiring Medicaid coverage for evidence-based smoking-cessation treatments (The Patient Protection and Affordable Care Act, 2010a, 2010b, 2010c, 2010d). These provisions in addition to the expansion of Medicaid across the majority of US states, led to an increase in access to tobacco cessation benefits for an additional 2.3 million low-income smokers (DiGiulio et al., 2016). Postenactment of the ACA, the California Department of Health Care Services (DHCS) issued a policy letter in September 2014, which outlined additional requirements for comprehensive tobacco cessation services among California's Medicaid managed care plans (i.e., Medi-Cal MCPs) (California Department of Health Care Services [DHCS], 2014). In November of 2016, DHCS issued an updated All Plan Letter (APL) in 2016 extending the implementation deadline for several of the requirements (California Department of Health Care Services [DHCS], 2016). These represent the most comprehensive set of regulations issued by a state Medicaid program to date.

Previous research has documented that only 5% of Medi-Cal MCPs have implemented all 20 different requirements detailed in the APL (McMenamin et al., 2020). Furthermore, two qualitative studies have been published that describe the barriers and facilitators to implementation of the APL within Medi-Cal MCPs and clinics (Economou et al., 2022; Tam et al., 2022).

Economou et al. (2022) reported that interviews with MCPs identified internal organizational resources (including human resources), technical infrastructure, incentives, educational and training resources from DHCS, and structure of contracts with providers as barriers to full implementation. Facilitators to implementation were also reported such as collaboration with other entities, external environmental resources, and engagement in quality monitoring activities. In addition, Tam et al. (2022) examined implementation of the APL in one urban federally qualified healthcare center primary care clinic. Interviews with clinic staff identified barriers to implementation such as lack of knowledge of external resources, lack of communication with external entities, and a lack of training and education on the APL.

The results of these two qualitative studies were used to inform a quantitative analysis using the EPIS implementation science framework to explore the factors that influenced partial and full implementation of the APL provisions (Aarons et al., 2011). This paper is the first to evaluate quantitatively the organizational and environmental factors associated with adoption of a comprehensive set of tobacco cessation services, such as those in the California APL. With more than three quarters (83%) of Medi-Cal beneficiaries enrolled in MCPs California-wide, and more than two-thirds of Medicaid beneficiaries (69%) enrolled in MCPs nationwide (California Department of Health Care Services [DHCS], 2020; Hinton et al., 2020), this research aims to assist state Medicaid policymakers and key stakeholders in understanding the organizational and environmental factors that serve as facilitators and barriers to implementing comprehensive tobacco cessation services.

METHODS

Theoretical framework

This research project investigates the implementation of a state-level policy to require MCPs to provide comprehensive tobacco-dependence treatments. Increasingly, dissemination and implementation (D&I) science has been used to study policy implementation (Crable et al., 2022). One popular D&I framework used in policy implementation projects is the

Exploration, Preparation, Implementation, and Sustainment (EPIS) framework (Aarons et al., 2011). Crable et al. (2022) recommend six strategies to optimize the EPIS framework to inform policy implementation. Two strategies that are relevant to this research project include: (1) Consideration of policy-relevant outer and inner context adaptations and (2) Identification and description of bridging factors necessary for successful policy implementation.

In this study, the policy (i.e., the APL) is being implemented at the MCP level, therefore the inner context refers to the structures, people, and processes that exist internal to the MCP that may influence policy adoption (Crable et al., 2022). This includes components such as the organizational culture and leadership, types of patients served, level of staffing, staff training and turnover, and other organizational resources (Aarons et al., 2011). The outer context refers to the environment external to the organization that influences policy implementation at the organizational level (Aarons et al., 2011). The relevant outer context for MCP APL implementation would include the county-level sociopolitical and economic context; relevant federal, state, and county-level policies; healthcare providers; state and local tobacco control agencies; and professional societies (Aarons et al., 2011). Bridging factors include factors that span both the inner and outer contexts (Aarons et al., 2011). Examples of relevant bridging factors that connect the MCP and external environment may include things such as contracts, negotiated reimbursement rates, and partnerships with other stakeholders.

Data collection

During fall 2018, researchers from UC San Diego, invited all 25 full-service MCPs serving Medi-Cal to participate in the study. MCP health educators (i.e., those most informed regarding APL implementation status) were recruited to participate in an online survey via a DHCS listserv. The online survey included questions on APL-mandated smoking cessation services and policies in place in 2018—specifically addressing implementation of APL items as described in *Outcome Variables* below. Upon survey completion, health educators participated in a semi-structured interview to clarify survey responses and report on the barriers that prevented full APL implementation. Survey and interview data were collected for 24 of the 25 Medi-Cal MCPs (96%), representing 96% of Medi-Cal enrollment. As one MCP administers smoking cessation benefits for two other MCPs, the final sample size was 22.

During spring 2019, MCP administrative documents (e.g., drug formularies, provider manuals) were archived for use as data validation documents. Postsurvey data aggregation, responses were coded into three categories (full, partial, or no implementation) for each APL provision by two researchers: one with a doctorate in health policy (SM) and a policy analyst (SY). Discrepancies in coding were resolved by consultation with an MCP or the project consultant (a former DHCS employee), and/or document reference.

Outcome variables

The survey included questions related to the implementation of each of the 10 core provisions as outlined in the APL ($N = 10$) (California Department of Health Care Services [DHCS], 2016).[1] Per APL Section 1, MCPs are required to ensure that contracted health care providers (1) identify and (2) track all tobacco use on a recurring basis.[2] Section 2 requires MCP coverage of all seven FDA-approved cessation medications for adults for 90 days without cost-sharing and coverage of at least one medication without utilization management.[3] Per Section 3, MCPs must ensure coverage of three recommended counseling modalities[4] without cost sharing. Per Section 4, MCPs must ensure providers refer beneficiaries who use tobacco to the California Smokers' Helpline (i.e., California quitline),[5] and encourage providers to use the quitline's web referral or e-referral systems. Section 5 requires providers to (1) ask all pregnant patients if they use or have been exposed to tobacco and (2) offer all pregnant tobacco users one or more counseling services. Section 6 refers to the provision of tobacco cessation counseling and pharmacotherapy for children and adolescents. Section 7 requires MCPs to (1) conduct tobacco cessation trainings for providers and (2) encourage providers to use the "5 A's."[6] Section 8 refers to engagement in enrollee outreach. Section 9 requires MCPs to require primary care practices to institute a tobacco user identification system. And Section 10 requires MCPs to develop a system to track utilization of tobacco cessation interventions.

Explanatory variables

The Exploration, Preparation, Implementation, Sustainment (EPIS) framework was utilized to select and contextualize various explanatory variables (Aarons et al., 2011). EPIS highlights key components of an implementation process (i.e., *Inner*, and *Outer Contexts*, and factors that connect the two contexts [*Bridging Factors*]) as it relates to the policy being implemented (i.e., the APL). Each component and the corresponding variables measuring each component as suggested by the framework are described below.

Inner (organizational) context

In this policy implementation study, the inner context refers to the individual characteristics of where the policy is implemented (i.e., an MCP's organizational characteristics) (Crable et al., 2022). Previous research suggests that important features of the inner context in terms of APL implementation include organizational resources and knowledgeable staff (Economou et al., 2022). Organizational resources were conceptualized as being related to organizational size (in terms of number of Medicaid enrollees and number of full-time employees). Organizational knowledge was conceptualized as being related to the structure of the organization, with organizational structures that were more focused on providing services to Medicaid enrollees (i.e., Medicaid-only, county-organized health systems, MCPs operating in only one county) anticipated to have higher levels of knowledgeable staff.

Data describing characteristics of each MCP were collected from publicly available sources. Three organizational characteristics: total MCP enrollment, type of enrollees (Medi-Cal and commercial enrollees or Medi-Cal only), and type of managed care model (county-organized health system, Medi-Cal only, or commercial) were obtained from DHCS (California Department of Health Care Services [DHCS], 2019). The number of (1) counties of operation and (2) full-time employees were obtained from the California Association of Health Plans (California Association of Health Plans [CAHP], 2018).

Outer (environmental) context

In the EPIS framework, the outer context refers to the environment external to the MCP that influences implementation of the APL. Previous research identified resources in the external environment as an important factor that contribute to APL implementation (Economou et al., 2022). In this study, environmental resources were conceptualized in three different ways. First, geographic location (urban/rural) was used as a measure of the external resources, as rural environments tend to have fewer tobacco cessation resources (Economou et al., 2022). In addition, counties with higher smoking rates and counties with lower median household incomes were hypothesized to have more resources to address treating tobacco use because of the greater need in these populations.

County-level data were collected including MCP location (urban/rural), county-level smoking rate (above/below statewide average), and median household income. Urban (area with ≥1 million persons) and all other locations (area <1 million persons) data were obtained from the US Department of Agriculture Economic Research Service (US Department of Agriculture Economic Research Service [USDA ERS], 2020). Smoking rate and median household income data in MCP-specific counties were obtained from the California Department of Public Health (CDPH) and County Health Rankings, respectively (California Department of Public Health [CDPH], 2018; County Health Rankings, 2020). A weighted average based on the population of the county was developed to obtain one overall rate for each MCP that operated in multiple counties.

Bridging factors

In policy implementation, bridging factors are structures, processes, and relationships that connect the inner context to the outer environment to facilitate policy implementation (Crable et al., 2022). Previous qualitative research suggests that bridging factors that contribute to APL implementation include the structure of compensation for physicians, not knowing about resources in the external environment, and external quality measures (Economou et al., 2022; Tam et al., 2022). Contracts between MCPs and physicians bridge the inner (MCP) and external (physicians) environments and can be structured in different ways to incentivize (fee-for-service) or disincentivize (capitation) delivery and documentation of tobacco-dependence treatment (Economou et al., 2022). Dominant compensation type for providers (capitated payments/noncapitated payments) were obtained from the CAHP (California Association of Health Plans [CAHP], 2018). It was hypothesized that MCPs that participated in county-level tobacco control meetings would have higher levels of knowledge of available resources in the external (county-level) environment. MCP participation in state-funded county tobacco control meetings was collected from our primary survey data. MCPs report quality measures to DHCS. MCPs that scored better on external quality measures are more likely to put emphasis on preventive care (a focus of many quality measures) and adherence to evidence-based practices (like tobacco dependence treatment). As data on quality measurement for smoking cessation was not available, two quality measures were selected to approximate smoking cessation as a preventive service (i.e., assessment of nutrition for weight loss) and as a chronic disease (i.e., treatment of chronic disease). These measures were obtained from an MCP quality review report (California Department of Health Care Services [DHCS], 2019).

Analysis

Simple frequencies were conducted for each APL provision and MCP characteristic (Tables 1 and 2). MCPs were categorized as having partially or fully implemented an APL section if they indicated that they engaged in any (partially) or all (fully) of the activities required in specific APL sections. A bivariate analysis using the one-way analysis of variance function in SPSS version 26 was conducted to determine the average number of the APL core provisions ($N = 10$) that were either at least partially (i.e., at least one

TABLE 1 Medi-Cal managed care plan full implementation of APL 16-014 core provisions ($n = 22$).

APL 16-014 provision	At least some implementation[a] number of MCPs (%)	Full implementation[b] number of MCPs (%)
1. Assessment of tobacco use	21 (96%)	6 (27%)
2. Tobacco cessation medications	22 (100%)	12 (55%)
3. Comprehensive counseling coverage	21 (96%)	18 (82%)
4. Referral/use of California quitline services and related systems	17 (77%)	1 (5%)
5. Assess and cover for pregnant tobacco users	20 (90%)	15 (68%)
6. Assess and cover for children and adolescents	14 (64%)	13 (59%)
7. Provider training and outreach	16 (73%)	10 (46%)
8. Enrollee outreach	20 (91%)	20 (91%)
9. Identification of tobacco users	12 (55%)	12 (55%)
10. Tracking treatment utilization of tobacco users	14 (64%)	14 (64%)
Implementation of all 10 APL 16-014 core provisions	5 (23%)	1 (5%)
Average number of provisions implemented (out of 10)	8	5.5

[a] At least some implementation indicates MCP has implemented at least some (or all) aspect(s) of the relevant core provision.

[b] Full implementation indicates MCP has fully implemented all aspects of the relevant core provision.

component) or fully (i.e., all components) implemented per select MCP characteristics (Table 3). An additional bivariate analysis looking at the proportion of MCPs adopting core provisions by select MCP characteristics was also conducted to better understand full APL implementation (Supporting Information: Table S4). As our small sample represented nearly the universe of MCPs (96%) and Medi-Cal enrollees, the SPSS complex samples module was run to adjust for the finite population correction.

RESULTS

Two years postrelease of the APL, MCPs demonstrate low implementation of the APL, with five MCPs (23%) implementing at least some aspect of all 10 core provisions and only one MCP (5%) fully implementing all 10 (Table 1). MCPs implemented at least some aspect(s) of an average of eight provisions and fully implemented an average of 5.5 provisions. Provisions that were most likely to be fully implemented include comprehensive counseling coverage (82%) and enrollee outreach (91%). Provisions least likely to be fully implemented include assessment of tobacco use (27%), referral to the California quitline (5%), and provider training and outreach (46%).

Table 3 presents the associations of the inner organizational, outer environmental, and bridging factors with the adoption of the APL provisions. Five clear patterns were identified. First, there was a clear pattern of number of Medi-Cal enrollees and size of staff being

TABLE 2 Medi-Cal managed care plan inner context, outer context, and bridging factors ($n = 22$[a]).

Managed care plan (MCP) characteristic	Number of MCPs (%)
Inner (organizational) context characteristics	
Total MCP enrollment[b]	
<250,000	7 (32%)
250,000–1,000,000	9 (41%)
>1,000,000	6 (27%)
Provide services to Medi-Cal beneficiaries (only)[b]	
Medi-Cal + Commercial enrollees	8 (36%)
Only Medi-Cal	14 (64%
Type of MCP[b]	
County Organized Health System	5 (23%)
Public only	9 (41%)
Commercial	8 (36%)
Number of counties of operation[c]	
1 County	13 (59%)
2 Counties	5 (23%)
3+ Counties	4 (18%)
Number of full-time employees[c]	
<500 employees	10 (46%)
500–4999 employees	7 (32%)
5000+ employees	5 (23%)
Outer (environmental) context characteristics	
Location of MCP (urban/rural)[d]	
Urban metropolitan area ≥1 million persons	14 (64%)
All other locations (i.e., Metropolitan area <1 million persons)	8 (36%)
Smoking rate is < 12% in MCP counties	
<12%	12 (55%)
≥12%	10 (46%)
Median household income in MCP counties[f]	
<\$70,000	6 (27%)
\$70,000–\$99,999	11 (50%)
≥\$100,000	5 (23%)
Bridging factors	
Dominant provider payment type (2 type)[c]	
Noncapitated	7 (32%)
Capitated	15 (68%)

(Continues)

TABLE 2 (Continued)

Managed care plan (MCP) characteristic	Number of MCPs (%)
Attend county tobacco control meetings[g]	
No	10 (46%)
Yes	12 (55%)
Quality score: Assessment of nutrition for weight loss[bh]	
Low	7 (32%)
Medium	9 (41%)
High	4 (18%)
Quality score: Treatment of chronic disease,[bh]	
Low	4 (18%)
Medium	6 (27%)
High	10 (46%)

[a] The count for the quality characteristics is equal to $n = 20$; Two MCPs were too new to rate in 2018.

[b] Organizational characteristics, including (1) total MCP enrollment, (2) type of enrollees, and (3) type of MCP, as well as quality scores pertaining to (1) assessment of nutrition for weight loss, and (2) treatment of chronic disease were obtained from a 2019 California Department of Health Care Services MCP quality review technical report.

[c] Organizational characteristics, including (1) number of counties of operation, and (2) number of full time employees, as well as dominant payment type (bridging factors) were obtained from a 2018 California Association of Health Plans membership directory.

[d] Location of MCP was obtained from the US Department of Agriculture.

[e] Smoking rate data in MCP-specific counties was obtained from the California Department of Public Health.

[f] Annual Median Household Income in MCP-specific Counties was obtained from County Health Rankings.

[g] Participation in County Tobacco Control Meetings was obtained from our 2018 UCSD survey data.

[h] Quality scores are divided into tertiles, with low representing the lowest quality scores and high representing the highest quality scores.

positively associated with the average number of APL provisions fully implemented (Table 3). We found that MCPs with high levels of implementation had an average member enrollment nearly three times the size of MCPs with low levels of implementation. Additionally, we found that MCP enrollment was positively associated with full implementation specific to: assessment of tobacco use, tobacco cessation medication coverage, and assessment and coverage for pregnant tobacco users (Supporting Information: Table S4).

Second, annual median household income in MCP counties was inversely associated with APL implementation (Table 3). As annual median household income increased, the average number of APL provisions implemented decreased (Table 3). MCPs with high levels of implementation operated in counties with an average median household income of $77,900 compared to $85,700 among low implementers. We also found that MCPs operating in counties with median household incomes <$70,000 had higher levels of full implementation of tobacco cessation medication coverage, assessment and coverage for children and adolescents, and provider training and outreach compared to MCPs operating in counties with higher median household incomes (Supporting Information: Table S4).

Third, we found that provider payment methods acted as an important bridging factor, with capitated payments being associated with a lower average number of APL provisions implemented compared to noncapitated (Table 3). More specifically, the use of capitation as the dominant provider payment method was associated with less comprehensive coverage for tobacco cessation medications and counseling, assessment and coverage for pregnant

TABLE 3 Bivariate analysis of the average number of APL 16-014 core provisions implemented by various Medi-Cal managed care plan characteristics (*n* = 22).

Managed care plan (MCP) characteristic	Average number of APL 16-014 sections at least partially[a] implemented (95% CI)	Average number of APL 16-014 sections fully implemented (95% CI)
Inner (organizational) context characteristics		
Total MCP enrollment[b]		
<250,000	7.43 (6.99–7.87)	4.43 (4.10–4.76)
250,000–1,000,000	7.78 (7.47–8.08)	5.11 (4.71–5.51)
>1,000,000	9.17 (9.05–9.29)	7.33 (7.12–7.55)
Provide services to Medi-Cal beneficiaries (only)[b]		
Medi-Cal + commercial enrollees	8.00 (7.59–8.41)	6.00 (5.55–6.45)
Only Medi-Cal	8.07 (7.86–8.28)	5.21 (4.97–5.46)
Type of MCP[b]		
County Organized Health System	8.60 (8.34–8.86)	5.40 (5.03–5.77)
Public only	7.78 (7.50–8.06)	5.11 (4.79–5.44)
Commercial	8.00 (7.59–8.41)	6.00 (5.55–6.45)
Number of counties of operation[c]		
1 County	8.62 (8.43–8.80)	6.15 (5.92–6.39)
2 Counties	6.40 (5.82–6.95)	3.40 (2.94–3.86)
3+ Counties	8.25 (7.95–8.56)	6.00 (5.40–6.60)
Number of full-time employees[c]		
<500 employees	7.80 (7.55–8.05)	4.70 (4.47–4.92)
500–4999 employees	7.71 (7.22–8.21)	6.00 (5.45–6.55)
5000+ employees	9.00 (8.88–9.12)	6.40 (6.03–6.77)
Outer (environmental) context characteristics		
Location of MCP (urban/rural)[d]		
Urban Metropolitan area ≥1 million persons	8.00 (7.72–8.28)	5.57 (5.27–5.87)
All other locations (i.e., Metropolitan area <1 million persons)	8.13 (7.88–8.37)	5.38 (5.01–5.74)
Smoking rate is <12% in MCP counties[e]		
<12%	8.58 (8.39–8.77)	5.83 (5.60–6.07)
≥12%	7.40 (7.04–7.76)	5.10 (4.69–5.51)
Annual median household income in MCP counties[f]		
<$70,000	8.50 (8.20–8.80)	6.50 (6.09–6.91)
$70,000–$99,999	8.00 (7.69–8.31)	5.36 (5.02–5.71)
≥$100,000	7.60 (7.21–7.99)	4.60 (4.25–4.95)

(Continues)

TABLE 3 (Continued)

Managed care plan (MCP) characteristic	Average number of APL 16-014 sections at least partially[a] implemented (95% CI)	Average number of APL 16-014 sections fully implemented (95% CI)
Bridging factors		
Dominant payment type[c]		
Noncapitated	9.00 (8.85–9.15)	6.43 (6.16–6.70)
Capitated	7.60 (7.33–7.87)	5.06 (4.77–5.37)
Attend county tobacco control meetings[g]		
No	7.30 (6.95–7.65)	4.70 (4.35–5.05)
Yes	8.67 (8.48–8.86)	6.12 (5.88–6.45)
Quality score: Assessment of nutrition for weight loss[bh]		
Low	7.29 (6.94–7.63)	4.43 (4.08–4.77)
Medium	8.89 (8.76–9.01)	6.44 (6.16–6.73)
High	9.25 (9.07–9.43)	7.25 (6.93–7.57)
Quality score: Treatment of chronic disease[bh]		
Low	7.50 (7.14–7.86)	4.25 (3.87–4.63)
Medium	7.50 (7.17–7.83)	4.67 (4.32–5.01)
High	9.30 (9.19–9.41)	7.30 (7.08–7.52)

[a] At least partially indicates the average number of APL sections that were at least partially implemented (if not fully).

[b] Organizational characteristics, including (1) total MCP enrollment, (2) type of enrollees, and (3) type of MCP, as well as quality scores pertaining to (1) assessment of nutrition for weight loss and (2) treatment of chronic disease were obtained from a 2019 California Department of Health Care Services MCP quality review technical report.

[c] Organizational characteristics, including (1) number of counties of operation and (2) number of full time employees, as well as dominant payment type (Bridging factors) were obtained from a 2018 California Association of Health Plans membership directory.

[d] Location of MCP was obtained from the US Department of Agriculture.

[e] Smoking Rate data in MCP-specific counties was obtained from the California Department of Public Health.

[f] Annual Median Household Income in MCP-specific Counties was obtained from County Health Rankings.

[g] Participation in County Tobacco Control Meetings was obtained from our 2018 UCSD survey data.

[h] Quality scores are divided into tertiles, with low representing the lowest quality scores and high representing the highest quality scores.

tobacco users, enrollee outreach, identification of tobacco users, and tracking treatment utilization (Supporting Information: Table S4).

Fourth, MCPs' participation in local county tobacco control meetings was positively associated with implementation, with those attending reporting a higher average number of APL provisions implemented compared to MCPs who opted out (Table 3). County tobacco control meeting participation was positively associated with full coverage of tobacco cessation medications, referral to the California quitline, assessment and coverage for pregnant tobacco users as well as children and adolescents, provider training and outreach, and tracking treatment utilization (Supporting Information: Table S4).

Fifth, MCPs' quality scores were positively associated with full implementation (Table 3). We found that scores on a preventive service quality measure (nutrition for weight loss) and scores on treatment of chronic disease were both associated with assessment of tobacco use, identification of tobacco users, and tracking treatment utilization (Supporting Information: Table S4).

DISCUSSION

This research found that MCPs are making progress in implementing the APL 2 years postrelease. However, a majority of MCPs have been slow to fully adopt all 10 core provisions. Our study identified the organizational, environmental, and bridging characteristics associated with the adoption of a comprehensive tobacco control program among Medi-Cal's MCPs. Five consistent patterns were identified as being associated with implementation: larger MCP enrollment and staffing, lower median household income, noncapitated provider payment, participation in county tobacco control meetings, and high-quality scores for preventive care and treatment of chronic disease.

Of the 10 core provisions, a majority of MCPs (>90%) at least partially (if not fully) implemented Section 1 (assessment of tobacco use), 2 (tobacco cessation medication coverage), 3 (comprehensive counseling coverage), 5 (benefit coverage related to pregnant tobacco users), and 8 (enrollee outreach). Higher adoption of these provisions can be explained by two factors: (1) state and federal policy environment and (2) the construction of the APL itself. The results specific to Sections 2, 3, and 5 are not surprising as coverage for medications and counseling was previously required under the ACA similar to coverage for pregnant women enrolled in Medicaid (ACA, 2010a, 2010b, 2010d; DiGuilio et al., 2018; McMenamin et al., 2018). Some implementation related to the assessment of tobacco users is also expected as DHCS requires completion of the Individual Health Assessment for all enrollees which contains questions related to assessment of tobacco use. Finally, enrollee outreach (Section 8) is defined very loosely; a multitude of activities can satisfy the requirement. Furthermore, the difference between provisions that were fully versus partially implemented could be explained in many instances by APL language that required MCPs to "ensure" contracting providers engage in specific activities (e.g., ensure assessment of tobacco use).

Looking at full implementation of the APL provisions, while Section 3 (comprehensive counseling coverage) and 8 (enrollee outreach) were fully implemented in more than 75% of the plans, Sections 1, 2, and 5 had much lower levels of being fully implemented. Section 1 was categorized as fully implemented if MCPs reported *ensuring* that contracted primary care providers conducted initial and annual assessments of tobacco use for each member, and partially implemented if the MCP had these requirements in primary care provider contracts, but could not *ensure* it was being done. MCPs that had fully implemented Section 1 indicated that they had a mechanism for monitoring tobacco-use assessment among their contracted providers. This capability was reported more often by MCPs with larger enrollment and those that had higher scores on quality measures related to preventive services and treating chronic disease.

Referral to the California quitline was another area (Section 4) where there was a large difference between the number of MCPs that fully and partially implemented the provisions. Similar to the requirements for Section 1, the main distinction was that while a majority (77%) encouraged contracting providers to refer patients to the quitline, only 5% (1 MCP) had the capability to *ensure* that providers were making these referrals. In this case, that was because the MCP had a pre-existing collaboration with the quitline that allowed for better coordination between the two organizations.

Section 2 (tobacco cessation medication coverage) was classified as fully implemented if the MCP formulary covered all seven FDA-approved tobacco cessation medications without copayments or stepped-care therapy requirements with at least one available without prior authorization. The difference between those MCPs that fully versus partially implemented this section was primarily driven by not covering nicotine spray and/or inhaler or by requiring failure of one tobacco dependence medication before obtaining coverage (i.e., stepped-care therapy requirement) for Chantix and nicotine spray and/or inhaler. Those MCPs that reported attending county tobacco control meetings had much higher levels of full implementation compared to those who did not (75% vs. 30%). Discussion on tobacco cessation medications is a topic that is likely to come up in these meetings, so attendance at these meetings may have aided with alignment of the formulary with the APL requirements.

In terms of inner-context factors that were related to APL implementation, this research found that MCPs with larger total enrollment had fully implemented a higher average number of provisions compared to MCPs with smaller total enrollment. This suggests that larger MCPs may have greater access to resources (e.g., funding, staffing capacity, in-person provider training initiatives) that allow them to treat tobacco dependence in a more comprehensive manner. There were, however, three provisions for which the smaller MCPs performed better than mid-sized MCPs: provider training and outreach, comprehensive counseling coverage, and tracking treatment utilization. This suggests that there may also be some advantages of being smaller that make it easier to coordinate and implement these provisions.

In addition, follow-up interviews with respondents indicated that lower implementation of select APL Sections could be attributed to a number of inner organizational context (i.e., MCP) factors. Multiple respondents indicated that a major barrier was a lack of integrated electronic medical records that would allow them to monitor what was happening at the provider level and to ensure that the APL items were being fully implemented. Without such a system, the only way to monitor implementation is conducting a chart review audit, which is both time and resource intensive. Health educators also expressed frustration at the lack of prioritization for treating tobacco use among MCP leadership. They also wondered why there was not more done by DHCS such as monitoring and enforcement to incentivize full APL implementation by MCPs. With the number of competing priorities facing MCP leadership, it is not surprising that those items that are not fully audited by the state (e.g., provision of comprehensive tobacco cessation services) tend to have a lower priority.

Specific to environmental characteristics, we found that median household income of MCP counties was inversely associated with implementation of nearly all the provisions. These results suggest that MCPs located in lower-income areas may have additional supports such as resources provided by other community-based organizations. Moreover, these MCPs may be located in communities that prioritize the provision of preventive treatment and services in medically underserved areas. Interviews indicated that community resources such as provision of hospital-based group smoking cessation classes were often a facilitator to being able to comply with APL provisions. Specifically, the APL requires MCPs to provide group tobacco cessation counseling sessions. Many MCPs did not provide that type of counseling modality and relied on group counseling sessions provided by local hospitals or other community-based organizations to satisfy that requirement.

For factors that bridge organizational characteristics and the external environment, we found that MCPs that primarily use capitation to pay contracted providers adopted a lower number of provisions in comparison to MCPs primarily using noncapitated payments. Health educators indicated that they have trouble with providers who are paid a capitated fixed amount per enrollee documenting provision of smoking cessation treatment, as they are not paid per service rendered (Gosden et al., 2000). This means that they may not take care to document every service that is delivered during a patient encounter as they are not being reimbursed per individual item. In addition, although it is expected that tobacco cessation services will be provided as part of the list of services covered under the capitated payment, there is no financial incentive for providers to deliver that service. This will make it more difficult for MCPs to ensure that these services are being provided, and thus make it more difficult to fully implement the APL. This may, in part, explain the findings that MCPs that use capitated payments have lower levels of fully implementing comprehensive counseling coverage, identification of tobacco users, and tracking related treatment utilization. Furthermore, MCPs with a dominant non-capitated payment method may have adopted more provisions due to their documentation practices, in which providers receive payment per number of services rendered (Medicaid and CHIP Payment and Access Commission [MACPAC], 2020).

Additionally, MCP participation in county tobacco control meetings was found to be positively associated with APL implementation. The California state tobacco control program provides resources for tobacco control at the local (i.e., county) level. Therefore, higher implementation of APL items for MCPs that participate in county tobacco control meetings suggests that MCPs that are more involved with their local tobacco control program may have greater support systems and access to resources to provide more robust tobacco cessation services. MCP interviews revealed that local tobacco control meetings informed MCP health education staff about additional resources in the community where they could refer patients.

Attendance at local tobacco control meetings was also associated with MCP comprehensive coverage of tobacco cessation medications. MCPs who had not fully implemented this section of the APL generally did not cover the nicotine spray and inhaler OR applied fail-first protocols (i.e., must try and fail on one cessation treatment before gaining coverage to another) which are both prohibited under state law. Despite being clearly laid out in the APL, interviews indicated that not all MCP pharmacy benefit managers were aware that they were out of compliance with these new requirements. It is possible that the higher rates of comprehensive coverage of tobacco cessation medications among MCPs that have representatives that attend county tobacco control meetings is due to the additional information disseminated at these meetings in relation to coverage of tobacco cessation medications.

Finally, we found that MCPs' scores on quality measures related to preventive services and chronic disease were positively associated with APL implementation. This is consistent with previous research that has found that requirements to report on quality measures or public recognition of high-quality scores are associated with increased support for smoking cessation among physician groups (McMenamin et al., 2003). Larger MCPs and those with higher scores on quality measures related to prevention and chronic diseases had higher rates of indicating that they met the APL requirements for assessing tobacco use among their enrollees. Follow-up interviews indicated that ensuring that contracting providers were engaging in documentation of tobacco use generally occurred through the quality or compliance departments conducting chart audits. Larger MCPs were more likely to have the organizational resources to conduct chart audits while organizations that scored well on quality measures were more likely to have a robust quality department.

Many, but not all, observations described in the previous qualitative interviews were seen in this quantitative analysis. For example, respondents' perceptions that being a smaller health plan or that having capitated providers made it difficult to implement all of the items in the APL was seen in the results of this analysis. In addition, respondents' comments regarding the lack of knowledge of external resources being a barrier was supported by the finding that not participating in local tobacco control meetings was associated with lower levels of APL implementation. Respondents' perceptions that being in a rural county made it difficult to implement the APL was not supported by this analysis. It is possible that while some rural counties lack the resources to support MCP tobacco dependence treatment, others may have extensive community collaboration that facilitates fuller implementation.

This study supports the previous qualitative literature that indicates that complex tobacco policy implementation is dependent on a variety of inner organizational and outer environmental factors (Economou et al., 2022; Tam et al., 2022). Policymakers should carefully consider how the variation in inner organizational characteristics may impact policy implementation, and how the link between the inner organizational context and external environmental resources can be bridged. This may be particularly important for smaller organizations and those operating in resource-scarce environments.

Limitations

This research is subject to several limitations. Our research was conducted as part of an academic research project; therefore, these results are not to be interpreted as a formal audit of compliance with DHCS Medi-Cal policy. DHCS does not conduct audits or enforcement activities related to the tobacco cessation APL, thus this research represents the only information publicly available on the extent to which MCPs have fully implemented the 10 APL core provisions. Moreover, although we obtained publicly available documentation to corroborate survey responses, in some instances we were unable to do so due to a scarcity of publicly available resources. Additionally, our research represents data that were collected in 2018. New policies may have been implemented since the completion of this study. Although the respondents were selected as those most knowledgeable regarding the status of APL implementation activities, interviews with executive-level leadership in the future could provide additional insight into organizational priorities and barriers to implementation. This research had a small sample size that does not lend itself to rigorous analytical methods; however, these respondents represent nearly the universe of MCPs operating in California. Therefore, this research is specific to the dynamics of California, and may not be representative of all state or country-run smoking cessation programs. That said, as California has one of the most comprehensive tobacco cessation programs in the U.S., these results may inform other states and countries exploring the plausibility of implementing a similar set of regulations.

CONCLUSIONS AND POLICY IMPLICATIONS

Although Medi-Cal MCPs are demonstrating progress in implementing the APL, they have been slow to adopt full coverage—especially among small-sized MCPs. California policymakers and tobacco control stakeholders may consider providing support and resources to small-sized MCPs to aid in their continued adoption of comprehensive tobacco cessation services. Furthermore, DHCS should consider releasing additional guidance for how MCPs can engage in activities to ensure APL implementation. Implementation of a large complex policy, such as the tobacco cessation APL, may require more dynamic interaction between DHCS and the MCPs to assess implementation progress and potentially revise expectations and/or timelines as the implementation process unfolds. The provisions that are most in need of support include assessment of tobacco use, referrals to the California quitline, and provider training and outreach. Offering incentives to small-sized MCPs and to providers in capitation systems may also help to increase APL implementation. In sum, the full adoption of a comprehensive tobacco control program will require collaboration and ongoing action from key stakeholders: MCPs, tobacco control, the California quitline, and close monitoring and enforcement by DHCS.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS STATEMENT

This manuscript has been solely submitted to WMHP and has not been published elsewhere either in whole or in part, nor have the findings been posted online.

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ENDNOTES

[1] For this analysis, we recoded the original eight APL sections into 10 provisions: The original APL Section 3 contained multiple components and was therefore recoded into four different provisions: Provision 3 (counseling coverage); Provision 4 (referral to CA quitline); Provision 7 (encourage providers to use 5A's); Provision 8 (Provision of cessation information by MCPs).

[2] Recurring basis refers to tracking all tobacco use on an initial and annual basis.

[3] Utilization management includes prior authorization and fail-first protocols.

[4] Recommended counseling modalities include: individual, group, and telephone counseling.

[5] In 2021, the California Smokers' Helpline rebranded to Kick it California (i.e., California quitline).

[6] The 5A's include: Ask, Advise, Assess, Assist, and Arrange.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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RESEARCH ARTICLE

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Challenges of COVID-19 vaccination program in rural areas of Eastern Indonesia: A qualitative study from a multistakeholder perspective

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Abstract

This research aimed to explore the challenges of the COVID-19 vaccination program from the perspective of multiple stakeholders in rural areas of eastern Indonesia. This qualitative participatory action research involved 115 participants selected from various groups in 20 subdistricts across five provinces, including Health Service workers, police staff monitoring the vaccination program, religious figures, and adult and youth community leaders. Furthermore, focus group discussion was conducted using semi-structured interview guidelines based on the WHO Strategic Advisory Group of Experts (SAGE) for vaccine and immunization model. The manifest content approach was employed to analyze the visible contents within the text. Implementation of the vaccination program was complicated by contextual, individual, and group factors, as well as vaccine and vaccination-specific factors. The contextual factors were socioeconomic, religious, and cultural conditions, changes in government policies, and geographical and climatic obstacles. Meanwhile, examples of group and individual factors were people's beliefs of COVID-19 being harmless and their invulnerability to the disease, along with misinformation and disinformation about vaccination, and fatalistic attitudes. Factors related to the vaccine and vaccination process include limited vaccine supplies, inadequate supporting facilities, and insufficient administration of vaccines. Multiple and complex challenges of COVID-19 vaccination in the rural areas of eastern Indonesia need attention from

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the local and national government, as well as other parties including the private sector, socio-religious figures and organizations, and the media.

KEYWORDS
COVID-19 vaccines, developing countries, rural population, vaccination hesitancy

INTRODUCTION

As a nation with among the highest cases worldwide, Indonesia has been severely impacted by the COVID-19 pandemic. As of January 2023, Indonesia had over 6.7 million total confirmed COVID-19 cases and the highest resulting death rate among Southeast Asian nations (ASEAN Biodiaspora Virtual Center, 2023; Indonesian COVID-19 Task Force, 2023). Nonpharmaceutical interventions (NPIs) and vaccination are two fundamental approaches employed to mitigate the virus spread (Ge et al., 2022). Vaccination has significantly altered the pandemic's course, saving tens of millions of lives worldwide (Watson et al., 2022). However, inadequate access to vaccines in low-income countries has reduced the effectiveness of vaccination in these settings, highlighting the critical need for global vaccine equity and coverage (Watson et al., 2022).

The Indonesian government has set a goal of vaccinating 234 million of its citizens, including health workers, the elderly, public service workers, vulnerable communities, the general public, and children aged 6–17 (Republic of Indonesia, 2023). The vaccination program is implemented through the collaboration of multiple parties, including state/regional-owned enterprises or private business entities, professional/social organizations, the Indonesian National Army/State Police, and other pertinent ministries/agencies. Nationally, the first and second vaccine doses surpassed 70% of their target, but the third experienced a sharp decline at 27.18% (Ministry of Health of Indonesia, 2022). Data indicate that coverage of full vaccination in Indonesia was the second lowest value recorded in Southeast Asia (ASEAN Biodiaspora Virtual Center, 2023). On closer examination, the second dose coverage is still low in several parts of the country's 34 provinces, particularly in eastern regions.

The Indonesian government has accelerated its COVID-19 vaccination efforts by enacting domestic travel vaccination regulations. Through the COVID-19 Mitigation Task Force, the government required travelers to have taken the first dose of the COVID-19 vaccination by October 2021. In anticipation of New Year's festivities, the Ministry of Home Affairs released instructions in December 2021 requiring Indonesians who travel by public transit to have obtained two doses (Indonesian COVID-19 Task Force, 2021). In March 2022, the COVID-19 Mitigation Task Force issued a regulation stating that those who intend to utilize public transportation must have received a first dose and have a negative polymerase chain reaction result (Indonesian COVID-19 Task Force, 2022). In Indonesia, COVID-19 regulations are considered to be quite dynamic (Attwell et al., 2022). Furthermore, rules related to COVID-19 have been criticized as contradictory, inconsistent, and untenable in relation to the substances regulated and implemented (Hadi & Gandryani, 2022).

To provide context, Indonesia is the world's sixth most unequal country, with persistent, uneven development (Gibson, 2017). The growth of cities appears to be more rapid in Java and the western part of the country compared to eastern regions (Wilonoyudho, 2017). The western provinces mainly experience a more rapid rate of economic growth than their eastern counterparts. For instance, western infrastructure, transportation, education, and healthcare facilities are significantly better than those in the east (Tubaka, 2019). Figure 1 shows the geographic disparities in the general growth of the economic and health sectors. In a report, WHO highlighted differences in health status and health resource distribution across Indonesia's subnational regions (World Health Organization, 2017a).

Jakarta, the capital, has the highest concentration of physicians and the highest physician-to-population ratio (Mahendradhata et al., 2017). In contrast, the eastern region of West Sulawesi has the lowest absolute number of general practitioners (GPs) and the lowest number of physicians per 1000 inhabitants (Mahendradhata et al., 2017). Medical specialists were found to be more concentrated in the larger provinces of Java and Bali, while North Maluku, West Sulawesi, and East Nusa Tenggara, located in eastern Indonesia, had the lowest distribution (see Figure 2) (Slamet, 2018). In the context of immunization, complete childhood immunization coverage was low at the national level, demonstrating that significant inequality was dependent on regional location and socioeconomic status (World Health Organization, 2017a). With lagging health indicators, the eastern regions of Indonesia are typically at a disadvantage (World Health Organization, 2017a). In addition,

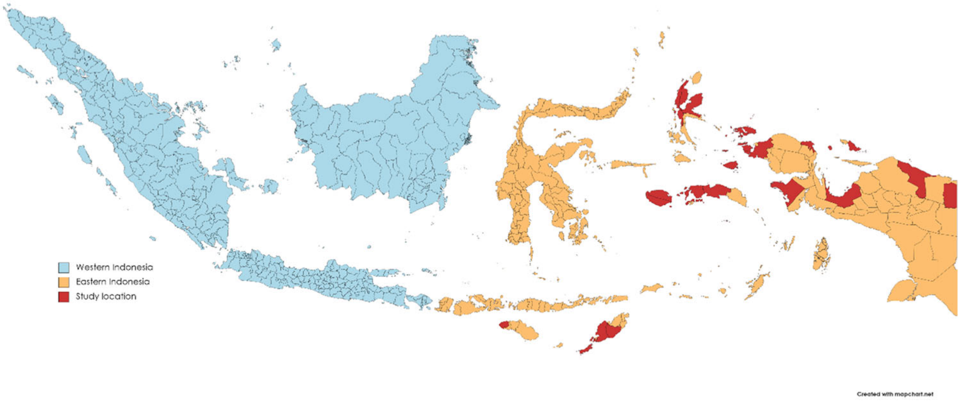

FIGURE 1 Western and eastern of Indonesia and the location of the study.

FIGURE 2 Map of Indonesia (*Source*: https://en.wikipedia.org/wiki/Provinces_of_Indonesia).

difficult social and economic conditions contribute to the unreadiness of various groups to respond to infectious disease outbreaks (Bolin & Kurtz, 2018).

Based on studies in five continents (South America, North America, Europe, Asia, and Oceania) inequality in the distribution of the COVID-19 vaccine was previously reported to be determined by micro and macro-level factors, such as socioeconomic conditions and access to healthcare (Bayati et al., 2022). However, as research has focused on vaccine acceptance in Indonesia's western regions, there has yet to be a comprehensive examination of the situation in eastern Indonesia (Toharudin et al., 2021). From the perspectives of multiple stakeholders, this research explores challenges faced in improving the vaccination program. By involving diverse stakeholders, it is anticipated that a comprehensive picture of the challenges and potential strategies for enhancing the vaccination program in Indonesia's eastern regions will emerge. Specifically, the purpose of this research was to gather viewpoints from youth and adult groups, nongovernment and government sectors, and health and nonhealth actors regarding the challenges of the COVID-19 vaccination program. As stated by WHO, multiple stakeholders' participation in the vaccination is strongly recommended to help build public confidence in the program, limit the damage caused by false vaccination beliefs, and prepare the non-health sector for vaccination efforts (World Health Organization, 2017b).

METHODS

Research design and setting

This research used a qualitative participatory action approach focusing on exploring the challenges of the COVID-19 vaccination program. Furthermore, the team and participants carried out a self-reflective inquiry to better understand and improve their practices within situations they encountered (Baum, 2006). Data were collected from September to October 2022 in the Indonesian provinces of Papua, West Papua, Maluku, North Maluku, and East Nusa Tenggara. Four regencies were selected from each of the five provinces, making a total of 20 (Figure 1). The selection of provinces and regencies was based on the low rate of second-dose COVID-19 vaccination coverage in comparison to other regions in Indonesia. For information, a regency is an administrative division of Indonesia, directly under a province or at the same level as a city. Moreover, a regency comprises a rural area larger than a city (Setiawan, 2020).

Research participants

Participants were selected through maximum variation sampling, which is a type of purposive sampling method. The participants included were from various groups, including health office staff, police staff who responsible for the vaccination program, religious figures, and community leaders. As a whole, this selection aimed to capture the diverse perspectives of multiple stakeholders (Palinkas et al., 2015). Before the research, existing contacts of youth leaders in each region were contacted by telephone to become participants. Subsequently, knowledgeable youth leaders in each region were identified and tasked with selecting and contacting other relevant parties involved in vaccination implementation. In this study, community leaders were selected from members of Muhammadiyah, a socioreligious Islamic organization established before Indonesian independence in 1945 (Sintha, 2018), with followers as well as social and health services affiliates across different regions (Fanani, 2019). Muhammadiyah, with the help of its members and social businesses, has supported the government's efforts to combat the pandemic through vaccination, treat COVID-19 patients, and other initiatives (Rachmawati et al., 2022). A total of 115 participants were selected, comprising four to six from each district/city. Their characteristics are presented in Table 1.

Research instruments

Focus group discussion was conducted using semi-structured interview guidelines. Research questions were designed based on the model proposed by the WHO Strategic Advisory Group of Experts (SAGE) on Vaccine. Furthermore, the model highlighted three key factors of the vaccination program: 1. contextual factors including religion, culture,

TABLE 1 Participants' characteristics.

	n	%
Gender		
Male	98	85.2
Female	17	14.8
Age (in years)		
<30	21	18.3
30–40	59	51.3
40–50	21	18.2
>50	14	12.2
Province		
Maluku	24	20.9
North Maluku	24	20.9
East Nusa Tenggara	21	18.3
Papua	21	18.3
West Papua	25	21.6
Position		
Health office workers	19	16.5
Police staff	15	13.0
Community leaders	12	10.4
Religious figures	28	24.3
Youth groups	41	35.7
Educational background		
Senior High School	19	16.5
Diploma 3	6	5.2
Undergraduate	80	69.6
Graduate	10	8.7

socioeconomic status, politics, and geographical barriers, 2. individual and group factors such as individual knowledge, awareness, and perceived risk/benefit of vaccination, and 3. issues related to the role of healthcare professionals, vaccine supply, and programs (Figure 3) (Dubé et al., 2014; MacDonald, 2015).

Data collection

Focus groups were conducted in meeting rooms located within the capital of each selected province. Each group consisted of a research team member as facilitator, and note takers (assistants), and four to six people from each selected district/city. The research team included three females and four males with communication, medical, and public health science backgrounds, and the lead research teams were experienced in qualitative analysis. The research team was comprised of lecturers in social, public health, nursing, and the medical sciences. The discussion process lasted between 1 and 2 h based on interview guidelines designed to explore various themes such as challenges and potential strategies for COVID-19 vaccination in the selected city. Before data collection, participants were given information about the research's background, potential conflicts of interest, purpose, and procedure, and those who agreed to participate signed a consent form. During the process, anonymity and confidentiality were maintained, and ethical approval was granted by the Ethics Committee of the Faculty of Health Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta, with approval number 03/20/07/0516. To ensure quality, the obtained

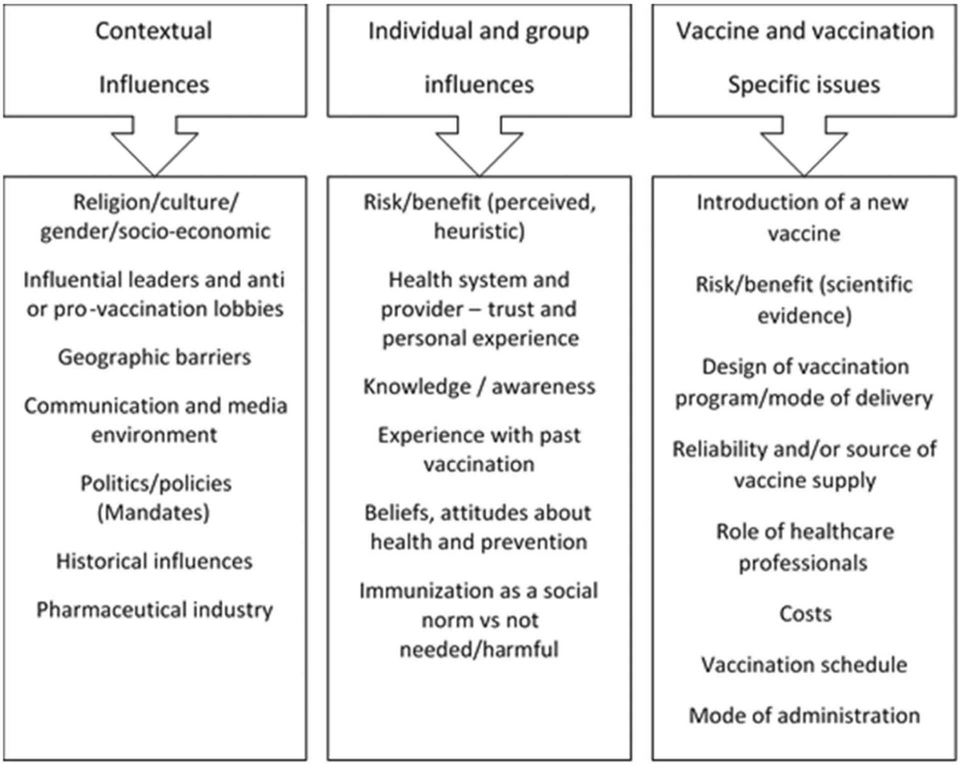

FIGURE 3 Determinants of vaccine uptake based on the WHO Strategic Advisory Group of Experts (SAGE) on Immunization.

results were reported in accordance with the consolidated criteria for qualitative reporting checklist (COREQ) (Tong et al., 2007).

Data analysis

After each interview, recorded results were entered into a matrix and analyzed with thematic content analysis techniques, which involved identifying and reporting patterns of data using Microsoft Excel (Braun & Clarke, 2006). Additionally, the manifest content approach was applied to analyze the visible and obvious contents within the text (Graneheim & Lundman, 2004). Research themes were determined based on four topics previously mentioned under the instruments section, namely challenges in vaccination arising from contextual, individual, and vaccine-related factors, and potential strategies for vaccination. An inductive approach was used to generate themes from the data (Elo & Kyngäs, 2008). Three researchers cross-checked all themes and codes.

RESULTS

The 115 participants had various backgrounds, namely health office staff, medical and healthcare workers, police staff, community leaders, and religious figures. They were mostly male (*n* = 98, 85.2%) and between the ages of 30–40. Most (69.6%) participants had at least some undergraduate education (Table 1). Table 2 shows the challenges of the COVID-19 vaccination program in eastern Indonesia, categorized into contextual factors, vaccine or vaccination-specific factors, and individual and group factors.

Contextual factors

Culture/religion/socioeconomic situations

Members of the community such as farmers, fishermen, and other who work in isolated settings and have limited exposure to outsiders, felt no need to receive the COVID-19 vaccine due to their perceived restricted mobility and low risk of contracting the virus. In addition, because they must work during the day, they reported being unable to

TABLE 2 Challenges of the vaccination program in Eastern Indonesia.

Theme	Code
Contextual factors	Religion/culture/socioeconomic situations
	Change of government policies
	Geographic and seasonal barriers
Individual and group factors	Perceived mild severity and low contraction risk of COVID-19
	Misinformation/disinformation related to the effect of vaccination
	Fatalistic attitudes
Vaccine or vaccination-specific factors	Limitation of vaccine supply and vaccination-supporting means
	Lack of administrative capacity

participate in vaccination programs held during the day; they could only participate in afternoon programs:

> *They are eager to get vaccinated because they want to travel. If they just stay at home, they do not want to be vaccinated. That is the obstacle. For example, the headmaster at my school did not get vaccinated because he thought he did not go anywhere. (Youth leader, Male, East Nusa Tenggara)*
>
> *The farming community can only vaccinate in the afternoon because they work in the morning so they need to carry out vaccinations in the afternoon. (Youth leader, Male, 29, East Nusa Tenggara)*

Some groups in the eastern regions with high poverty rates were only willing to receive the COVID-19 vaccine when given necessities such as rice or cooking oil. This situation was driven by the increase in the prices of staple goods such as cooking oil and fuel. Meanwhile, supposing some community groups participate in the program, they expected to be offered prizes like those offered through previous, nonvaccine government programs:

> *Based on the experience that has occurred in our village, the community received assistance from the government, hence, it became a bond. If there is no vaccination, the community will not receive assistance. From there, there will be awareness among the community hence they are willing to participate in vaccination. (Youth Leader, Male, 23, Papua)*

These communities are accustomed to traditional medicine and beliefs. For example, some members reported using amulets to stop COVID-19 spread, leading to their nonacceptance of vaccination as a means of preventing the virus. There is also ongoing discourse among the community concerning the halal and haram aspects of the COVID-19 vaccine, which caused some members to reject the vaccination due to the uncertainty about its acceptability in religious terms:

> *The issues spreading on social media still affect the halal and haram aspects of the vaccine content. Some say that the vaccine contains pig blood, thereby making Muslim communities unwilling to be vaccinated. (Religious leader, 55, Male, East Nusa Tenggara)*

Conflict also exists between community groups or armed criminal groups with law enforcement agencies. These conditions hinder the vaccination program as health workers are reluctant to enter the area due to security issues:

> *Not only from armed groups, there are also security issue from community groups such as hijacking because sorry there are groups of people who like to drink alcohol which can trigger violence (Youth leader, 32, Male, Papua)*

Decreased COVID-19 cases and changes in government policies

The decrease in community enthusiasm for the second and third doses of the COVID-19 vaccine is also due to the loosening of regulations on checking second vaccination status while accessing public services including public transportation. The policy regarding the non-requirement of the second vaccine dose also stemmed from a decrease in reported COVID-19 cases. Previously, the government required people to show their vaccination certificates to access public spaces including airports, malls, train stations, and restaurants, as well as personal identity services such as ID cards and marriage certificates. In mid-2022, the end of this policy contributed to a decline in enthusiasm for vaccination:

> *Because the opportunity to travel outside the area is wide open (in 2021), eventually people seeking vaccines increase. Because when I was vaccinated at the Civil Registration Office, there were already a lot of people, they said they want to go back to work again, they want to work in Kalimantan, So the need for outbound travel has started to increase, that's why they want to be vaccinated. Secondly, yesterday it started to increase because people had started to go to college, so in the end many students were looking for vaccines for their needs. But we have reached the second of this year, we are still looking for vaccination targets. (Health Officer, 46, Male, East Nusa Tenggara)*

> *At the beginning of 2021, the community was enthusiastic about getting the first and second doses of the vaccine. Even we, the police, the hospital, and the navy, were enthusiastic to the point of queuing up for the vaccine, but community enthusiasm has been gradually decreasing. (Health Officer, 30, Male, Maluku)*

Previously, entities (the community as well as village leaders) in need of direct cash assistance from the government as part of the social security program were required to receive the vaccination. However, the end of this requirement contributed to a decline in vaccinations. A similar situation was reported by the vaccination unit of the Indonesian police that even though vaccination centers were open daily, the enthusiasm for vaccination was in decline:

> *Based on the education level, some people, even those in civil servant positions in the third and fourth ranks, refuse to get vaccinated. It is not a matter of education. For example, as I said in the Civil Registry and Identification Office. I first went to the vaccination center at the police station, but because few people participated in the vaccination, we moved to the police post in the market area because people often come there to deal with health-related matters. However, as time goes by, community enthusiasm is also decreasing. (Police officer, 26, Male, Maluku)*

Geographic barriers

The geographical conditions in several eastern island regions make healthcare staff visitation to such communities difficult. Healthcare staff also report difficulty reaching these areas. In addition, bad weather and road conditions sometimes make it impossible to reach certain areas, specifically those often accessed only by sea:

> *Many people still live in remote areas. If in the city, this may only be within city and regency limits. The regency community still lives in rural areas. The main obstacle is sometimes the distance to the vaccination center is far. Moreover, the available vaccinator staff is limited and most vaccine is stored in the*

> *Kupang Regency pharmacy warehouse before being distributed to health centers. The distance from the health centers to the pharmacy warehouse is also far. In Kupang Regency, the closest health center is about 3–4 km in Pesao, and the access is still good. However, access to villages and the community is a challenge. In this regency, we usually use police and army official vehicles, for vaccination. We pick up the community in the village to come to the vaccination center, then we return them. As mentioned by the religious figure earlier, sometimes when we are about to go there, the community has already gone to the fields. (Police officer, 50, Male, East Nusa Tenggara)*

> *Many people live in the hills and valleys. The road access there is not very good, hence, the road cannot be passed during rainy seasons. Meanwhile, the vaccine availability is insufficient and the healthcare staff is limited, making it very difficult to gather the community. Therefore, the only option is to bring them, which is also difficult. If the program is implemented for 2 years, the maximum potential would have been reached. (Health officer, 30, Male, East Nusa Tenggara)*

Individual and group factors

Perceived mild severity, low contraction risk, and COVID-19 fatalism

Data suggest that the community perceived a decrease or even absence of COVID-19 cases in the eastern regions of Indonesia:

> *Now, COVID-19 cases have started to decrease, and this information has reached the community, hence, why does vaccination need to be carried out again? Perhaps it is the responsibility of the relevant parties to provide solutions to anticipate this problem. (Religious leader, 47, Male, East Nusa Tenggara)*

Additionally, as the eastern regions are known as endemic areas for malaria and dengue fever, the community views COVID-19 as no more dangerous than these diseases, leading to a mindset that vaccination is unnecessary. The fatalistic view that getting vaccinated or not does not impact the risk of dying is mostly held by older Indonesians, forming the basis for their reluctance to accept the vaccine:

> *Because many thinks like this. Some think I am [too] old for the vaccine. What do I vaccinate for? Awareness is still lacking and rare. (Health officer, 38, Female, East Nusa Tenggara)*

Misinformation/disinformation related to vaccination effects

Mis- and disinformation are spreading among the community. Many members believe that vaccines lead to harmful health effects, such as paralysis or even death. Moreover, some report believing that vaccines are a tool to eliminate certain ethnic groups. The community is highly aware of a situation in which a person died a month after receiving the vaccine in eastern Indonesia. Inaccurate news disseminated both across the community and among religious figures, some of whom encouraged their followers not to get vaccinated:

> *There were cases of death after allegedly receiving the first and second doses of the vaccine. The issue continued to develop, thereby causing the community to become more afraid and unwilling to get vaccinated. (Youth Leader, 33, Male, West Papua)*

> *In our school, when the health department gave the vaccine, one student's body became sweaty. They performed vaccination without any prior examination, and just injected it. The impact was convulsions and other things. […] This made other students scared to get vaccinated. When the health department performed the second vaccination, almost no students wanted to get vaccinated. (Religious Leader, 41, Male, East Nusa Tenggara)*

Exposure to misinformation played an important role in the community's rejection of the vaccination program. Members blocked roads and vandalized public facilities to protest the vaccination that reportedly caused one resident to die. Additionally, threats made against health workers and the government have had an effect of loosening official guidance requiring or urging the community to vaccinate against COVID-19:

> *There was one case in an area where a person died after the vaccine, the rumor spread, so residents who did not want the vaccine blocked the road. (Youth Leader, 33, Male, West Papua)*

There are differences within community groups based on the sources of information trusted by the community concerning vaccination. Community groups living in urban areas tend to trust health workers as a source of COVID-19 vaccination information. Those living in rural areas tend to trust local tribal chiefs more than health workers. Therefore, some still do not know the procedures, schedules, and conditions of vaccination due to the lack of information dissemination related to vaccination.

Vaccine or vaccination-specific factors

Limitation of vaccine supply and vaccination-supporting means

Certain areas have limited health workers who can serve as vaccinators, leading to wasted stocks of COVID-19 vaccine. There are also conditions where people's enthusiasm is high enough to get vaccinated, but the availability of vaccines is insufficient, contributing to the erosion of public trust in vaccines. Additionally, some areas experience gaps between the types of vaccine needed and available. In this case, the government has made regulations concerning the vaccine combination that can be used in the first, second, and third doses. Therefore, health workers make adjustments to inject the vaccine types according to the doses needed by the community. It is common for health workers to need a particular brand of vaccine that ends up being unavailable. There are also reports of expired or near-expired vaccines. These various conditions affect the ongoing vaccination program:

> *If you just need to pick it up, it is very easy. For the Kupang regency area, it is still easy. However, the problem is the expiration of the vaccine. Sometimes the average shelf life of a vaccine is only 2 weeks because anyone up to a month*

> *has already expired. Therefore, the vaccinator has to work extra, and they become tired while trying to meet the target of not expiring vaccines. If they have to go to the village today, they cannot go to another village in the next day. (Police officer, 50, Male, East Nusa Tenggara)*
>
> *Our experience in the Fatmala subdistrict was registering 500 people daily, but 1000 came. Therefore, some did not get the vaccine even though they had come from far away. Their enthusiasm was extraordinary despite being tired of coming over a long distance. (Health officer, 30, Male, East Nusa Tenggara)*

An additional factor that poses a challenge to the administration of COVID-19 vaccinations within the community is the presence of work fatigue or delayed incentives from the government:

> *Secondly, our weakness is that our program is not only for COVID-19. The Health Department, Police, and Army surely have their programs. During national immunization month, we clashed between carrying out vaccination or immunization for children. Clashes between programs within one agency make us less focused on carrying out vaccination or immunization programs. (Health officer, 30, Male, East Nusa Tenggara)*

Lack of administrative capacity

The limited technological infrastructure, including internet access, in eastern Indonesia led to difficulties in maintaining an accurate vaccination database, which is primarily managed online. However, the inadequacy of recording is not only merely caused by technological negligence but also by poor recording. For example, those who do not have an ID number cannot be recorded on the Ministry of Health's vaccination database. Moreover, since the current recording is based on the ID number within the online system, doses of the COVID-19 vaccine were not recorded at the time they were given due to difficulty accessing the internet at several vaccination sites.

When vaccination cannot be recorded in the database due to the lack of internet, this results in problems generating the computer-formatted vaccine certificate. This will have an impact on public dissatisfaction considering that policies required certificates to access to public facilities. Additionally, the aforementioned conditions cause discrepancies between data recorded manually and data recorded in the system, where manual records reflect higher coverage than electronic records:

> *There is a difference between the manual report and the P-care report recorded at the center. The manual report is 90% but the ministry application is still 76%. This is because the ID number has problems and there is no network in villages or rural areas. There is no network to input data directly, therefore, a buildup occurs in places where a network is present while entering data. Many data were also missed and piled up. Furthermore, there was a difference in data between the manual and the application and several other problems were found. There has been a national forum with the Population and Civil Registration Office. However, this issue remains unresolved as the community members still need to verify their accounts. (Health officer, 40, Male, East Nusa Tenggara)*

DISCUSSION

This study discovered numerous obstacles in administering COVID-19 vaccination in rural areas of eastern Indonesia. The social, geographical, and economic conditions of the community, government policies related to the vaccination program, misinformation and disinformation related to vaccination effects, community awareness to the program, and administrative capacity in the program are several of the important findings discussed in this session.

In the context of economic conditions, the highest poverty incidence is observed in eastern Indonesia, including the provinces of Papua (specifically in the highland regency), West Papua, Maluku, and East Nusa Tenggara. Providing rewards for vaccine recipients is one of the government's strategies for accelerating the vaccination program. However, vaccination incentives are common in many countries and not only applied to the poor. Programs worldwide range from payments of US $4 (CA $5) in Vancouver, Canada, and lotteries in the US state of Ohio to payments of US $175 (€150) in Greece (Oza, 2021). Multiple research studies have showed that incentives can increase vaccination rates (Campos-Mercade et al., 2021; Klüver et al., 2021). Incentivizing also benefits vaccine recipients, including preventing harm from COVID-19 and protecting disadvantaged populations (Persad & Emanuel, 2021). Ethical and economic concerns arise once large monetary incentives are needed to increase vaccination acceptance (Sprengholz et al., 2022). One of the possible supportive efforts is to involve the private sector and philanthropic institutions in providing incentives for vaccine recipients. Indonesia's rapid growth in philanthropic organizations is closely linked to its recognition as the most generous country in the world (Charities Aid Foundation, 2021; Hartnell, 2020).

In addition, several local governments at the provincial and city level have established policies requiring that beneficiaries receive a COVID-19 vaccination before they can receive this assistance. Moreover, the philanthropic funds provided by donors, such as the government and nongovernmental organizations, have been utilized to procure essential items, such as cooking oil, which are then distributed to individuals receiving vaccines. In the community context, provinces in eastern Indonesia are regions that have a greater depth of poverty than regions in western Indonesia. This encourages vaccine providers to provide incentives to attract people's interest in getting the COVID-19 vaccination.

Many community members believe mis- and disinformation concerning vaccinations, and an infodemic unfortunately accompanied the pandemic. An infodemic is a condition where there is an overabundance of information—some accurate and some not—which creates a challenge for communities to locate trustworthy sources and reliable guidance once needed (Pan American Health Organization, 2020). Moreover, low literacy levels drive the massive spread of misinformation or hoaxes (Susilo et al., 2020). The data obtained related to the Indonesian literacy index in 2019 indicated the Eastern provinces have a lower reading literacy index than the Western counterpart (Widjaja et al., 2019). Previous research showed that limited or insufficient literacy is associated with reduced adoption of protective behaviors, such as immunization. This is due to the complexity of information and the multiple steps involved in successfully adopting vaccination (Castro-Sánchez et al., 2016). Therefore, building digital health literacy is vital to limit inequalities from expanding (van Kessel et al., 2022). There are several strategies for combating infodemics, including information monitoring, capacity building for eHealth Literacy and science literacy, encouraging knowledge refinement and quality improvement processes such as fact-checking and peer review, and accurate and timely knowledge translation while minimizing distorting factors such as political or commercial influences (Eysenbach, 2020). We discovered that people with low economic and literacy levels tended to reject the COVID-19 vaccine due to misunderstandings about the effects and benefits of vaccination; this confirmed the SAGE Working Group finding that vaccine hesitancy occurs in people with high socioeconomic status living in urban areas who have concerns about vaccine safety (Dubé et al., 2014).

One of the factors contributing to vaccine acceptance is individuals' perception of COVID-19 being harmless in certain communities while malaria is considered more dangerous, leading to a sense of not needing vaccination. As popularly known, Indonesia is still among the nine malaria-endemic countries in the Southeast Asia region. Additionally, it accounts for 15.6% of the region's reported cases and 22% of malaria deaths (The Lancet Regional Health—Southeast Asia, 2022; World Health Organization, 2022a). Annual Parasite Incidence/API shows the concentration of high malaria endemic regencies or cities in Eastern Indonesia. Around 86% of malaria cases in Indonesia occur in Papua Province, followed by East Nusa Tenggara and West Papua (Directorate of Vector Infectious and Zoonotic Disease Prevention and Control Ministry of Health of Indonesia, 2022). This situation also reflects the fact that there are numerous other global health concerns that must be addressed and remedied, as many outbreaks of cholera, measles, malaria, and meningitis have occurred in numerous nations (World Health Organization, 2022b).

Another condition affecting vaccination coverage is the military conflict that occurred in the eastern regions, specifically Papua, leading to the difficulty for health workers and volunteers to administer vaccinations. In 2019–2020, a series of incidents exacerbated the long-standing conflicts between the Indonesian Government and the Papuans (Gayatri, 2023). Military conflict has been an ongoing determinant of inequitable immunization coverage in many low- and middle-income countries (Grundy & Biggs, 2019). Community engagement needs to persist through the entire COVID-19 response. In conflict-affected areas, the involvement of community and religious leaders, as well as individuals from lower socioeconomic backgrounds, in the delivery of health programs has the potential to enhance program acceptability (Durrance-Bagale et al., 2022). Moreover, specific activities related to vaccine introduction, such as collecting, analyzing, and acting on feedback, perception, and beliefs, should be integrated into country strategies and plans (World Health Organization & United Nations Children's Fund, 2021).

One condition that complicates the implementation of vaccination in the eastern regions is limited geographic access. The geographical conditions in Indonesia, an archipelagic nation with around 17,000 islands (of which 5000–6000 are inhabited) have proven to cause disparities between regions, leading to the uneven distribution of healthcare facilities (Mboi et al., 2022; Tan et al., 2014; Wulandari et al., 2022). Overcoming geographical and seasonal barriers, such as living on islands, dependence on tides, and the rainy season, required significant efforts (Jusril et al., 2022). Geographically inaccessible communities such as those who lived on islands, mountains, valleys, slums, and other places that become inaccessible during the rainy season were considered as barriers to vaccination programs (Tagoe et al., 2021). Geographic limitations to immunization services, political disputes and instability, and illegal immigration were all concerns in low- and middle-income countries (Dubé et al., 2014). Mobile vaccination units are a promising strategy to distribute vaccines directly to individuals facing challenges due to transportation, technology, and geographic barriers (Gonzales et al., 2021).

The geological features of the islands and mountains also make developing the internet and using technology in those locations challenging. In reality, the COVID-19 vaccine was recorded online using the p-care program, which is difficult to access in areas with limited internet networks. This situation additionally hinders health workers from recording vaccination recipients in the system when vaccines are administered, resulting in discrepancies in vaccine recipient data between manual recording and the online system. In these circumstances, the local government promotes health facilities by providing computers and internet networks so that officers can enter manual records into the system, resulting in similarities between manual and system records.

Strengths and limitations

This research is one of the first to explore vaccination challenges with a multi-perspective approach in rural areas, specifically in eastern Indonesia. During data collection, some of the scheduled participants from the Police Health Division were absent. However, it was discovered that many participants associated with this institution were located in other regencies/cities. Moreover, the results of this qualitative study may not be generalizable to other parts of the country, though they may provide insights relevant to stakeholders in similar situations (Denny & Weckesser, 2019). Therefore, further investigation using quantitative methods is needed to examine the determinants of vaccine access in rural areas in the Eastern regions.

CONCLUSION

The low coverage of COVID-19 vaccination in eastern Indonesia cannot be attributed to a single factor, as various complex and context-specific factors are involved. Challenges in administering vaccinations in this region come from contextual factors, individual and group factors, and vaccine or vaccination factors. Various sectors and figures should be involved in carrying out several important tasks, particularly to improve people's access to vaccination programs and healthcare. The community needs to be continuously provided, through different communication channels, with correct information such as the benefits of vaccines in addressing the pandemic, as well as vaccination's associated side effects. This should be integrated with the community's culture and religion. Community and religious figures can be involved in the communication by integrating the process into cultural activities to increase the acceptance of the information disseminated. Philanthropic organizations or private parties can participate in providing financial support, including various gifts, for vaccine recipients. The central government should prioritize allocating funds, vaccines, and supporting facilities specifically to rural eastern Indonesia areas to improve access vaccine and healthcare. Moreover, related to vaccine mandates, the government should engage directly with several stakeholders such as medical and legal experts and their citizens including vaccine-hesitant individuals (Attwell et al., 2022).

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CONFLICT OF INTEREST STATEMENT

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author.

ETHICS STATEMENT

Ethical approval was granted by the Ethics Committee of the Faculty of Health Sciences, Universitas Islam Negeri Syarif Hidayatullah Jakarta. Number 03/20/07/0516.

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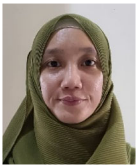

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RESEARCH ARTICLE

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Mapping the extraordinary measure disease outbreak (EMDO): An analysis of health regulations in Indonesia 2000–2023

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Abstract

This research focused on the Indonesian Government's global pandemic policy mapping from 2000 to 2023 ($n = 979$). Indonesia has been affected by diseases such as H1N1, H5N1, SARS-Cov-1, and the current SARS-CoV-2 (COVID-19). This research will focus on these outbreaks to see the readiness of Indonesian government policy mapping to emergencies. This research will measure Indonesian health policy mapping based on its capability to adapt to local contexts, construct a care delivery value chain, leverage shared delivery infrastructure, and improve health delivery and economic development. This study implemented feasibility analysis with a method scoring system for all the pillars above. Findings indicate that most health policies developed by the Indonesian Government are oriented toward responding to current conditions, not preparing for future health challenges. This research also provides patterns regarding the development of health policymaking to deal with emergency conditions.

KEYWORDS

disease control, effectiveness, emergency service, emergent infections, health policy, policy analysis, policy implementation, risk situation

Key points

- Most health policies instituted by the Indonesian government are oriented toward responding to the current condition, not preparing for future health challenges.
- There are minimum policies regarding the infrastructure for the prevention and readiness of Indonesian health challenges, especially regarding the Extraordinary Measure on Disease Outbreak (EMDO).
- This research finds a small number of policies addressing viruses and bacteria in Indonesia.

INTRODUCTION

Humans are vulnerable to infection by more than 1400 species of infectious disease (Berman, 2019; Sampath et al., 2007; van Doorn, 2014). In addition, several ecological factors, including climate change and cross-special transmission, can create viral emergency hotspots (van Doorn, 2014). All countries can pose a risk to meet the challenges of future epidemics and pandemics (Frutos et al., 2021).

As the fourth most populous country in the world, Indonesia is vulnerable to numerous diseases (Coker et al., 2011). The rapid development of technology and globalization in recent years poses a severe challenge to preventing disease outbreaks in Indonesia. As technology and information advance, increasingly porous national borders encourage mobility. Uncertain global conditions increase the prevalence of global health threats.

Indonesia, the world's largest tropical archipelago, has more than 17,000 islands straddling the equator. However, Indonesia's population is distributed unevenly, presenting substantial challenges to governance, communication, transportation, and the equitable availability of essential health services. Moreover, since 1990, Indonesia has been experiencing a double disease burden at the national level (Mboi et al., 2018). Nowadays, Indonesia is struggling to deal with the triple burden of disease, that is, noncommunicable diseases (NCDs), communicable diseases, and the existing but neglected tropical diseases, such as yaws, schistosomiasis, and other emerging and reemerging diseases (Moeloek, 2017). Indonesia could become a tropical hotspot with its high frequency of novel viral emergences poised to spread globally (Coker et al., 2011).

In July 2021, the World Bank reported on the impact of the COVID-19 pandemic. Among other things, Indonesia fell from an upper-middle-income to a lower-middle-income status (World Bank, 2022). Moreover, health is closely connected to the economy's growth (Szreter, 2007), leaving marginalized groups vulnerable to profound health and economic risks during the COVID-19 pandemic. According to the World Health Organization, health policies ideally consist of promotive, preventive, curative, and rehabilitation actions. Health policies should be concerned with the growth of economic development and strengthening legislation for public health emergencies (World Health Organization, 2010).

A disease is a disorder of structure or function in a human, animal, or plant, especially one that produces specific symptoms or affects a particular location and is not simply a direct result of physical injury. Disease is a natural phenomenon, which is crucial in the adaptation process. Human activities become one of the resources of the disease spread. Disease can spread suddenly from human activities and lifestyle. Health policy must focus on the possible spread of disease. Lifestyles are related to consumption and cleanliness, especially within residences, which can facilitate disease spread (Farmer et al., 2013). With the increasing complexity of human life, the pattern of human life can also spread disease.

Several outbreaks were characterized by similar dynamics in the past decade. The H1N1 and H5N1 flu viruses have transformed into very fast early pandemics, followed by the SARS and MERS viruses, which also became pandemics. During 2020, the recent Coronavirus (COVID-19) cases are a real example of disease outbreaks. Since the H1N1 and H5N1 pandemics, the Indonesian Government has only been able to implement viral sovereignty to prevent a monopoly on vaccines and medical equipment that can prevent a pandemic from happening again (Šehović, 2017). Viral sovereignty can be interpreted as the state's responsibility to maintain the people's health, especially implementing strategies to overcome the pandemic, mainly ensuring the availability of vaccines and limiting the distribution of samples so that the health industry does not commercialize them. Government policy is more in response to the commercialization of vaccines than preparing for the possibility of future pandemics.

Indonesia was hit by several dangerous outbreaks in 2006, such as H5N1 and H1N1. However, Indonesia still has not delivered the best response because health facilities have not been adequate to research and overcome this outbreak (Šehović, 2017). Limited economic capacity has led to poor investments in health facilities and other infrastructure by the Indonesian government. Based on the National Long Term Development Plan (Indonesian Law No. 17 2007), public health development has become a governmental focus. The implementation of health services and policy are constrained by economic capacity. The World Bank (2022) classifies Indonesia as a lower-middle-income country, hindering the Government's ability to prevent the spread of disease.

This study discovered the conflicting interest in formulating and implementing public policy to handle communicable disease outbreaks in Indonesia. It also identified an urgent need to review institutional structures, especially The Ministry of Health, with a systematic integration and policy strategy approach to develop capacity for public health resilience. This paper will map policies adopted by the Government as part of the pandemic response and the crucial factors determining readiness for emergency mitigation. This study also measures the characteristics of government policy for disease outbreaks. This paper analyzes the robustness of several policies adopted to overcome Indonesia's global pandemic. Current conditions that are increasingly unpredictable should make the Government more responsive in mitigating the spread of outbreaks or pandemics that can threaten lives.

LITERATURE REVIEW

The policies implemented by the Government must pay attention to more critical aspects of handling emergency conditions, especially dealing with pandemics. According to Farmer et al. (2013), public health policy should be based on four main pillars, namely:

- Adapting to the local context;
- Constructing a care delivery value chain;
- Leveraging shared delivery infrastructure and;
- Improving both health care delivery and economic development.

These four pillars must be manifested in every government policy, ensuring public health and effectively addressing emergency conditions.

First, every government public health policy must provide an accommodative space for local characteristics and aspects (Farmer et al., 2013). Health is an aspect of human life closely related to other aspects, especially culture. Hence, local knowledge about the disease will significantly influence people's knowledge about health. Health policies should pay attention to cultural aspects so that the health policies will not override local aspects. Health is also related to community customs. Several variables must be considered when ensuring that health policies have been adapted to the local context, including:

- Climate conditions. Tropical or colder conditions may differentiate in disease risk.
- Geographical variations. Mountainous or dune regions may differentiate in disease.
- Politics shape how policies are made.
- Labor market characteristics and demographic trends.
- Health policies must reflect customs and local contexts.

The second is constructing a care delivery value chain. In this context, every health policy taken must attend to the value of patients to ensure that policies are oriented toward communities rather than being preoccupied with programmatic effectiveness or efficiency

(Farmer et al., 2013). Care Delivery Value Chain (CDVC) is a concept about optimizing health policies oriented to the community, especially in emergencies. Prioritizing the community in emergency conditions is not an easy thing. In the context of disease outbreaks, patients can exceed the capacity of health facilities, which needs to be responded to by policymakers by building a health system that can accommodate all levels of society. In this CDVC system, health policies must account for all stages of patient health management, from diagnosis to preparation, intervention, and rehabilitation. In addition, CDVC also guarantees all crucial aspects of medical treatment in the community, which include monitoring, prevention, the termination of medical treatment, and medical management.

The third aspect becomes the primary indicator in ensuring the implementation of community-oriented public health policies. This aspect is related to the capacity of health infrastructure to overcome various kinds of medical problems in the community (Farmer et al., 2013). Adequate health facilities are focused on modernizing medical equipment, health infrastructure capacity, a separate pharmacy system at each intervention stage, and medical personnel qualified for medical treatment. The number of hospitals and clinics determined the scoop and capacity of health infrastructure to be inclusive within the region. Not to mention, this pillar also considers the quality of medical tools, such as the recency and the advancement of its technology. In a pandemic situation, the capacity of health infrastructure will be the key to handling the pandemic, and if the capacity of health facilities is not proportional to the population, the implications will be fatal for handling the pandemic. The availability of drugs and medical personnel must be considered in the case of a pandemic, which are vital factors in suppressing the spread of the disease.

The last factor related to the health system is economic progress and the process of implementing public health policies. Economic factors will support infrastructure capacity and the government's readiness to respond to emergencies. However, the availability of health facilities and medical personnel is impossible without economic benefits. The construction of health facilities is essential for ensuring the availability of health infrastructure and the recruitment process for professional medical personnel. Although the health sector has a substantial role in the private sector, the Government's capacity in the health sector is the leading indicator that determines an adequate public health system. The government must focus on economic policies that can encourage the development of health infrastructure and the availability of medical personnel. The government must also focus on reducing poverty so that the disparity in access to health and poverty will be disparities.

By paying attention to the four main aspects of constructing public health, the government and private sector collaboration plays an important role. The Government must also focus on preparing schemes to deal with emergency conditions, especially those related to pandemics and epidemics of certain diseases. The collaboration between the Government and the private sector is vital to ensure the availability of health readiness in responding to the challenges of disease outbreaks.

DATA AND METHODS

Data on health regulations and Indonesia's health profile used in this study are available on the Indonesian Ministry of Health website (http://hukor.kemkes.go.id/). We used a web-scrapping method to collect health policy data from the Ministry of Health of the Republic of Indonesia website. Data was obtained by web-scraping Indonesia's central-level health regulations. Web-scraping is a method of extracting large amounts of specific data and is effective for collecting large amounts of data in a short time while retaining data formatting. The health policies in Indonesia will become data instruments that play a role in health regulation in sub-provincial government, sub-district government, professional bodies, and associations. Data are gathered by classifying a type of regulation for over two decades, between 2000 and 2023. Scraping yielded 979 overall health regulations.

According to Indonesia's law and institutional authority hierarchy, we organized regulations into seven parts. All seven parts were analyzed considering demography, healthcare facilities, and community-based health efforts. Data were selected and published from the Indonesia Health Profile for 22 years between 2000 and 2023. The research also verified the annual report of the Health Indonesia Profile by cross-checking the implementation of health regulations at the subcentral government level to determine the existing condition of health development in Indonesia.

The analysis is carried out feasibility analysis with a method scoring system. The scoring (health regulations) is assessed using the following pillars: (i) adapting to a local context, (ii) constructing a care delivery value chain, (iii) leveraging shared delivery infrastructure, and (iv) improving both health delivery and economic development (Farmer et al., 2013). Furthermore, the research classifies health policies into two categories: public health emergencies of international concern (PHEIC) and disease outbreak. PHEIC is for health policies that regulate outbreaks that have become international epidemics derived from WHO policies. Meanwhile, the disease is for health policies that regulate outbreaks that have entered Indonesia. To be classified as Extraordinary Measure on Disease Outbreak (EMDO), a health policy must meet the categories of PHEIC and/or disease.

This research will use scoring through numeric coding criteria (on each scale). This method will produce numbers at the measurement interval level and interpretations generated in the category or ordinal level score groups. The raw score generated from the scale code is the sum of the item score on the scale. A score of numeric criteria using (a) no relation to the four pillars = score 0, (b) there is only one pillar out of four pillars = score “1”, (c) there are only two pillars out of 4 pillars = score “2”, (d) there is only three pillars out of 4 pillars = score “3”, (e) 4 pillars fulfilled = score “4”.

RESULTS AND DISCUSSION

Indonesia faces a double burden of diseases due to the increasing number of non-communicable diseases and the high incidence of infectious diseases. The Global Burden of Disease study quantified health loss levels and trends due to diseases, injuries, and risk factors in Indonesia. The disease burden was increased to 20 leading risk factors in 2019, expressed as a percentage of Indonesian DALYs (Mboi et al., 2022). The study indicated that Indonesia is facing double burdens for communicable and noncommunicable diseases that spread out around 38 provinces in Indonesia. In 2020, The Maternal Mortality Rate (MMR) documented almost 7000 deaths and was confirmed by the Ministry of Health Indonesian MMR at 305 deaths per 100,000 live births (Indonesian Ministry of Health, 2023)—a finding that gives Indonesia the highest maternal mortality rate in Southeast Asia. The under-five, infant, and neonatal mortality rates reflect the child mortality indicator, including 28,158 under-five deaths and 20,266 neonatal deaths (Hardhana et al., 2020). Indonesia's top five mortality risks are stroke, ischemic heart disease, neonatal disorders, diabetes, and tuberculosis (TB) (Mboi et al., 2022).

Furthermore, Indonesia has one of the highest TB disease burdens globally due to its large population and high prevalence rate (Collins et al., 2017). The incidence rate of TB in Indonesia has been falling slowly but is almost wholly offset by population increase. Additionally, other endemic diseases include HIV-AIDS, pneumonia, hepatitis, diarrhea, malaria, dengue, leptospirosis, measles and rubella, yellow fever, filariasis, meningitis, polio, and several other zoonotic diseases.

In response to the exponential increase in international travel trade and the emergence of international disease threats and other health risks. WHO has necessitated a paradigm shift in emergency preparedness. The International Health Regulations (IHR) signaled the need to move from control at borders to containment at source and from managing emergencies to managing risks. The IHR aims to improve countries' core capacities in detecting, verifying, reporting, and responding to PHEIC.

Indonesia's geographical location makes it a hotspot for emerging infectious diseases. One of the biggest emerging diseases in Indonesia is influenza. Indonesia's efforts in emergency preparedness are a tremendous effort to improve pandemic preparedness following avian influenza A (H5N1) outbreaks in humans in 2005 through developing the national strategic plan for controlling avian influenza preparedness 2006–2008.

Not only H5N1, but Indonesia also faced the emerging disease of H1N1. On April 29, 2009, WHO declared an influenza virus strain H1N1 outbreak, quickly becoming a pandemic phase 5. Until July 12, 2009, there were more than 64 cases of H1N1 in Indonesia (Indonesian Ministry of Health, 2009). Responding to the influenza A (H1N1) pandemic in 2009, Indonesia developed and implemented a pandemic response plan involving multisectoral stakeholders. Influenza-like illness and severe acute respiratory infection sentinel surveillance as part of the Global Influenza Surveillance and Response System (GISRS) detected H1N1 in 2009 in Indonesia. In 2011, to improve equality and fairness in pandemic preparedness, Indonesia initiated the development of the pandemic influenza preparedness framework for access to vaccines. This effort aims to make pandemic influenza preparedness more transparent, equitable, efficient, and effective for low-middle-income countries. Based on lessons learned from the experience of the 2009 H1N1 influenza pandemic, the WHO developed guidelines for influenza pandemic risk management. This effort shifted toward an all-hazards emergency risk management approach to pandemic preparedness and response.

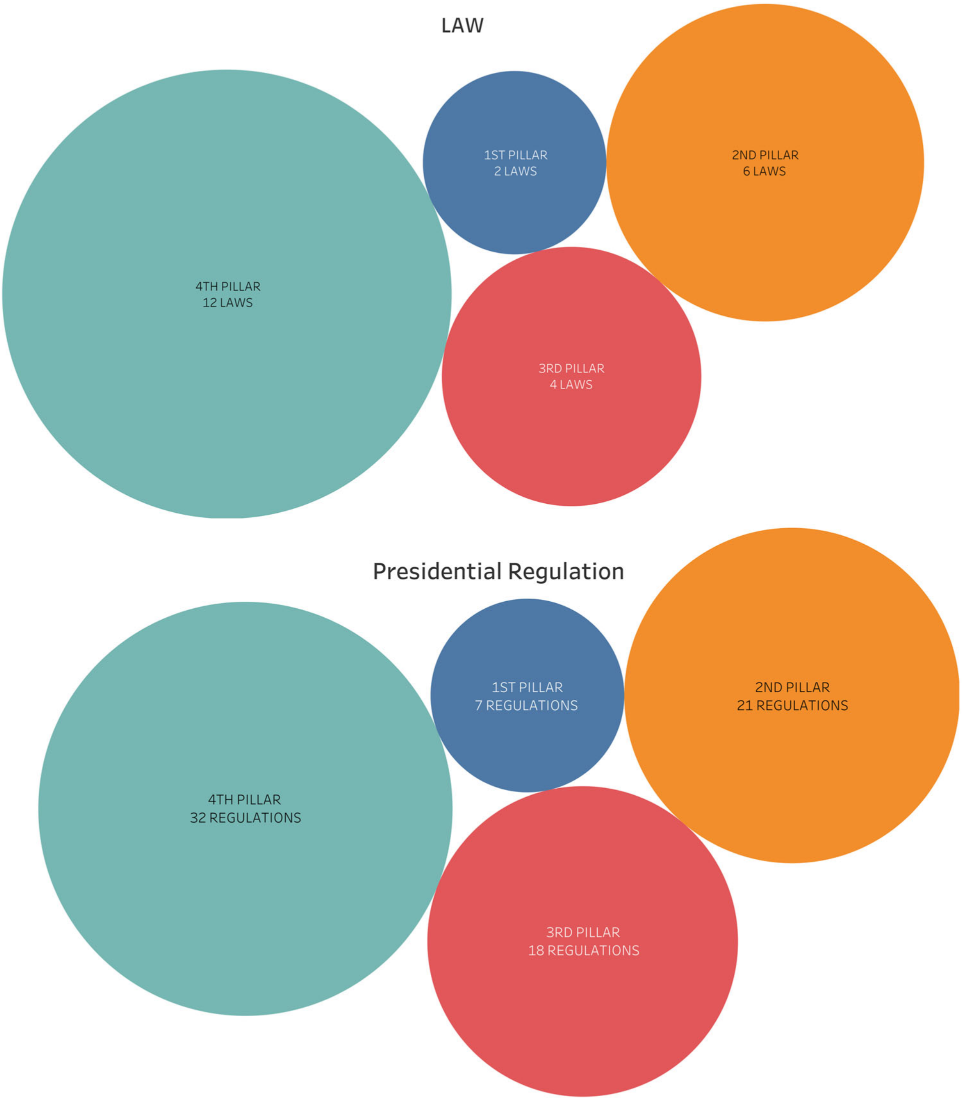
In 2017, Indonesia used these guidelines and the WHO pandemic preparedness checklist to create the national pandemic risk management guideline and contingency plan for pandemic influenza. These were developed using a whole-of-society approach, involving multisectoral stakeholders at all levels, subsequently in a commonly agreed coordination framework with clear roles and responsibilities defined for all sectors and agencies (Rai et al., 2020).

The Ministry of Health plays a vital role in organizing multisectoral stakeholders to manage health regulations in Indonesia. The Ministry of Health is also in charge of managing national health threats. The Ministry of Health is tasked with overseeing the health sector, including the seven types of policies related to health regulations:

1. Decree of the Minister of Health (*Keputusan Menteri Kesehatan*), $n = 460$.
2. Regulation of the Minister of Health (*Peraturan Menteri Kesehatan*), $n = 353$.
3. Executive Order (*Instruksi Presiden*), $n = 8$.
4. Government Regulation (*Peraturan Pemerintah*), $n = 47$.
5. Presidential Decree (Keputusan Presiden), $n = 9$.
6. Presidential Regulation (Peraturan Presiden), $n = 78$. Lastly, Law (Undang-Undang), $n = 24$.

The study aims to classify and identify the disease control and prevention regulatory analysis. In conducting the analysis, we used four analysis pillars to score each policy. The four pillars are (1) adapting to the local context, (2) constructing a care delivery value chain, (3) leveraging shared delivery infrastructure, and (4) improving both health delivery and economic development. A policy must fulfill specific requirements for each of the four pillars to receive a score for that pillar.

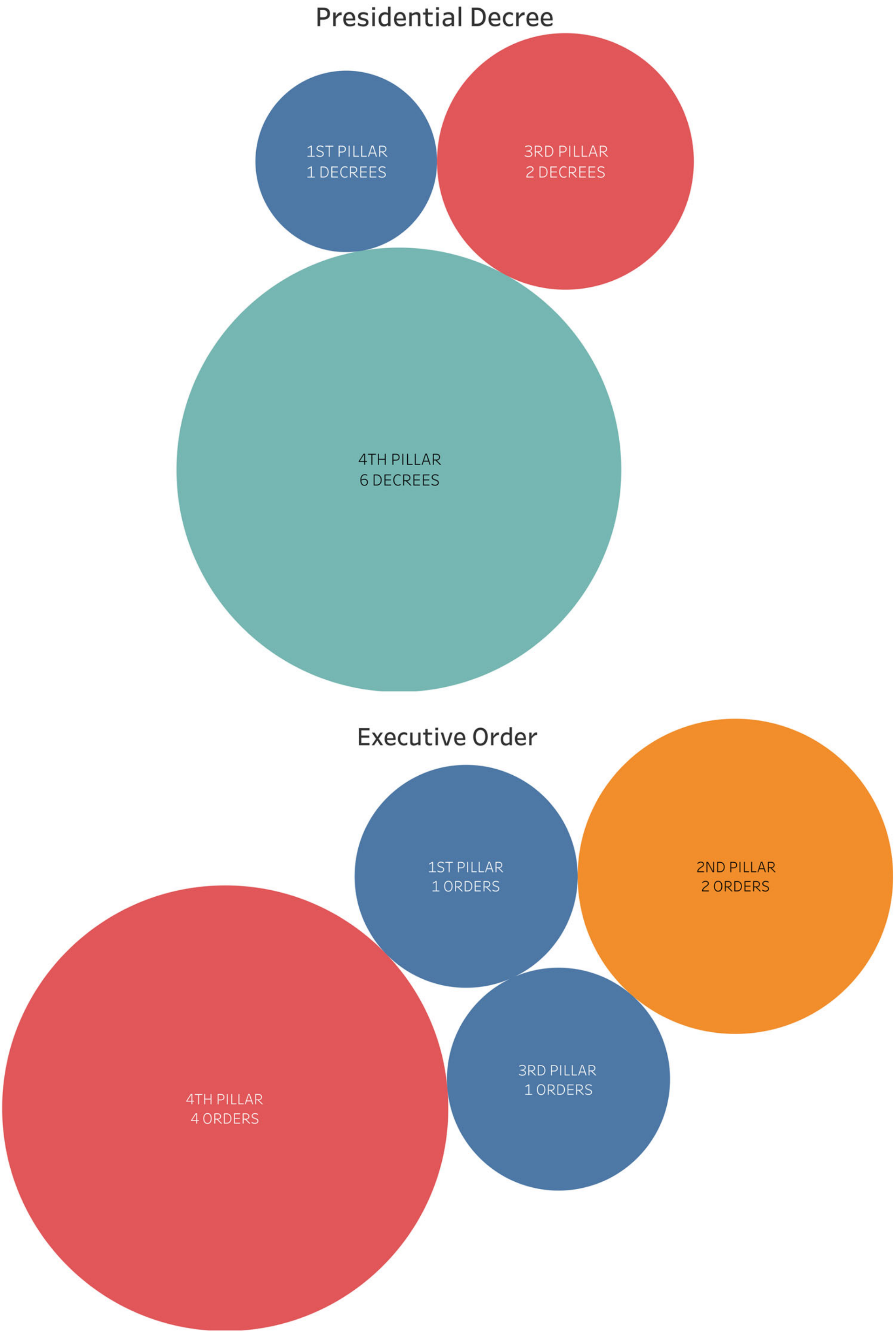
According to Graphic 1, Data from the chart shows the diversification of health policy data that we provide from 2000 to 2023. We analyzed seven types of health policies in



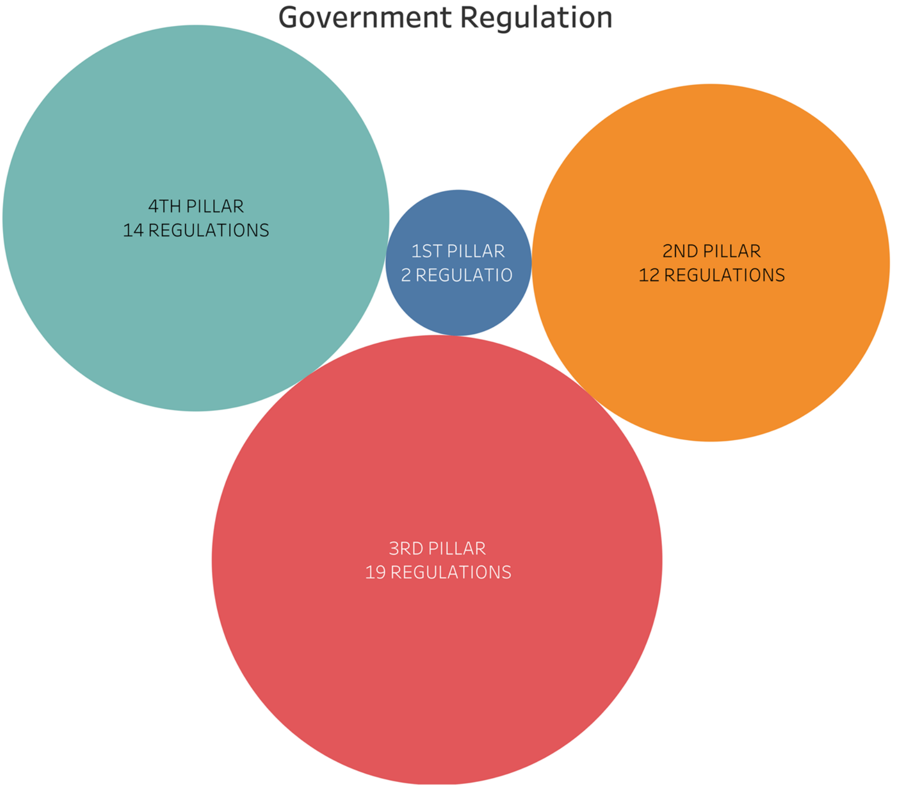
GRAPHIC 1 Health policy mapping 2000–2023.

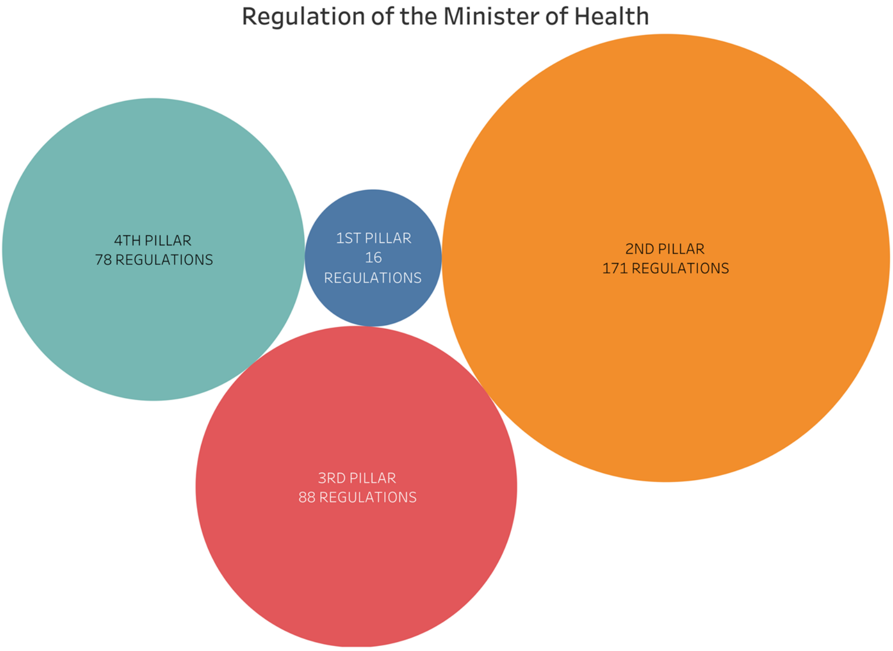
Indonesia using the four pillars of analysis, including laws, presidential regulations, presidential decrees, government regulations, executive orders, regulations of the minister of health, and decrees of the minister of health. From the analysis results of the seven health policies, we found that the number of health policies that fulfilled four pillars was 339 (35%), while the remaining 640 health policies (65%) did not fulfill the four pillars of analysis. Therefore, health policies in Indonesia, especially those related to handling outbreaks and EMDO, are still ineffective and unprepared for future health challenges.

The first pillar discusses adapting to the local context. This pillar focuses on a country's local circumstances, including its geography, demographics, climate conditions, and political characteristics. According to Graphic 2, in its implementation in Indonesia, the 979 health policy data provided has fulfilled this first pillar. The main reason for policymaking in Indonesia must consider the local context as the primary justification. The interests in



GRAPHIC 1 (Continued)





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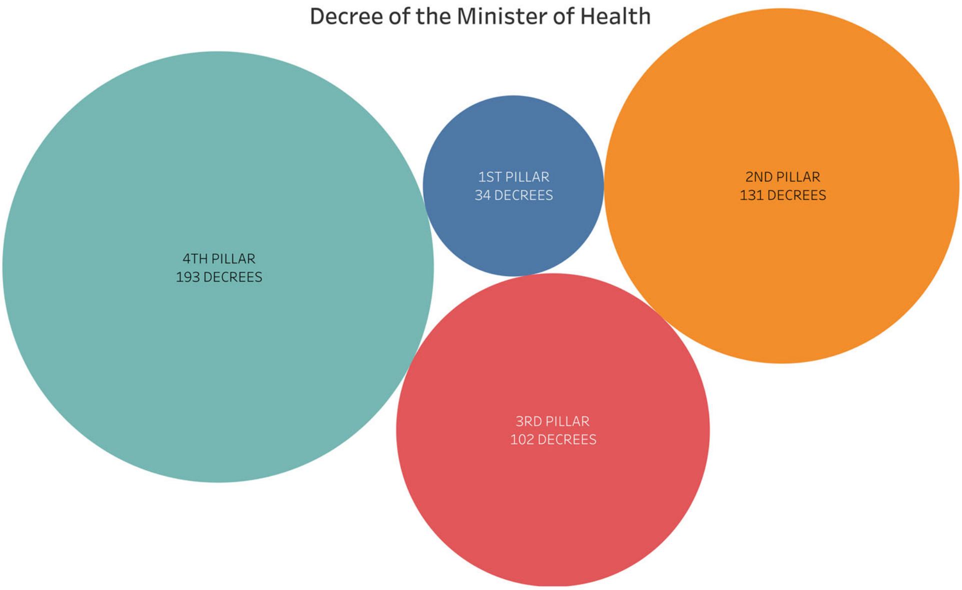

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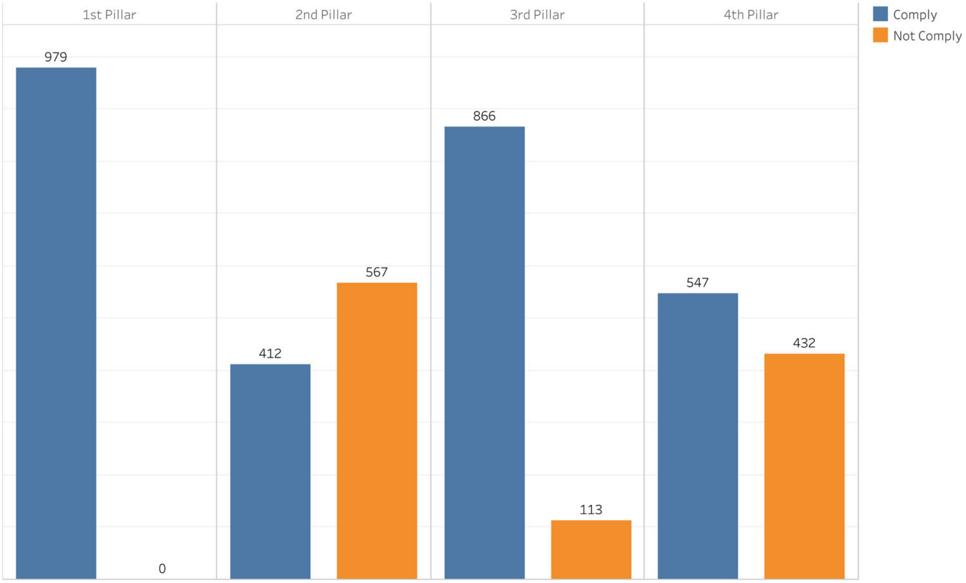


GRAPHIC 2 Scoring system analysis of each pillar.

policymaking are only focused on local needs. Therefore, all formulated policies cannot deviate from local aspects and contexts.

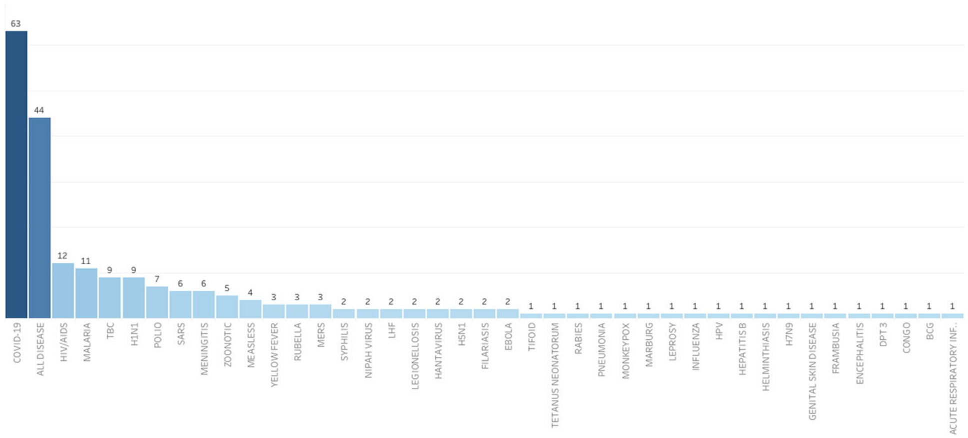
The second pillar discusses constructing a care delivery value chain. This pillar focuses on anticipatory and preventive efforts, medical interventions, any effort to delay the potential or progression of an outbreak, and rehabilitation or continuous disease management. Based on Graphic 2, the 979 data analyzed show that 412 health policies in Indonesia fulfill this pillar, while the remaining 567 do not. This result indicates that this pillar has the lowest achievement compared to other pillars. The current condition happens because out of the 979 health policies in Indonesia from 2000 to 2023, only 175 policies (18%) were identified as outbreaks, 122 policies (12%) were identified as PHEIC, 855 policies (88%) were identified as non-PHEIC, and 802 policies (82%) were identified as non-outbreak. Convincingly, health policies in Indonesia are still not concentrated on handling outbreaks or PHEIC and are lacking in highlighting rehabilitation or continuous disease management. Therefore, not many policies have been fulfilled for this second pillar yet.

The third pillar discusses leveraging shared delivery infrastructure. This pillar emphasizes the importance of utilizing existing health infrastructure and human resources. According to Graphic 2, from the 979 data analyzed, it is shown that 866 health policies in Indonesia fulfill this pillar, while the remaining 113 do not. This result implies that this pillar has a significantly high level of achievement.

The fourth pillar discusses improving both health delivery and economic development. This pillar emphasizes the importance of integrating health programs with national economic development. Based on Graphic 2, the 979 data analyzed show that 547 health policies in Indonesia fulfill this pillar, while the remaining 432 do not. This result indicates that the connectivity between health programs initiated by the Government of Indonesia, especially the Ministry of Health of the Republic of Indonesia, and national economic development still needs to be improved. This is quite important, considering that the linkage of national health programs with the direction of national economic development will have a long-term impact that supports the program's sustainability toward the welfare of society.

After gathering the health-related policies from 2000 to 2023, most government policies must follow all pillars that measure the policy capability on emergency and contagious disease prevention. Most of the policies taken between 2000 and 2023 only focus on the organization of the ministry, budgeting, and health-related permission. The data also reveal that on the executive level, especially at the ministerial level, only policies are taken regarding health emergencies and controlling contagious diseases. In general terms, there are only six clusters of policies taken by the Indonesian government, which are (1) appeal, (2) disease prevention, (3) medical treatment, (4) research and development, (5) international cooperation, and (6) subsidies, insurance, and compensation. Most policies only focus on the appeal to society, mainly because most health policies are not fulfilled by the fourth pillar, improving health delivery and economic development. With the fourth largest population in the world, it is challenging for the Indonesian Government to deliver primary health care and infrastructure to Indonesian society.

The research also implements cluster analysis on how the health policy prevents disease outbreaks. The research found that the series of policies taken by the Government does not focus on disease outbreaks. From 2000 to 2023, there were only 187 policies that focused on disease outbreaks nationally. Most policies are merely concerned with the current disease outbreaks, especially COVID-19. According to Graphic 3, since the first case of COVID-19 in Indonesia in 2020, only 63 policies have been established to respond to the disease outbreak. These numbers are far from expected compared to any other non-extraordinary measure policy ratified during this period. It indicates that Indonesia is unprepared with the prevention mechanism to tackle and prevent a disease outbreak. Indonesia only focused on disease policies when outbreaks reached pandemic levels. Meanwhile, other policies only focus on a few diseases, such as HIV/AIDS, Malaria, H1N1, TB, SARS, and others. The percentage of these diseases vastly differs from the percentage of policies focusing on COVID-19. Furthermore, the government should have prepared itself for all types of epidemics to anticipate the effects of the outbreak. Not only focusing on the recent outbreaks but should focus on the long-term outbreaks.



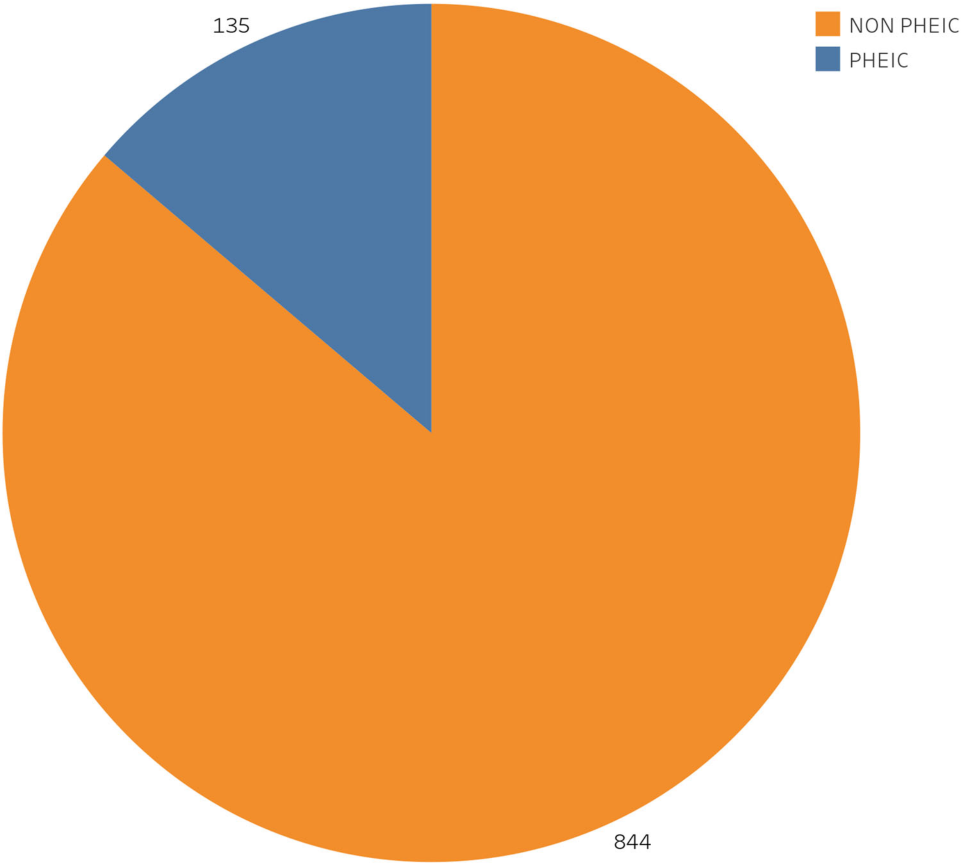
GRAPHIC 3 Health policies related to disease outbreaks.

Not only nationally, but the Indonesian government is also required to be able to maintain health policies based on international standards. Meanwhile, Indonesia is not concerned about emerging diseases based on international regulations. Public Health Emergency of International Concern (PHEIC) is an effort declared by the World Health Organization to minimize global health risks. The purpose is to prevent global disease from unexpected, profound, and unusual situations. Based on Graphic 4, the Indonesian government only established 135 policies that fulfilled the international standard in preventing global health matters. Only 13.7% of policies were synced with PHEIC by the Indonesian government from 2000 to 2023.

We analyze regulations according to the president's term of office as head of Government (1 period of presidency = 5 years). Based on Graphic 5, this number does not align with non-PHEIC regulations. There have been many non-PHEIC policies in Indonesia for the past 22 years. From 2000 to 2004, there were 49 non-PHEIC policies, and this increased fourfold from 2005 to 2009 (214), continuing to increase year by year. Indonesia faced pandemic outbreaks of H5N1 A in 2005 and H1N1 in 2009. From 2010 to 2014, the WHO did not declare any Public Health Emergencies of International Concern; yet, during these intervals, some communicable diseases such as HIV/AIDS, Malaria, H1N1, TBC, Leptospirosis, and other zoonotic diseases were present. Even though WHO declared some outbreaks, such as Polio and Ebola, in Western Africa, these outbreaks are not considered emergencies. Therefore, using years as an interval, Indonesia has created 23 PHEIC policies compared with 265 non-PEHIC policies.

During 2015–2019, the number of PHEIC policies decreased from 23 to 13. During this time, the world was also dealing with Ebola, Zika, and Kivu Ebola cases. This situation led critics from many international parties to declare that Indonesia was not contributing meaningfully to maintaining global health. In contrast with the next internal, 2020-present, WHO issued the most PHEICs to date, with 68 PHEIC policies compared with 43 non-PHEIC policies. These data indicate that Indonesia only focuses on recent disease outbreaks.

This condition has become the main obstacle in health policymaking in Indonesia. Since the policy does not comprehensively respond to the viral threat or emerging infection, the Ministry of Health gives more significant tendencies to the non-EMDO policy. EMDO means that the government should be concerned with disease prevention based on emerging diseases. The achievement of the four pillars and concern for emerging disease outbreaks

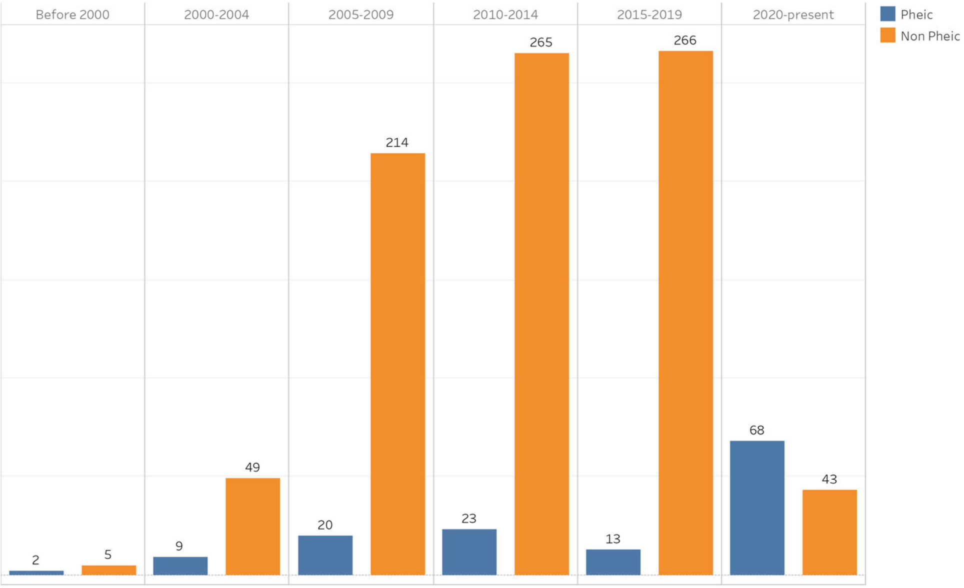


GRAPHIC 4 Total PHEIC and non-PHEIC regulation in Indonesia. PHEIC, public health emergencies of international concern.

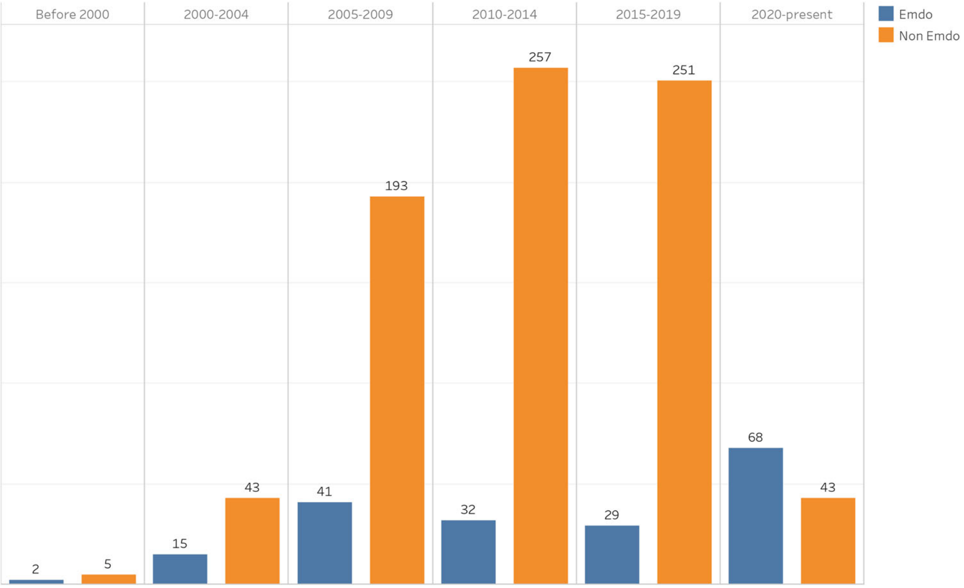
represents the excellent quality of a policy at the national level. Every country has different conditions and EMDO will measure the country's preparedness to prevent emerging diseases at the national level.

According to Graphic 6, there are only 187 EMDO policies in Indonesia. This means that only 19% of policies are concerned with emerging diseases. From 2000 to 2004, along with the SARS and H5N1 outbreaks, Indonesia only released 15 EMDO policies compared to 43 non-EMDO policies. During this time, EMDO policies were at their lowest point in 20 years. Most of these policies focused on irrelevant issues regarding EMDO, such as policies on guidelines for rehabilitation practices, implementation of health education, and procurement of goods and services to national social insurance. Theavian influenza epidemic arose in 2005, increasing the urgency for EMDO policy arrangements to suspend the spreading impact of the outbreak. Unfortunately, the government failed to establish prevention and healthcare facilities through a concrete extraordinary policy.

In the next 5 years, 2005–2009, Indonesia was still in the same situation, focusing on non-EMDO policymaking as shown in Graphic 6; the non-EMDO policies released in 2005–2009 were 193 policies. During this period, Indonesia faced several disease outbreaks caused by viruses, starting from the situation in Indonesia, which was still faced with cases of avian influenza, a continuation of cases from 2005 since the first outbreak.



GRAPHIC 5 Interval period of PHEIC regulation in Indonesia. PHEIC, public health emergencies of international concern.



GRAPHIC 6 Interval period of EMDO in Indonesia. EMDO, extraordinary measure disease outbreak.

Cases of Malaria and Tuberculosis, the outbreak of chikungunya disease in 2006 and 2009, the swine flu virus emerged, which later became an outbreak status because it had spread in Indonesia, and there was an increase in cases of dengue fever outbreaks until 2010. However, with this situation, Indonesia only issued 41 EMDO policies. Many of these policies needed to be more effective and comprehensive to accommodate the outbreak crisis in Indonesia. In the long term, Indonesia faced the challenge of preventing and controlling disease spread.

During 2010–2014, the government issued only 32 EMDO policies and 257 non-EMDO policies. This number has decreased compared to the previous year for EMDO policies. In addition, the government reported the highest rate of HIV/AIDS in 20 years (1.8%). This report is separate government efforts to reach EMDO standards. The Indonesian government is expected to maintain EMDO minimum standards in every policy. During 2015-2019, however, EMDO policies decreased to 29 compared with 251 non-EMDO policies.

Lastly, from 2020 until now, Indonesia issued the most EMDO policies in the last 20 years, with 68 policies. The emergence of the COVID-19 pandemic also triggers this number. Some of the extraordinary measures by the government are strengthening health infrastructure, health services, supply of medicines, and providing incentives for health workers, including procuring vaccines. Besides, the government responded to the outbreak by launching non-extraordinary measures around the 43 non-EMDO Policy.

Subsequently, the number of health regulations (n) correlated with the president's term. The number of health regulations (n) is significant in the president's first term and related to re-election prospects. The 2004–2009 interval is during the reign of President Susilo Bambang Yudhoyono, while the 2014–2019 interval is the period of the administration of President Jokowi in the first period. In addition, Presidents Susilo Bambang Yudhoyono and Jokowi served for two terms. Indonesia will face general elections (5 years), determining the direction of health development in the next 5 years. Based on this condition, performance achievement in policy implementation will be used as a strategic capital campaign and for political promises to win the election.

Over the last decade, Indonesia has introduced several reforms affecting different aspects of the health system, each of which is affected by multi-sectoral government and public administration reforms. Reforms that focus specifically on the health sector include improving the quality of human health resources and introducing the National Health Insurance Program (JKN). In 2014, JKN was a governmental health service program in the form of BPJS Health and BPJS Employment. JKN is the New Model of Indonesian Health Services (Mahendradhata et al., 2017).

The system uses an insurance system. The legal basis for Health Insurance is substantiated in Section 28-H of the Indonesian constitution. Law No. 40/2004, which concerns the National Social Security System, established JKN. Health services are provided through a referral system and strengthening the development of health efforts to ensure service quality. Health effort resources consist of human health resources and financing, service facilities, pharmaceuticals, medical devices, adequate management, and health information systems. Health efforts are carried out with promotive, preventive, curative, and rehabilitative approaches.

Accordingly, JKN implementation has succeeded in expanding and facilitating public access to affordable medical services. JKN also addresses various diseases ranging from emergency- and infectious- to chronic- and non-communicable diseases. The expansion and ease of access to health services provide an accurate picture of the health condition of the Indonesian people. The ideal health system concerns curative, rehabilitative, promotion, and disease prevention. The vital issue is that the cost of treating the disease is higher than preventing it.

The Global Health Delivery Project has outlined some of the basic principles of health care delivery: with the local context, designing care systems that maximize value for patients, leverage shared delivery infrastructure, and improve both health services and economic development. The final section then looks at human resources for health and health financing, one of the critical components of strengthening the health system (Farmer et al., 2013). The implementation of the pandemic influenza preparedness framework should position the Indonesian government to face future pandemics. The government's position is further strengthened by multi-sectoral coordination mechanisms, the active involvement of all relevant stakeholders, and political support (Rai et al., 2020).

However, Indonesia has immense potential to become a pandemic epicenter (Health Policy Watch, 2021). Along with global disease spread, Indonesia has experienced various disease outbreaks since its colonial period. Disease outbreaks like pox were crucial concerns for Indonesia's primary colonizer, the Dutch (Purnamasari, 2019). After Indonesia gained independence, health management institutions became urgent issues. During this era, various health institutions, especially in the field of disease control, had been established and spread across several regions in Indonesia.

One that inspired the fulfillment of the pillars was Indonesia's mitigation and management of Avian Influenza, the most prominent infectious disease before COVID-19. The National Institute of Health Research & Development (NIHRD) and the Eijkman Molecular Biology Research Center (currently under the Ministry of National Research and Innovation Agency coordination) are responsible for researching emerging viruses and infections. In addition, the Ministry of Health has yet to make substantial commitments to developing research facilities that become essential bodies to mitigate and prevent a pandemic through policy making. The existing health research institutions are currently separated from the Ministry of Health. Henceforth, the Indonesian government, especially the Ministry of Health, struggled to develop a concrete and comprehensive policy on the mitigation, prevention, and management of pandemics in Indonesia.

A significant alteration to the Ministry of Health's organizational structure occurred in 1965 with the creation of numerous directorates general as technical implementing units. Previously, these units were absent in the Ministry of Health's organizational structure (Indonesian Ministry of Health, 2007). To that purpose, the Directorate General of *Krida Nirmala*, which translates as “efforts or work to eliminate illnesses,” was established by the Ministry of Health as a division in the field of infectious diseases. Its primary responsibility was to carry out a portion of the Ministry of Health's primary responsibilities in the areas of prevention and control of animal-borne diseases, direct transmission diseases, epidemiology, vaccination, also hygiene and sanitation. In a recent development, as the health risk increases, the development of more modern and contextual institutions of disease control has not yet been fully developed by the Ministry of Health. The evolution of the Directorate General of *Krida Nirmala* to the Directorate General of Disease Prevention and Control was stimulated by the existing threat during the global pandemic H1N1 and H5N1. Health institutions should be independent to prevent and control disease to answer future health challenges. The vital institution also will require more budgeting support and willingness from the policymakers.

In the current context of health policymaking, the Indonesian government focuses only on the current challenges and not focused on long-term policy to mitigate the pandemic. The commitment of the Indonesian government to the research and development of infectious and emerging diseases is insignificant according to the policy taken by the government. Government and policymakers only pay attention to the extraordinary disease-spread cases. During the COVID-19 pandemic, the Indonesian Government did not have any comprehensive policy about the pandemic. Indonesian government did not have any policies about the technical instructions on how the government manages and mitigates infectious diseases. The COVID-19 pandemic worsened because the government could not have a concrete policy, inflicting inconsistent policies that confused society.

CONCLUSION

Overall, Indonesia needs more preparedness to meet the future health challenges. This research has three main findings. First, most health policies taken by the Indonesian government are oriented toward responding to the current condition rather than future health challenges. Second, there are minimum policies regarding the infrastructure for the prevention and preparedness of Indonesian health challenges, especially the EMDO. This research identified a small number of policies regarding the laboratory for researching viruses and bacteria. Third, it found that advisory policies regarding preventing disease outbreaks and Extraordinary Measures for Disease Outbreaks are prevalent.

Indonesian society tends to underestimate the role played by governmental policies. This study identified several urgent needs. Indonesia needs help to recruit medical personnel who can focus on virology, epidemiology, and microbiology while considering economic capacity. Building proper health facilities remains a significant challenge, which is a problem compounded by the fact that most regulations emphasize curative and rehabilitative principles in health. In addition, the adaptive regulatory capacity needed to meet rapidly changing healthcare needs requires urgent attention, such as the conditions facing unexpected pandemics and the ability to cooperate with various related parties. With too many regulations focused on priorities other than disease outbreaks, Indonesia remains unprepared to address future health challenges.

AUTHOR CONTRIBUTIONS

Conception or design of the work: Adhi Cahya Fahadayna. *Data analysis and interpretation*: Adhi Cahya Fahadayna. *Critical revision of the article*: Adhi Cahya Fahadayna. *Final approval of the article*: Adhi Cahya Fahadayna. *Final approval of the article*: Abdul Hair. *Drafting the article*: Abdul Hair.

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ETHICS STATEMENT

This research uses policies taken by the Indonesian government as data, and the interpretation of data will use a scoring system from scholarly work. Full data can be accessed at the link: https://doi.org/10.7910/DVN/CNLBJK. So, ethical approval for this type of study is not required and is waived by the author's institution.

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RESEARCH ARTICLE

The economic costs of COVID-19 in a rural Western US state

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Abstract

The impact of the coronavirus disease-2019 (COVID-19) pandemic has been felt worldwide. While the United States appears to be on path to recovery, the economic burden and rising medical care expenditures associated with the pandemic remains in the trillions of dollars. Utilizing data from the US Department of Health and Human Services and FAIR Health, this study estimates the economic burden of COVID-19 for Idaho was estimated through assessment of direct medical costs and indirect costs for years 2020–2021. Total direct medical hospital costs associated with COVID-19, among adults, were estimated as the sum of hospital costs associated with inpatient visits. The cost of testing was included in the direct cost assessment, with data from the Idaho Division of Public Health and Medicare Administrative Contractor payment rates. To determine indirect absenteeism costs, daily cases were multiplied by 7 to account for days of missed productivity; this number was then multiplied by an employment-adjusted average daily wage to obtain a lost productivity dollar value. Lastly, premature mortality costs were estimated based on the lost value of future earnings. Results show that in 2020, the associated direct and indirect costs of COVID-19 amounted to over $608 million and increased to over $1.3 billion in 2021 for the state of Idaho. As the pandemic lingers on with new variants and mutations, rising costs will continue to place a heavy burden on many Idahoans, who are already often face disparate health outcomes and access to health care.

KEYWORDS
COVID-19, health care costs, rural health

Key points

- The economic burden of the COVID-19 pandemic is in the trillions of dollars.
- Idaho is a uniquely rural and western state with low vaccination rates.
- In Idaho, direct and indirect costs of the COVID-19 pandemic were high.
- Idaho's total economic burden exceeded $601 million in 2020 and $1.35 billion in 2021.

INTRODUCTION

Since the start of the coronavirus disease 2019 (COVID-19) pandemic, the economic, clinical, and humanistic consequences have been devastating on a global and domestic level. In the United States alone, more than one million deaths have occurred due to COVID-19, with over 6.4 million deaths occurring worldwide (World Health Organization [WHO], 2022). As a consequence, life expectancy in the United States decreased by 1.8 years, a rate that is three times higher than other industrialized nations (Lane et al., 2022). While there is no universally accepted “value” one can assign to an individual's life, estimates have been produced by economists for a “statistical life”; conservatively, a statistical life is valued at $7 million per life (Cutler & Summers, 2020). With approximately 1 million premature deaths in the United States from COVID-19 to date, economic costs would value said loses at $7 trillion.

Additionally, while mild to moderate cases of COVID-19 typically last 2 weeks, early estimates indicate that roughly one-third of all COVID-19 survivors are likely to face long-term medical issues (i.e., “long haulers”) and are likely to experience continuing health issues (e.g., respiratory illnesses, fatigue, coughing) long after diagnosis, leading to higher medical expenditures (Chung et al., 2022; Cutler & Summers, 2020). Mental health issues have also increased due to the pandemic, with rates of anxiety and depression averaging 40% in April 2020, compared to 11% in early 2019 (Cutler & Summers, 2020). Early estimates of the mental health toll of COVID-19, were these conditions to last for 1 year, come in at $1.6 trillion for the United States (Cutler & Summers, 2020). Economically, the pandemic decreased global economic output, as measured by gross domestic product (GDP), by an estimated 3.9% in 2020 (Gopinath, 2020). In the United States, millions of Americans lost their jobs, with unemployment rates increasing to 13% at the height of the pandemic in mid-2020 before dropping to 6.7% by the fourth quarter (Civilian Unemployment Rate, 2022). The economy started to rebound in 2021 as countries started to reopen and with the increased availability and proliferation of vaccines (Oum et al., 2022).

While the COVID-19 public health emergency has ended, new variants and mutations are consistently developing and suboptimal vaccination rates are leading to ongoing cases, hospitalizations, and deaths; thus, there is a continued need to analyze the economic and health consequences associated with the COVID-19 pandemic. Although several models and studies have attempted to quantify the economic costs of the pandemic, this study focuses on the economic impact in a large, western, rural state. To our knowledge, this has not been previously conducted. Specifically, we estimate the total economic burden of COVID-19 in the state of Idaho in 2020 and 2021. We combine both the direct medical burden of COVID-19 (i.e., estimated hospitalization and testing costs of the illness) and indirect costs (i.e., lost productivity in the workforce stemming from absenteeism and premature mortality).

We elect to focus on the state of Idaho, rather than a cohort of states, for a number of reasons. First, before the pandemic, rural communities, on average, faced higher levels of poverty, were more susceptible to labor market shocks, had older populations, more health-compromised populations, and less access to healthcare (Mueller et al., 2021). These disproportionate health burdens already placed on rural communities became further amplified during the COVID-19 pandemic, further raising the need to study the impacts on rural health (Mueller et al., 2021). Second, as health policy is set at the state level (e.g., stay-at-home orders or mask requirements), each state's response to the COVID-19 pandemic, and thus the subsequent economic costs, are unique to each state. The variation in states, and thus the different outcomes, is further highlighted by the differences in vaccination rates by states. Third, not all states participate in nationwide healthcare data reporting, such as the US Department of Health and Human Services' Healthcare Cost and Utilization Project (HCUP), making tracking these impacts even more difficult. As such, we are able to provide a unique methodological approach for estimating the economic costs for a state where data is limited. Thus, given the particular vulnerabilities that rural communities face with regard to both the health and economic impacts of the pandemic, along with both the absence of standardized data for some of these very places and the unique response and outcomes of each state, researching such costs for a large, rural state, like Idaho, is of pressing importance.

METHODS

To estimate the total economic burden of COVID-19 in Idaho, which was computed by an estimate of both the direct costs of hospitalization and testing and the indirect costs from absenteeism and premature mortality attributed to the disease, a combination of methods needed to be utilized due to shortfalls and variations in data reporting and availability. Data came from a variety of sources, and due to the lack of hospital care data for the state of Idaho, estimates for healthcare utilization and costs (i.e., direct costs estimates) were based on national averages.

Although the value of a statistical life, currently estimated at approximately $7 million per life, is often used to determine costs associated with illness or disease, we elect not to utilize said figure for a number of different reasons. First, this estimate of a statistical life is not age-adjusted. Second, theoretically and empirically speaking, uncertainty exists regarding the relationship between age and the value of a statistical life, where the statistical life of an individual aged 65 years or above remains uncertain (Robinson et al., 2021). Third, since Idaho has an above-average life expectancy, this would further complicate the valuation of an individual based on a statistical life. The basis for obtaining each component of our estimates is outlined below.

Direct costs of COVID-19: Hospitalization (adults)

Data utilized for the direct hospital costs of COVID-19 come from the US Department of Health and Human Services (HHS) and FAIR Health (FAIR Health, 2021; US Department of Health & Human Services, 2022). Data from FAIR Health were utilized to estimate the costs of complex and noncomplex COVID-19 hospitalizations. FAIR Health estimated state-specific COVID-19 hospitalization costs from private healthcare claims data for years 2020–2021. HHS data, provided by the White House COVID-19 Team, Joint Coordination Cell, Data Strategy and Execution Workgroup, collects state-level time series data on hospital utilization starting on January 1, 2020. Hospital utilization data were reported on a facility-level basis, with information gathered either from the National Healthcare Safety Network, direct reporting, or HHS TeleTracking (US Department of Health & Human Services, 2022).

Total direct medical hospital costs associated with COVID-19, among adults, were estimated as the sum of hospital costs associated with complex and noncomplex inpatient visits. Disaggregating this further, total costs of complex COVID-19 cases were estimated multiplying the number of complex cases (per day) by the median daily cost of treating complex cases. Similarly, total costs of noncomplex cases were computed by multiplying the number of noncomplex cases (per day) by the median daily cost of treating noncomplex cases.

Complex inpatient COVID-19 costs reflect those costs associated with serious cases, where hospital admission is required as is ventilation and/or admission to the intensive care unit (ICU). Data from FAIR Health showed that based on the charge amount, the median cost of a complex case for Idaho was $280,836 (with an average of $303,873) while the median cost based on the estimated allowed amount was $81,525 (with an average of $102,783). Median costs were utilized based on the allowed amount for complex cases ($81,525). To estimate the number of complex COVID-19 cases for Idaho, data on number of staffed intensive care unit (ICU) beds occupied, per day, for adult patients with confirmed COVID-19 were utilized. In 2020, the average length of stay for a complex COVID-19 case ranged from 13 days (April) to 8 days (December); in 2021, the average length of stay for a complex COVID-19 case was relatively stable, with a high of 8 days (January-February) and 7 days for March-July (FAIR Health, 2021). Average length of stay for a complex case in 2020 was 8.89 days and 7.29 days in 2021 (rounding the numbers to the nearest integers). Thus, the median daily cost of treatment for a complex case amount to approximately $9,170 in 2020 ($81,525/8.89 days) and approximately $11,183 ($81,525/7.29 days) in 2021.

Costs associated with COVID-19 noncomplex cases represent typical costs of COVID-19 cases where hospitalization is required (with no ventilation nor ICU stay). FAIR Health show that based on the charge amount, the median cost of a noncomplex case for Idaho was $70,321 (with an average of $95,584) while the median cost based on the estimated allowed amount is $27,808 (with an average of $37,163). To estimate noncomplex cases, data on the number of inpatient beds used, per day, for adult patients were utilized. Average length of stay for noncomplex remained stable between 2020 and 2021, with an average of 3.56 days. Utilizing the median costs based on the allowed amount for complex cases ($27,808), the median daily cost of treatment for a noncomplex case amounted to approximately $7,811 ($27,808/3.56 days).

Direct costs of COVID-19: Testing (all ages)

As a proxy for measuring outpatient costs, the cost of testing was included in the direct cost assessment for COVID-19. In particular, the total costs associated with COVID-19 testing were estimated by the number of polymerase chain reaction (PCR)/nucleic acid amplification test (NAATs) and antigen tests conducted, per year, and multiplied by the median cost of testing.

Data utilized to access number of tests performed come from the Idaho Division of Public Health (Idaho's Department of Health and Welfare's COVID-19 Dashboard, 2022). Number of tests performed was presented weekly so when the calendar year ended in the middle of a week, the number of tests performed for that week were divided by seven and then multiplied by the number of days in the week for the calendar year of interest. Costs associated with testing come from the Medicare Administrative Contractor (MAC) payment rates for Idaho for each test type. Current Procedural Terminology (CPT) codes 87635 ($51.31) and 87426 ($35.33) were used for PCR/NAAT and antigen tests, respectively (Medicare Administrative Contractor MAC COVID-19 Test Pricing, 2021). Recognizing the wide variation in testing costs, a second analysis of the direct costs of COVID-19 testing was completed with the cost of testing estimated to be $100, regardless of test type. Our estimates utilized published local lab testing prices (COVID-19 Testing Information, 2022; COVID-19 PCR Test Labcorp Visit, 2022).

Indirect costs of COVID-19: Absenteeism

To fully analyze the total societal burden of COVID-19, indirect costs, while more difficult to measure, were also considered. Broadly, indirect costs measure additional costs of disease stemming from productivity losses (i.e., costs associated with an individual's productivity being diminished or significantly reduced), measured through absenteeism, presenteeism, premature mortality, workers compensation, and workers disability. Given the lack of available data, this study estimated COVID-19 indirect costs pertaining to absenteeism and premature mortality through the human capital approach, thus providing conservative estimates of indirect costs of COVID-19 for Idaho.

Absenteeism costs arise from being absent from work due to an illness or injury (i.e., costs associated with time off from work). Absenteeism associated with COVID-19 stems from two sources: days not spent at work due to being ill, and days not spent at work due to mandated quarantine time. Given the lack of publicly available data regarding specific case severity and duration, each positive test was assumed to result in 7 lost days of productivity. This number reflects the 10-day recommended quarantine advised by the Centers for Disease Control and Prevention for the duration of the study period. For a worker with a standard Monday through Friday work week adhering to a 10-day quarantine, cases starting on Monday, Tuesday, or Wednesday would have missed 8 days of work, cases starting on Thursday or Sunday would have missed 7 work days, and cases starting on Friday or Saturday would have missed 6 days. Compounding the complexity is that some cases reported on a Monday might have been from a test performed on Saturday or Sunday; assigning all cases a uniform 7 days of missed work sidesteps any such reporting issues. Already lower than the missed workday average, when coupled with the facts that many workers likely missed a day or two before receiving their test, and that a significant number of cases kept workers off the job longer than the 10-day quarantine period, 7 days of lost work per case was a safe choice for a conservative estimate.

After multiplying each day's number of cases by 7 to account for days of missed productivity, this number was then multiplied by the employment-adjusted average daily wage for that quarter to obtain a lost productivity dollar value (Table 1). This employment-adjusted average daily wage was calculated from average Idaho quarterly wages from the Quarterly Census of Employment and Wages of the Bureau of Labor Statistics (BLS), then adjusted downward using the BLS' employment-population ratio to account for those not in the labor force. As the BLS reports the employment-population ratio monthly, each quarter's 3-month average was used.

Indirect costs of COVID-19: Premature mortality

Premature mortality costs were estimated based on the lost value of future earnings, rather than an assigned value of a “statistical life.” The number of COVID-19-related deaths in Idaho by age were omitted for one age cohort, those aged 15–24, in both 2020 and 2021

TABLE 1 Employment-adjusted Idaho daily wages calculations.

Year and quarter	Employment-population ratio	QCEW average weekly wage ($)	Average employment-adjusted daily wage ($)
2020_Q1	62.2	871	108.35
2020_Q2	57	877	99.98
2020_Q3	59.53	882	105.02
2020_Q4	60.27	1043	125.72
2021_Q1	60.33	915	110.41
2021_Q2	60.4	928	112.10
2021_Q3	60.27	957	115.35
2021_Q4	60.07	957[a]	114.97

Abbreviation: QCEW, quarterly census of employment and wages.

[a] Fourth-quarter 2021 wage data for Idaho was not released at the time of this analysis, so the previous quarter's value was used.

TABLE 2 Idaho COVID-19 deaths.

Age group	COVID-19 deaths 2020	COVID-19 deaths 2021
All ages	1541	2784
Under 1 year	0	0[a]
1–4 years	0	0
5–14 years	0	0
15–24 years	0[a]	9[b]
25–34 years	4[b]	23
35–44 years	15	81
45–54 years	49	220
55–64 years	124	440
65–74 years	332	688
75–84 years	466	732
85 years and over	551	591

[a] Omitted data in younger age range assigned zero deaths.

[b] Deaths otherwise unaccounted for assigned to highest category with omitted data.

data. To keep the estimate of mortality loss conservative, the deaths unassigned from the total were placed in the 2021 omitted cohort, and a zero assigned to the 2020 omitted cohort. Total COVID-19-related deaths for Idaho are provided in Table 2.

To estimate the costs of premature mortality, individuals in each age cohort were assumed to be at the upper end of the age range when calculating years left in the labor force, and retirement imposed at age 65. For example, everyone in the 45–54-year-old age range was assumed to be 54, meaning each of their deaths resulted in 11 lost working years. The total of lost working years for each cohort was then multiplied by the present discounted value of wages that year. This wage was calculated by converting the employment-adjusted daily wages to annual wages for 2020 and 2021 by multiplying the average quarterly wage for each year by five work days for the weekly employment-adjusted wage, then by 50 weeks of work for an annual employment-adjusted wage. Finally, the annual wages were discounted at 3% per working year lost. Multiplying each cohorts' working years lost by the present discounted value of the employment-adjusted annual wage resulted in the total mortality loss for each cohort; summing these losses gave the total mortality loss for each year.

All data used in this study was publicly available and anonymized, and thus exempt from ethical compliance review.

RESULTS

Direct costs of COVID-19

While it is likely that the estimated median daily cost of treating noncomplex and complex COVID-19 cases for Idaho were higher in 2020 than in 2021 given the novelty of treatment in 2020, to provide conservative estimates, the same median cost of treatment for both years was used. Starting in March 2020, the number of inpatients beds utilized for noncomplex COVID-19 cases were 51,959 (in total for the year). With an estimated median daily cost of approximately $7,811 per case, the total cost of noncomplex cases for Idaho for 2020 amounted to $405,851,749 ($7811 × 51,959). A total of 7833 ICU beds were staffed due to COVID-19 in 2020 which, given the median daily cost of approximately $9170, amounted to $71,828,610 ($9170 × 7833). Hence, total estimates associated with noncomplex and complex cases for Idaho in 2020 amounted to $477,680,359.

Total direct costs associated with COVID-19 increased in 2021, as seen from the increase in the number of hospitalizations; noncomplex hospitalization days for the year increased to 103,271, amounting to $806,649,781 ($7811 × 103,271) spent on noncomplex cases (given the same estimated median daily costs of noncomplex cases of approximately $7811). In addition, total number of ICU beds staffed for the year increased to 29,151 total beds, translating to $325,995,633 ($11,183 × 29,151) spent on complex COVID-19 cases. Thus, total direct costs associated with COVID-19 hospitalizations in 2021 amounted to $1,132,645,414 for Idaho.

Total costs associated with COVID-19 testing for years 2020 and 2021 were computed. In 2020, a total of 875,160 PCR/NAATs and 78,665 antigen tests were reported to be conducted. Using conservative MAC estimates, this amounted to $44,904,460 (875,160 × $51.31) on PCR/NAATs and $2,779,234 (78,665 × $35.33) on antigen tests in 2020, totaling $47,683,694 for 2020. In 2021, a total of 1,462,499 PCR/NAATs and 380,663 antigen tests were reported to be conducted. Using MAC estimates, PCR/NAATs amount to $75,040,824 (1,462,499 × $51.31) and antigen tests to $13,448,824 (380,663 × $35.33) in 2021, totaling $88,489,648. Lastly, estimating testing to cost $100 (regardless of test type), 2020 estimates were $95,382,500 ([875,160 + 78,665] × $100) and 2021 estimates were $184,316,200 ([1,462,499 + 380,663] × $100).

Indirect costs of COVID-19

Average employment-adjusted daily wages lost in Idaho were at least $55,955,080 in 2020, and $31,436,603 in 2021. These likely undercount the productivity loss in the state as nonwage-earning individuals were excluded in the employment-adjusting process. Insofar as nonwage-earning individuals still provide value to society (e.g., caring for young children and elderly relatives) these numbers are safely conservative estimates.

Premature mortality costs for the state of Idaho were $19,996,593 in 2020, increasing to $98,627,334 in 2021. This large increase reflects both a significant increase in deaths (1541 in 2020 compared to 2784 in 2021) and a shift in the demographics of the deceased. In 2020 two-thirds of deaths were persons aged 75 years or older, whereas in 2021 this demographic accounted for less than half of all deaths.

DISCUSSION

This study assessed the economic burden of COVID-19 for the state of Idaho from a societal perspective, including both direct and indirect costs. After taking both noncomplex and complex COVID-19 cases into account, the total medical burden (i.e., hospitalization costs) amounted to $477,680,359 in 2020, and increased further to $1,132,645,414 in 2021. In addition, conservative estimates of testing costs amount to $47,683,694 spent in 2020 and $88,489,648 spent in 2021. Given this, this study estimates that the total direct costs of COVID-19 in 2020 amounted to $525,364,053 and increased to $1,221,135,062 in 2021. Estimates regarding indirect costs also show a substantial burden. In 2020, the estimated burden of absenteeism amounted to $55,955,080 and $31,436,603 in 2021. In 2020, this study estimates that the cost of premature mortality amounted to $19,996,593 and $98,627,334 in 2021. In total, the economic burden amounts to over $601 million in 2020 and over $1.35 billion in 2021 for the state of Idaho.

Not surprisingly, costs increased for all measured variables from 2020 to 2021 except for absenteeism. This decrease is attributable to two colliding factors. As noted in Table 1, the average daily wage in the fourth quarter of 2020 hit the highest level observed in the study period. This coincided with the surge of cases attributed to the Delta variant: there were an average of 445 daily cases in this quarter, with daily case counts rising above 200 per day on September 16, 2020, and not falling below 200 cases a day until January14, 2021. The combined impact of high cases counts and high daily wages pushed the absenteeism costs for 2020 above those of 2021.

The results presented here are unique in that they profile Idaho, a large, western, rural state (Rural Health and Underserved Areas, 2022). Research consistently shows that those in rural communities typically have poorer health outcomes, higher rates of preventable diseases (e.g., certain cancers, diabetes, and obesity rates), and higher rates of opioid overdoses and suicides (Case & Deaton, 2015; Richman et al., 2019). These disparities, importantly, have also been widening over time (Richman et al., 2019). As the COVID-19 pandemic progressed, the burden fell increasingly on rural communities with death rates in rural communities amounting to 175 deaths per 100,000 individuals while death rates for those in urban areas was 151 death per 100,000 individuals (Bradford et al., 2021). Compounding this issue is the relatively low COVID-19 vaccination rates for Idahoans and lack of preventive measures. Recent estimates show that approximately 56.2% of individuals are fully vaccinated in Idaho while Maine has approximately 79.9% of individuals fully vaccinated (Mayo Foundation for Medical Education and Research, 2022).

Limitations

While the number of limitations in this study were minimized, limitations existed which are largely attributed to the novelty of the disease and lack of publicly available data. Regarding the lack of data availability, certain assumptions had to be implemented. First, neither publicly available hospital data nor government insurance claims (e.g., Medicaid and Medicare) were available for Idaho; thus, median, national estimates rather than age-adjusted or individually-adjusted, Idaho-specific estimates from FAIR Health data were used. This, in turn, does not allow us to consider the substantial variation, not only in costs associated with treatment of COVID-19 by health insurance type (i.e., private, public, or uninsured) but also, does not allow for us to analyze the differences in days of hospitalization by patient population. Thus, this limitation does not allow for the ability to identify specific cost drivers or the variation in costs associated by patient population or insurance type.

Second, estimates are likely conservative as potential long-term complications arising from COVID-19, which can lead to prolonged medical burdens such as respiratory or cardiac illnesses, were not quantified (Cutler & Summers, 2020). Third, the cost estimates also did not include the associated burden of the mental toil of COVID-19, affecting both those who have been diagnosed with the disease and those who have not through measures such as social distancing/isolation, the death toll, and economic security (Cutler & Summers, 2020).

Fourth, certain assumptions needed to be imposed for estimates. When measuring indirect costs, for example, this study utilized the human capital approach. The implicit assumption made is that COVID-19 affected those in and out of the labor force in roughly the same proportions; if COVID-19 systematically infected more individuals outside of the labor force, this employment-adjusted average daily wage would result in an overcount of absenteeism costs. The formulation, however, ignores that a number of individuals outside of the labor force add significant value to the economy even though they do not collect a wage. On balance, the employment-adjusted average daily wage was likely a close yet conservative approximation of the true dollar value loss of productivity. Lastly, other measures of indirect costs (e.g., delayed medical procedures such as elective surgeries, as well as worker's compensation, worker's disability, and presenteeism) were not able to be quantified.

CONCLUSIONS

This study estimates the overall economic costs of COVID-19 for the state of Idaho at $601,315,726 in 2020 and $1,351,198,999 in 2021. Despite the use of conservative estimates, this study shows a significant economic burden with regard to both direct medical costs and indirect costs. Although the COVID public health emergency has ended, recognizing the short- and long-term impacts of COVID-19 continues to be important. This study also highlights alternative data collection and analysis approaches, especially when there are constraints in available data. Such alternative approaches may be necessary as direct COVID-related funding decreases.

As the pandemic lingers on with new variants and mutations, rising medical care spending will continue to place a heavy burden on many Idahoans, including the estimated 150,000 of those who may be disenrolled from Medicaid coverage when Medicaid Protection ends in April 2023 (Jeppesen, 2023). For those living in rural areas, who already often face poorer health outcomes and decreased access, the burden may be even greater. Rural hospitals will no longer receive government relief funds and will once again be at risk of closure. The end of the COVID-19 relief funds for families, workers, businesses, and local and state governments will also affect financial solvency. Lastly, with the increasing cost of healthcare, the total cost of the pandemic will continue to rise, increasing the financial burden of access to care.

Utilizing the methods described in this study, researchers can estimate the economic burden of disease in light of data constraints. Additionally, results from research such as this can inform policies for the current and future pandemics, thereby. mitigating the costs to both individuals and society.

ETHICS STATEMENT

The authors declare that this manuscript has not been published elsewhere and that all co-authors have met the criteria for authorship.

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Elaine Nguyen, PharmD, MPH, BCPS, BCACP, Dr. Nguyen's foundational research skills can be applied to many areas and her research spans a variety of topics. She focuses on optimizing health services and the delivery of care (e.g., she is currently conducting systematic reviews on population health management and care coordination). She is also interested in diabetes and cardiovascular disease prevention and treatment. Dr. Nguyen's long-term goal is to promote optimal healthcare delivery in patients with diabetes and cardiovascular diseases, especially those living in rural, underserved areas. She is working toward this goal through research and collaboration with patients, providers, payers, and other stakeholders. Recognizing the important roles that pharmacists play on the health care team and as a pharmacist herself, she is particularly interested in pharmacy-related health services research. She has published on topics such as the value of online medication therapy management (MTM) resources, the impact of nonmedical switching, and the impact of appointment-based medication synchronization.

Iris Buder, PhD, teaches undergraduate courses in the economics of health care, labor economics, microeconomics, econometrics, mathematics for economics, and economic issues. Her research interests in the area of health economics include analyzing the economic costs of diseases, conducting cost-effectiveness analyses for public health interventions, and researching health disparities. Her research interests in the area of labor economics include labor market disparities, occupational prestige, and wage disparities. She currently serves as a board member for Health West Community Center and enjoys spending time biking or hiking in her free time.

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RESEARCH ARTICLE

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Disparities in catastrophic health expenditure for hospitalization in Urban Kerala, India: Evidence from 75th round of the National Sample Survey

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Abstract

Existing literature suggests significant disparities in health expenditure incurred by households receiving health services. To determine fair contributions by beneficiaries, it is crucial to understand the existing inequalities in the context of financial protection measures and the factors influencing them. This exploratory study looks at how catastrophic health expenditures (CHE) are distributed across economic groups. The study also casts light on what drives the inequalities in the incidences of CHE. The study uses unit-level data from the 75th round of the National Sample Survey fielded periodically by the Government of India. It employs logistic regression to study factors affecting CHE. Furthermore, the concentration index and its regression-based decomposition are employed to have a sense of inequality and the factors driving it. The findings reveal socioeconomic inequality in CHE incidence and highlight the contribution of medical institutions (whether public or private) and consumption expenditure of households to the total inequality. The present study, while critically looking at the pre-existing inequalities, highlights the shortcomings of health financing in urban areas and calls for a reconsideration of extant policy designs. The study maintains that factors outside the control of the health system may be responsible for disparities in catastrophic medical spending. Therefore, to reduce the burden of catastrophic health spending and its inequalities, future policy measures must take into account both elements within the health system and those outside of it.

KEYWORDS
catastrophic health expenditure, inequality, out of pocket expenditure, public funded health insurance, universal health coverage

Key Points

- The study reveals a negative concentration index for catastrophic health expenditure (CHE) underlining the stark reality of heightened CHE incidence among households from disadvantaged socioeconomic backgrounds.
- Using decomposition analysis, authors expose the influence of social determinants of health, such as the economic status of households, in exacerbating disparities in the incidence of CHE.
- The Ayushman Bharat Program of the Government of India emerges as a beacon of hope, demonstrating its profound capacity to revolutionize the health finance landscape of India. Its proper execution promises a dramatic reduction in out-of-pocket healthcare expenditures, significantly alleviating the financial burden on individuals and families.
- The study highlights the drawbacks of channeling public funds through private hospitals in public-funded health insurance, prompting a call for systemic changes to promote equity and improve financial risk protection in healthcare, furthering public health and social justice goals.

INTRODUCTION

The emergence of Universal Health Coverage (UHC) in health policy discussions has sparked debate about protecting individuals from catastrophic health expenses (CHE) driven by elevated out-of-pocket expenses (OOPE). CHE occur when healthcare costs exceed a predetermined threshold based on household income or financial capacity (Rodin & De Ferranti, 2012), and it can push previously financially stable families of low-income segments of society further into poverty. In India, a significant portion of healthcare funding relies on OOPE, creating financial challenges for households and threatening their overall financial stability. The high OOPE acts as a barrier to achieving universal healthcare access (Sharma et al., 2017). Despite some progress, India still faces substantial obstacles in providing healthcare access to the beneficiaries (Ram, 2021) and many find essential medical treatments unaffordable. OOPE healthcare costs have been identified as a significant welfare concern (Al-Hanawi, 2021), leading individuals to seek costly private treatments to receive timely medical care. This regressive health financing mechanism (Edeh, 2022) contributes to disparities in accessing high-quality healthcare services, alters households' healthcare-seeking behavior, and decreases healthcare utilization. It also forces households to reduce essential expenses such as food, clothing, and education for their children. Evidence suggests that around 150 million individuals worldwide experience financial ruin annually, with approximately 100 million people falling into poverty due to the burden of direct payments for healthcare services (Vahedi et al., 2020). Citing a WHO report of March 2022, Selvaraj et al. (2022) explain that over 17% of households in India experience catastrophic healthcare expenditures annually.

Policymakers, however, are not just concerned with the occurrence of CHE but also its distribution among various economic categories. While numerous studies have explored the extent of CHE in India, few have examined the inequality therein. Some evidence indicates the global inequalities of CHE, with a notable concentration among specific demographic groups (Njagi et al., 2020). In India, significant health disparities exist in healthcare expenditures incurred by households (Swain et al., 2020). While the country has seen a decrease in CHE over the past decade, there has been a simultaneous rise in associated inequality (Mohanty & Dwivedi, 2021). A recent study by Gaddam and Rao (2023) revealed that despite a decline in catastrophic events, there has been a noticeable upsurge in the unequal distribution of the burdens these events impose on affected populations. As we move closer to universal healthcare, defining a fair financial contribution for healthcare service users is a key policy challenge (Moradi et al., 2018). In this context, understanding the driving forces behind these inequalities is of paramount policy relevance, particularly within the framework of sustainable development goals. To establish a fair financial contribution, it is crucial to comprehend existing inequalities in financial protection and the factors influencing them (Masiye et al., 2016; Rahman et al., 2013). Research indicates that factors beyond the healthcare system's control may be responsible for disparities in catastrophic medical spending (Vahedi et al., 2020).

Kerala, a province in Southern India, faces unique health system challenges, particularly when it comes to its urban areas. Notably, the effects of climate change on cities and changing patterns of urbanization in the context of an aging population of Kerala impact the health and healthcare costs of urban residents, underscoring the necessity of studying urban Kerala as a distinct category. Furthermore, Kerala also witnessed a modest increase in out-of-pocket spending in comparison to the previous health round, as revealed by the latest National Sample Survey health round (75th round). Within this context, the paper aims to explore the determinants of CHE and the factors driving inequality in the incidence of CHE in urban Kerala.

METHODS

Data source

The study has examined data from the 75th round of social consumption on a health survey, conducted by the National Sample Survey Office (NSSO) under the Ministry of Statistics and Program Implementation of the Government of India. The survey gathered information from 113,823 households and 555,115 individuals from all states and union territories of India, by using a multistage random sample procedure to select households from both rural and urban areas. The data provided insights into a range of health-related topics, including healthcare expenditure, morbidity, health financing, insurance coverage, maternal care expenditure, immunization, and information about the elderly. Details about the questionnaire, sample design, and sample weight can be found in the public domain. We considered only those individuals from urban Kerala, the southern province in India, who have incurred OOPE for hospitalization during the last year of the survey. If OOPE for a hospitalization episode exceeds 10% and 25% of the usual annual consumption expenditure (UACE), then the individual is said to incur catastrophic health expenditures CHE-10 and CHE-25 respectively. We extracted merged and weighted the unit-level data for our study.

Variables

The dependent variable used in the study is CHE. For the calculation of CHE, we require information on OOPE and household income. The OOPE for each hospitalization episode were measured by deducting compensation obtained from insurance plans from medical and transportation expenses incurred during hospitalization. In the context of developing countries, information on consumption expenditures of the household are considered as an ideal proxy for income. As it is advisable to use consumption expenditure data as proxy for income in developing country context, we measured CHE in relation to usual annual consumption expenditure (UACE) in this study. CHE at 10% (CHE-10) and 25% (CHE-25) thresholds were determined by assessing whether the total annual healthcare expenses of the household exceeded 10% and 25% of the UACE. Thresholds were selected based on the WHO Sustainable Development Goals (SDGs) (Ram, 2021). Similar CHE estimation strategy was utilized in prior studies (Ranjan & Muraleedharan, 2020). Further, drawing from the prior research, the present study has chosen specific predictor variables, including household type, religion, social group, and types of medical institution (Ranjan & Muraleedharan, 2020).

Concentration index (CI) and decomposition

Literature posits that only two approaches, specifically the slope index of inequality and the CI, are likely to represent accurately the socioeconomic disparities in health sector (Wagstaff et al., 2018, 1991). the concentration indices are commonly used to assess inequalities in one variable compared to another (Carrieri & Jones, 2016). It has an advantage over gini index as CI gives a socioeconomic rank-related measure of inequality. In the context of health, CI are often used to measure the disparity in health outcomes based on socioeconomic status. The CI derived from concentration curve furnishes a concise measure of the extent to which variable of interest (in our case CHE) is concentrated among households with better socioeconomic status compared to those with lower socioeconomic status. The CI measures the degree of income inequality in a population, with values ranging from −1 to 1. Negative values indicate a greater concentration of the variable among lower-income individuals, and positive values indicate a more significant concentration among higher-income individuals. The concentration curve displays the total percentage of a health variable on the *y*-axis versus the cumulative proportion of that variable within the population ranked by a socioeconomic indicator on the *x*-axis. When the concentration curve is above the line of equality, it indicates that the poor bear higher relative out-of-pocket health expenditure. In comparison, a curve below the line denotes that the wealthy bear a higher relative out-of-pocket health expenditure (Hajizadeh et al., 2022). The greater the degree of inequality, the more the concentration curve diverges from the 45° line. To comprehend the extent of inequality, we can compare the distance between the concentration curve and the diagonal line, where a more considerable distance implies a greater degree of unfairness. This is evaluated using the CI, which is obtained by doubling the area between the concentration curve and the diagonal line.

The CI quantifies the extent to which CHE is disproportionately concentrated among socioeconomic spectrum. The CI is computed using the following formula:

$$CI = \frac{2}{n\mu}\sum_{i=1}^{n} h_i R_i - 1,$$

where *hi* is the health indicator for individual *i*. The mean is represented as μ. *Ri* is the relative rank of the *ith* individual in the income distribution. *n* represents the sample size.

To understand the factors contributing to the observed CI, a decomposition analysis was conducted. The decomposition analysis identifies the relative importance of various factors in driving the inequality in CHE. Existing evidence suggest that the health CI can be broken down into individual factors. Each factor's contribution to health inequality is determined by its sensitivity to health outcomes and the level of income-related inequality associated with that factor. This decomposition can be applied to any linear additive regression model used to analyze health.

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon.$$

CI could be represented by the following equation

$$C = \sum_k (\beta_k \bar{x}_k / \mu) C_k + GC_\varepsilon / \mu.$$

Essentially, health CI can be expressed as a weighted sum of concentration indices for each regressor in the model. The weight assigned to each regressor (*xk*) is determined by the elasticity of health (*y*) concerning that particular regressor. The equation further takes into account the mean of the dependent variable (μ), the mean of the regressor (*xk*), and the generalized CI for the error term (*GCε*). The final term in the equation captures the residual component.

Statistical analysis

Thus, the present study employed descriptive statistics, logistic regression, CI and it's decomposition at different stages to fulfill the research objectives. Logistic Regression was used to find factors affecting CHE; Concentration curve and indices were used to provide a sense of whether CHE is distributed against the interests of the poor. Decomposition analysis was conducted to study factors driving inequality. Only those observations that incurred some OOPE were used in the analysis of CI and its decomposition. Data analysis was conducted using Stata 14, developed by StataCorp LP, which is a private company based in College Station, Texas, USA. The software facilitated our analysis and ensured the accuracy and reliability of the results.

RESULTS

In this section, we look at CHE from three angles: first, we begin with the fundamental descriptive statistics; then, we examine the factors responsible for CHE (determinants); and lastly, we investigate what contributes to the disparities in the occurrence of CHE.

Descriptive statistics

In this subsection, we provide an overview of the descriptive statistics related to CHE. Our analysis encompasses key metrics, such as the prevalence of CHE within the population, the distribution of healthcare expenditure among affected individuals. The aim is to establish a clear baseline and context for the subsequent sections.

TABLE 1 Descriptive statistics of the sample.

Variables	n	Percent	CHE-10	CHE-25
Household type				
Self-employed	547	27.16	11	3
Regular wage/salary earning	499	24.78	16	7
Casual labor	533	26.46	23	11
Others	435	21.60	27	17
Religion				
Hinduism	1,018	52.73	44	23
Islam	589	29.99	15	7
Christianity	327	17.13	18	8
Jainism	2	0.10	0	0
Others	1	0.05	0	0
Social group				
ST	6	0.30	0	0
SC	122	6.06	3	0
OBC	1327	65.89	42	23
Others	559	27.76	32	15
Type of Med. Institution				
Government	177	32.66	7	3
Charitable	24	4.43	5	4
Private	341	62.92	65	31

Source: Author's compilation from unit level data NSS 75th.

Table 1 is divided into four categories: Household type, Religion, Social Group, and Type of Medical Institution. For each category, it provides the number of respondents (*n*) and the percentage they represent within the total sample. Additionally, the table displays the prevalence of CHE-10 (individuals spending more than 10% of their usual annual consumption expenditure) and CHE-25 (individuals spending more than 25% of their usual annual consumption expenditure) for each subgroup within the respective categories.

Determinants of CHE

The following section aims to identify the determinants influencing the affordability of healthcare expenses at the 10% and 25% expense levels (referred to as CHE-10 and CHE-25, respectively) within the urban regions of Kerala.

Table 2 provides an overview of the factors influencing the occurrence of CHE-10. The table includes various variables and their respective coefficients, standard errors, *Z*-values, *p*-values, and 95% confidence intervals. Notably, the type of medical institution exhibits a statistically significant impact on CHE-10, with a positive coefficient, possibly denoting higher healthcare expenditure in private institutions. Social Group also plays a significant

TABLE 2 Factors affecting CHE-10.

Variable	Coefficient	Std. error	*z*-value	*p* Value	95% Confidence interval (lower)	95% Confidence interval (upper)
Household type	0.0069	0.0360	0.190	0.847	–0.0637	0.0776
Religion	–0.0002	0.1551	–0.000	0.999	–0.3042	0.3038
Social group	0.0865	0.0439	1.970	0.049	0.0005	0.1725
Type of Medical Institution	0.7332	0.1741	4.210	0.000	0.3919	1.0744
MPCE	–0.0001	0.0001	–1.200	0.229	–0.0002	0.0000
Constant	–3.7259	0.5527	–6.740	0.000	–4.8090	–2.6427

Source: Author's compilation from unit level data NSS 75th.

TABLE 3 Factors affecting CHE-25.

Variable	Coefficient	Std. Error	*z*-value	*p* Value	95% Confidence interval (lower)	95% Confidence interval (upper)
Household type	0.0914	0.0458	1.990	0.046	0.0015	0.1812
Religion	0.0513	0.2030	0.250	0.800	–0.3466	0.4493
Social group	0.0704	0.0574	1.230	0.220	–0.0420	0.1829
Type of Medical Institution	0.7905	0.2539	3.110	0.002	0.2929	1.2881
MPCE	–0.0001	0.0001	–1.350	0.177	–0.0002	0.0000
Constant	–4.9034	0.8025	–6.110	0.000	–6.4763	–3.3304

Source: Author's compilation from unit level data NSS 75th.

role, showing a positive correlation, while other variables like Household Type, Religion, and Monthly per capita consumption expenditure (MPCE) do not demonstrate statistically significant associations with CHE-10.

Table 3 examines the factors influencing the occurrence of CHE-25. Similar to Table 2, it presents various variables and their associated coefficients, standard errors, *Z*-values, *p*-values, and 95% CIs. Notably, the type of medical institution (Type of Medical Institution) and household types are both statistically significant factors influencing CHE-25.

CI and factors contributing to inequality in incidence of CHE- 25

The computation of the CI of CHE -25 yielded a significant negative value when ranked by usual annual consumption expenditure. The CHE CI, calculated at a 25% threshold, yielded a value of approximately –0.3922, accompanied by a standard error of approximately 0.1581 and a notably low $p = 0.01$. The presented CI value signifies a significant level of economic rank-related inequality. Nevertheless, the CI calculated for CHE at the 10% threshold did not produce a statistically significant result.

Figure 1 illustrates the concentration curve.

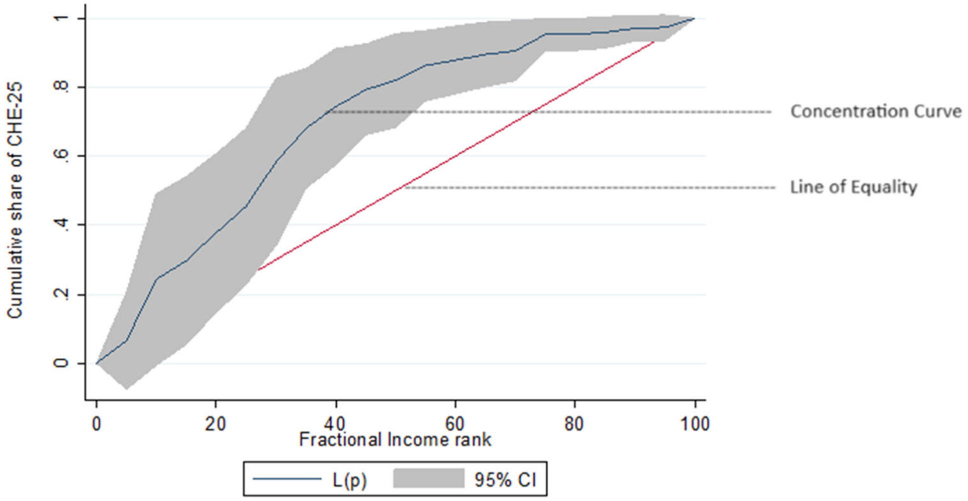

FIGURE 1 Concentration curve of CHE-25.

TABLE 4 Decomposition results.

Variable	Elasticity	Concentration index	Contribution	Percentage contribution
Household type	0.4231	−0.1231	−0.0521	0.1301
Religion	−0.1990	0.0237	−0.0047	0.0118
Social group	0.8049	0.0057	0.0046	−0.0115
Med. Institution	1.1609	0.02305	0.0267	−0.0668
MPCE	−0.7498	0.1798	−0.1348	0.4231

Source: Author's compilation from unit level data NSS 75th.

Factors contributing to inequality: Decomposition results

The result of the decomposition analysis of the CI of CHE-25 is presented in Table 4, showcasing the elasticity, CI, contribution, and percentage contribution of each variable.

Upon examining the results, it can be observed that the variable with the highest absolute contribution is the type of medical institution, with a value of 0.0495. The medical institution variable also has the highest negative percentage contribution (−2.8635%), indicating its significant impact in reducing the overall incidence of CHE. The MPCE variable has the second-highest absolute contribution (−0.0604). In terms of percentage contribution, MPCE has the highest positive value (3.4937%), indicating its substantial influence in increasing the overall incidence of CHE. The remaining variables—household type, religion, social group, and gender—have relatively smaller contributions.

DISCUSSION

Previous research has conducted comprehensive analyses of the temporal evolution of OOPE and its variation across distinct socioeconomic strata. In the context of the 71st and 75th rounds of the National Sample Survey (NSS), prior investigations unveil a noteworthy decrease in OOPE among the most affluent quintile within both rural and urban settings. Conversely, for private sector hospitalization, OOPE escalated across all income brackets in rural areas, with the exception of the most affluent class. In urban locales, the top two income quintiles witnessed a reduction in OOPE, while an escalation was witnessed for all other strata (Mukhopadhyay et al., n.d.). Moreover, in urban settings, OOPE diminished for all demographic segments, except for the Scheduled Castes (SCs). In accordance with the findings presented in the referenced working paper (Mukhopadhyay et al., n.d.), the nature of the healthcare facility (public or private) emerges as a pivotal factor influencing the incidence of CHE. Our research echoes a similar theme, wherein the type of healthcare provider emerging as the primary determinant of CHE. Further, inequality in incidence of CHE is explained by health system-related factors as well as the broader societal-level factor. This finding is consistent with previous literature (Vahedi et al., 2020). For instance, literature posits that factors such household economic position, the head of household's sexual orientation, head of household's level of education, and the presence of people over 65 played a significant role in determining CHE (Rezapoor et al., 2016). Moreover, there are studies which identify income as the biggest factor of inequality in financial risk protection (Moradi et al., 2018). This study suggests that improving socioeconomic variables can lessen the disparity in health spending and its consequences on poverty. Essentially, this means that while designing health policies, it is important to consider social determinants of health.

Findings on the CI of CHE-25 imply that the distribution of the CHE across various consumption expenditure levels exhibits some degree of disparity. The negative value of indices indicates that CHE is concentrated among households with lower socioeconomic status, and the magnitude of the index value can be interpreted as the percentage reduction in CHE that would be achieved if there were perfect equality in the distribution of CHE across socioeconomic groups. Those households with lower UACE are more likely to incur the cost, suggesting that obstacles may prevent those with lower socioeconomic status from receiving necessary products and services. Decomposition analysis connects the concentration indices of factors influencing a health variable to the CI of the health variable itself using a regression model that includes these determinants (Hosseinpoor et al., 2006). By the processes of decomposition analyses we were able to consider different components of CI together. One can now assess the direction, magnitude, and relative importance of each variable's contribution to the CI. The contribution component represents the absolute impact of each variable on the overall CI. It shows the extent to which each variable contributes to the CI. A positive contribution indicates that the variable contributes to inequality, while a negative contribution suggests a mitigating effect on inequality.

Overall, the results suggest that addressing inequalities in consumption expenditure and improving access to care through public medical institutions are critical for reducing the incidence of CHE. The study presents the type of medical institution (public/private/charitable run) as a major determinant of incidence of CHE. In essence, these facts underscore the indispensability of improving public delivery of healthcare services as a critical measure to secure impartial accessibility to healthcare amenities; particularly for those financially incapable of bearing the exorbitant costs of private healthcare services. After all, a widely acclaimed conception exists that the private sector demonstrates efficacy in furnishing healthcare services, yet this proposition needs more substantiation from research investigations (Basu et al., 2012).

The recommended course of action is implementing UHC, which can help achieve health equity through financial risk protection or enhancing public health infrastructures (Wagstaff et al., 2018). UHC, recognized as an inherent human right, has been consistently featured on the global health agenda. India has made progress on the road to UHC. On September 23, 2018, the Indian government took a significant step by announcing its commitment to the

Ayushman Bharat Program which has two major components. The first component focuses on establishing Health and Wellness Centres (HWCs) dedicated to offering comprehensive primary healthcare (PHC) services to the entire population. HWCs will and can contribute to reducing CHE and disparities therein. This pioneering program represents a significant step in India's healthcare landscape. Nevertheless, it is imperative to ensure that both the design and implementation of the Ayushman Bharat Program are executed meticulously. The program has the potential to serve as a transformative platform for healthcare reform in India, expediting the nation's progression towards achieving UHC (Lahariya, 2018). However, the effectiveness of HWCs hinges on several vital factors such as swift policy implementation, a comprehensive approach addressing both healthcare supply and demand, robust financial support from central and state governments, judicious use of technology, active community and stakeholder engagement, strong referral systems, and a focus on public health and population health interventions are crucial (Lahariya, 2020).

A potential solution to decrease the burden of paying for OOPE is expanded public-funded health insurance (Al-Hanawi, 2021; Al-Hanawi, Mwale, et al., 2021). The second component Ayushma Bharat program, known as the Pradhan Mantri Jan Arogya Yojana (PMJAY), is essentially a public funded health insurance (PFHI) which is designed to provide financial safeguards to the population, particularly concerning expenses related to secondary and tertiary level hospitalization. A person's ability to pay should be considered when determining the cost of healthcare, and medical services should be provided following each person's need to avoid excessive out-of-pocket expenses and reduce the risk of poverty brought on them by unwanted health problems (Callander et al., 2019). PMJAY specifically targets the bottom 40% of the total population. Moreover, evidence indicates that PFHI and Medicare improved the distribution of out-of-pocket costs for medical treatment among the elderly (Rubin et al., 1995) suggesting that a universal national health insurance program would improve equity. In fact, the effect of health system financing on the welfare of households via insurance mechanism has influenced the development of health systems as such in various countries, such as the USA, Australia, India, and Indonesia (Xu et al., 2022). To achieve UHC, it is essential to rely on prepaid health spending and pool financial risks. This shift towards demand-side financing models, in the form of publicly sponsored health insurance schemes, was proposed by the High-Level Expert Group (High-Level Expert Group Report on Universal Health Coverage, 2007) of the former Planning Commission and has been implemented through different publicly funded health insurance in India since 2007. Until then, the country mainly concentrated on financing healthcare through the supply side, focusing on enhancing healthcare infrastructure and workforce. However, between 2007 and 2010, there was a significant policy change, and several publicly financed health insurance schemes were launched at both the central and state levels (Prinja et al., 2012). These schemes allow poor and vulnerable households to choose cashless healthcare from a pool of empaneled providers. With the advent of PFHI and strategic purchasing arrangements, the government has shifted its focus from being the service providers to the purchasers of healthcare. Despite efforts to improve health financing and move towards UHC, there are still equity issues and factors that further exacerbate them. Supply-side moral hazards in the health finance landscape such as the provision of unnecessary care poses serious threat to equity and financial risk protection, the two major dimensions of UHC. The ground reports suggests provision of unnecessary care and supply-side moral hazards; including insurance frauds in the roll out of PFHI. Routing public money via private hospitals empaneled under the PFHI could be detrimental for the cause of equity and financial risk protection. Regulation becomes difficult given the information asymmetry between service providers and patients. Therefore, policies could be directed at improving public health infrastructure and utilities. Further, in light of supply-side moral hazards in the roll out of public health insurance, we find that there is an immediate need to design institutions and processes to be able to have meaningful strategic purchasing arrangements on board.

TABLE 5 Health spending in India (2005–2020).

Financial year	Health spending (US$ per capita)	Government health spending as % of health spending	Out-of-pocket expenditure (OOPE) as % of health spending
2005–06	27	20.1	73.1
2010–11	45	26.2	65.2
2015–16	58	25.6	64.7
2020–21	57	36.6	50.6

Data Source: World Health Organization. (Year). Country Health Expenditure Database. World Health Organization. https://apps.who.int/nha/database/country_profile/Index/e.

Moreover, India's healthcare system needs to be more adequately funded. The current government spends only 1.3% of its GDP on public health expenditure, compared to the 2.5% target set in the National Health Policy of 2017. It is amongst the lowest levels of public health funding globally (Sundararaman et al., 2021). This chronic underfunding exacerbates equity and financial risk protection problems in health systems. However, there has been a slight increase in health spending as indicated by Table 5.

The data indicates a positive shift towards increased government health spending, reducing the burden of OOPE on individuals. Notably, health spending per capita exhibited a considerable increase from 27 US$ in the 2005–06 financial year to 58 US$ in 2015–16. However, in the most recent available data for 2020–21, this figure slightly decreased to 57 US$. Equally important is the upward trajectory of government health spending, which grew from 20.1% in 2005–06 to 36.6% in 2020–21, signifying a substantial enhancement in public health financing. Correspondingly, the percentage of OOPE in health spending has seen a remarkable reduction from 73.1% in 2005–06 to 50.6% in 2020–21, reflecting positive progress in reducing the financial burden on individuals. The analysis underscores the need for continued efforts to stabilize or increase health spending per capita while simultaneously focusing on policies to maintain and expand government health funding.

In the context of the health and family welfare budget in the state of Kerala, Rs 291.37 million US dollar has been allocated for urban health services in the latest health budget (2023–24). The actual spending in 2021-22 was Rs 1.43 billion USD. The initial budget estimate for 2022–23 was set at Rs 1.19 billion USD, but during the year, the revised estimate was reduced to Rs 1.13 USD. Looking ahead to the fiscal year 2023–24, there is a 6% increase in the budget estimates compared to the revised estimate for 2022–23. Nevertheless, in the pursuit of financial risk protection for hospitalization in urban Kerala, a comprehensive set of strategic measures is imperative. These include rigorous oversight of budget allocations, the expansion of health insurance coverage, fortification of public healthcare services, a heightened emphasis on preventive healthcare initiatives, the meticulous regulation of private healthcare costs, the cultivation of community-wide health awareness, and the establishment of an ongoing evaluation framework to gauge the efficacy of these interventions. In the context of results obtained, policymakers have ample opportunity to reconsider the way they run the health system. Results indicate that health expenditure inequality is determined by factors within and outside the purview of health system. Therefore, this study calls for multisectoral collaborations and changes in design features to address resilience issues and shocks that can potentially harm the cause of UHC. Central to these dialogs, particularly within the framework of post-pandemic urban spaces, are institutions that demonstrate dexterous agility.

CONCLUSION

By employing a magnifying lens on pre-existing inequalities, the present study highlights the shortcomings of health financing in urban areas and calls for a reconsideration of societal structures. The study's findings underscore the imperative of mitigating socioeconomic disparities in healthcare expenditure and CHE. The study maintains that factors outside the control of the health system may be responsible for disparities in catastrophic medical spending. Therefore, to reduce the burden of catastrophic health spending and its inequalities, policy measures must take into account both elements within the health system and those outside of it. Our analysis of urban Kerala's experiences revealed the need for innovative financing and governance models to address equity and financial risk protection issues.

Policymakers should prioritize the reduction of these inequalities, with a particular focus on private healthcare institutions. Strategies to enhance healthcare accessibility, affordability, and quality must be contemplated, alongside the implementation of effective health financing mechanisms to safeguard households from catastrophic medical expenditure. A critical evaluation of urban health financing and a comprehensive consideration of external factors influencing healthcare spending are crucial. Aligning policies with sustainable development goals and championing data-informed decision-making will further bolster the drive for equitable access to healthcare services.

The COVID-19 pandemic has triggered a noteworthy upsurge in the number of people living in abject poverty worldwide. The bulk of these “new poor” are residents of urban regions, frequently dwelling in densely packed vicinities who are often being marginalized from relief initiatives and urgent assistance. In the absence of prudent attention to the symbiotic domains of healthcare funding and urban management, the forthcoming prospects are poised to remain depressing, impeding the timely attainment of the Sustainable Development Goals pertaining to equity and financial risk protection. The authors hope that further examinations will be carried out especially in the context of developing countries so that the causes of poverty due to health-induced out-of-pocket expenditures can be alleviated through public health care and UHC.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ETHICS STATEMENT

This study, utilizing National Sample Survey 75th round data, upholds rigorous ethical standards. Participants granted informed consent, and confidentiality was ensured through data anonymization. Ethical approval was obtained, affirming adherence to established guidelines. The study prioritizes beneficence, pursuing valuable insights without harm, and adheres to principles of transparency and responsibility in knowledge acquisition.

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RESEARCH ARTICLE

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Inequalities in public funding: Are hospital-based dental services funding models in Australia logical?

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Abstract

The availability of hospital-based dental services across Australia varies with a number of hospitals disestablishing dental departments due to rising costs. However, the perceived costs are difficult to quantify as funding models used to capture activity are not uniform across health facilities. To investigate this the predicted funding generated using current models of activity-based funding in the provision of specialist dentistry in Australian public hospitals was examined. Using data from Fiona Stanley Hospital regarding the dental treatment for head and neck cancer patients as part of their work-up for cancer management, expected funding was estimated using the existing fee-for-service and capped-fee models currently in use. Funding estimates were based on the Department of Veterans' Affairs Fee Schedule of Dental Services and the Independent Hospital Pricing Authority's Australian Non-Admitted Care Classification. A total of 127 patients received dental treatment over 209 appointments including 17 patients who had all their remaining teeth removed. Analysis revealed the fee-for-service model generated more expected funding than the current capped-fee model, or an average of AUD $458 (USD$356) per patient. Differences in how activity was recorded resulted in 81.7% uncaptured funding between the two models. This study shows that fee-for-service models capture activity more accurately. However, this model is not used in public hospitals despite it being standard practice in stand-alone public dental clinics. As a result, hospital-based dental clinics appear to be unproductive. Further research can include developing a model that better captures both the activity undertaken as well as patient complexity.

KEYWORDS
complexity, dentistry, funding

INTRODUCTION

The World Health Organization describes a well-functioning health system as one that "is built on having trained and motivated health workers, a well-maintained infrastructure, and a reliable supply of medicines and technologies, backed by adequate funding, strong health plans and evidence-based policies" (World Health Organization, 2021). Health systems across the globe vary and can include a mixture of both public and private funding. Possibly one of the most well-known health services is the United Kingdom's National Health Service where health care is universal and comprehensive (Klein, 1990). Public dental services in the United Kingdom are subsidized by the government and found both in hospitals and in the community (Boyle, 2011). In contrast, Australia's health-care system is structured as a mixed model of public and private services. While the Australian Medicare scheme provides universal access for medical and pharmaceutical benefits, the majority of dental services in Australia are funded privately with public services largely restricted to certain patient groups (i.e., Concession card holders; Australian Government Department of Health and Aged Care, 2015). Although public dental services in Australia are largely confined to stand-alone dental facilities, some public hospitals do have Dental Departments (Schwarz, 2006).

Activity-based funding

The National Health Reform Agreement, signed in 2011, described how Commonwealth, State, and Territory governments in Australia work in partnership to improve health outcomes of its residents while ensuring the sustainability of the country's health system (Australian Government Department of Health and Aged Care, 2011). This agreement introduced significant structural reforms including the use of an activity-based model to improve patient access, thereby promoting public hospital efficiency. Activity-based funding (ABF), as the name suggests, is where providers are funded based on the activity they undertake (Eagar, 2011). While the premise of this funding structure is in use across Australia, nuances exist when comparing the funding of public dental clinics based at various institutions. These differences in ABF are based on how the individual facility records activity (Australian Dental Association, 2017; Independent Hospital Pricing Authority [IHPA], 2019a). For instance, activity in stand-alone dental clinics is measured by recording the type and number of dental procedures completed for each patient (Australian Dental Association, 2017; IHPA, 2020). Using this structure the Australian Government's Department of Veteran Affairs (DVA) specifies the amount dental procedures can be claimed for when its clients are treated (Australian Government DVA, 2019); however, this fee schedule is not exclusive to veterans and is available to eligible patients who receive subsidized public specialist dental care (WA Health, 2019). This tool accounts for the variety of dental procedures performed and assigns a cost updated annually (Australian Government DVA, 2019). Conversely, activity in outpatient clinics in a tertiary referral hospital is recorded by the number of patients seen (IHPA, 2019a). The majority of outpatient clinics in such facilities are run by a variety of medical and allied health specialties and are primarily consult-based. In contrast, where medical procedures are indicated, a patient is not seen in an outpatient clinic but admitted to the hospital. As opposed to the funding of outpatient clinics, the funding of an admission includes consideration of the procedure(s) performed and length of stay (WA Health, 2021). The funding of outpatient clinics is based on figures provided by the IHPA, which is responsible for calculating the national efficient price (NEP) for public hospital services (IHPA, 2019b). The NEP determines the level of government funding for public hospital services, and subsequently, the funding each patient visit generates at a tertiary facility (i.e., the Non-Admitted Care Classification).

Provision of public specialist dental service

Special needs dentistry (SND), the specialty that focuses on the dental management of patients with special health-care needs, is unique in that it can be based in both tertiary and stand-alone dental facilities (Lim et al., 2020; Sundaresan et al., 2022), and therefore the way activity is recorded differs despite the sole difference being the location of where the service is provided. The largest tertiary hospital in Western Australia is Fiona Stanley Hospital (FSH) and houses an SND clinic. In addition to receiving referrals from community and hospital-based clinicians, it is also involved in the multidisciplinary management of patients receiving care for head and neck cancer. This clinic is responsible for the review of patients before the start of cancer management and stabilizing their dentition. Two Head and Neck Cancer Multidisciplinary Teams (MDTs) serve Western Australia. The second MDT is based at Sir Charles Gairdner Hospital (SCGH). In contrast to FSH, SCGH does not have its own dental service. SCGH is adjacent to the stand-alone dental facility the Oral Health Centre of Western Australia (OHCWA), where the SCGH MDT refers its patients for dental management. While both FSH and OHCWA provide dental care to the same cohort of patients, activity is recorded differently.

This study compares existing ABF models in Western Australia to investigate if there are discrepancies in SND funding based on where a clinic is housed by analyzing patient treatment at the SND clinic at FSH (Head and Neck Cancer MDT).

MATERIALS AND METHODS

All new referrals for SND review from the FSH Head and Neck Cancer MDT between January 1 and December 31, 2019 were screened. Data regarding dental screening and dental treatment were collected including the number of appointments for the course of care, types of dental imaging used, and dental procedures performed. The collected data were then inputted into the two ABF arrangements in use in the state (Department of Veterans' Affairs Fee Schedule of Dental Services and The IHPA's Australian Non-Admitted Care Classification) to estimate the expected funding generated by both funding models. Estimates were based on the annual fee schedules for each ABF model for the study period.

Data were analyzed using IBM SPSS Statistics for Windows, version 23.0 (IBM Corp).

RESULTS

The SND clinic at FSH in the study period reviewed 127 patients over 209 appointments. All patients received oral hygiene instruction and dietary advice, and a dental panoramic radiograph as a primary screening tool. Further investigations (e.g., intraoral radiographs) were completed depending on individual patient needs. Eighteen patients required no dental interventions before their HNC management. During the study period, 407 extractions and 30 restorations were completed as part of stabilizing the patient's dentition before management of their head and neck cancer. Seventeen patients required removal of all their remaining teeth over an average 2.7 appointments (range: 1–4 appointments). The remaining 110 patients had their treatment completed over 161 appointments (average 1.5 appointments; range: 1–2 appointments).

IHPA

The IHPA's Australian Non-Admitted Care Classification for the study period was AUD $339 (USD$216) per appointment. On average, patients required 1.65 appointments (range: 1–5), which averaged AUD$559 (USD$356) per patient (range: AUD$339–1695). Most patients had their course of care completed in either one appointment (71 patients, 56% of patient cohort) or two (32 patients, 25% of patient cohort). One patient required five appointments to complete their course of care (expected funding generated AUD$1695). Patients who did not require any dental intervention generated AUD$339 (USD$216) in estimated funding. The total estimated funding received via this structure was AUD $70,851 (USD$45,181).

DVA fee schedule

Using the DVA schedule, dental treatment was coded and recorded using the Australian Dental Association's schedule of dental services (Table 1). On average, patients required AUD$1016 (USD$648) (range: AUD$511–4222) worth of dental treatment as part of their work-up. Patients who did not require any dental intervention generated AUD $511 (USD$216) in estimated funding. Most patients generated an estimated funding less than AUD$1000 ($n = 97$, 76%), followed by AUD$1000–2000 ($n = 13$, 10%), AUD $2000–3000 ($n = 7$, 6%). The total estimated funding using this ABF model was AUD $129,029 (USD$82,281).

This amounted to a total difference of AUD$58,178 (USD$36,928) between the two ABF tools; or on average AUD$458 (USD$291) per patient. On average, the DVA schedule generated 81.7% more in funding per patient than the IHPA's Australian Non-Admitted Care Classification (Figure 1).

DISCUSSION

ABF is not new to Australia and has been used in the funding of public hospitals since the 1990s (Eagar, 2011). The concept behind ABF was that by reimbursing health-care providers based on a fixed rate per unit of activity, there would be a financial incentive to being more productive (Australian Government Department of Health and Aged Care, 2011; Eagar, 2011). Being *productive* though can be determined in many ways depending on how the activity is recorded. For example, public health services in Australia use several interpretations of fee-for-service (FFS) and capped-fee (CF) models such as those investigated in the present study to measure productivity and subsequently funding (Dawda, 2015).

The practice of dentistry is highly procedure-based with many types of procedures performed. Consequently, CF funding structures fail to accurately capture the dental treatment provided as they do not account for this variety of treatments nor the time taken for

TABLE 1 DVA subsidy used in the study period with corresponding dental treatment codes (Australian Government DVA, 2019).

Item number	Item description	DVA subsidy* (Australian dollars)
017	Consultation by referral	$106.00
013	Oral Examination—Limited	$28.35
311	Removal of a tooth or part(s) thereof	$309.10
141	Oral hygiene instruction.	$51.05
114	Removal of calculus—First appointment	$92.55
131	Dietary analysis and advice	$37.55
525	Adhesive restoration—Five surfaces—anterior tooth direct	$232.75
531	Adhesive restoration—One surface—posterior tooth	$127.30
532	Adhesive restoration—Two surfaces—posterior tooth	$159.80
521	Adhesive restoration—One surface—anterior tooth	$119.15
533	Adhesive restoration—Three surfaces—posterior tooth	$192.10
522	Adhesive restoration—Two surfaces—anterior tooth	$144.70
523	Adhesive restoration—Three surfaces—anterior tooth	$171.35
037	Panoramic radiograph—Per exposure	$97.25

Abbreviation: DVA, Department of Veteran Affairs.

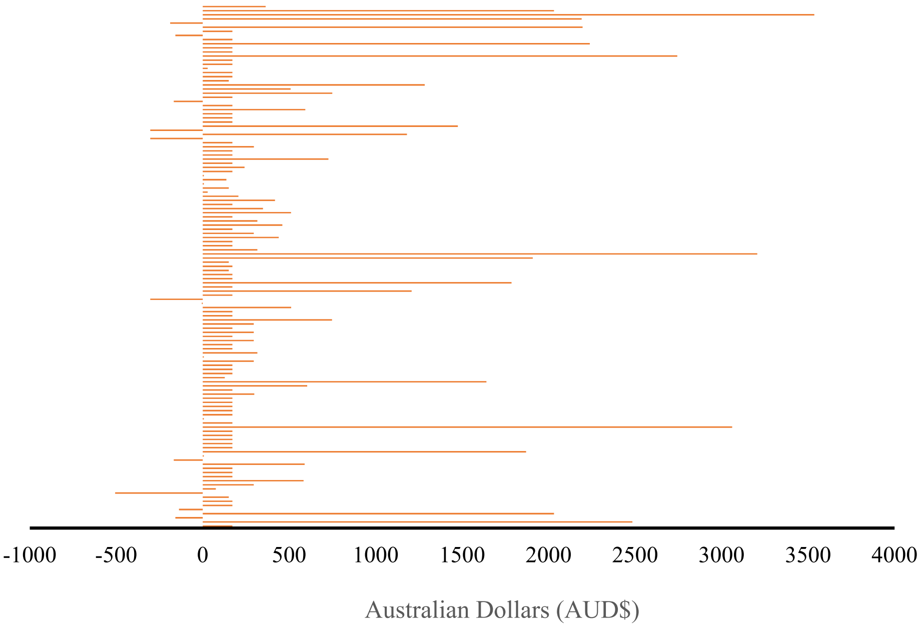

FIGURE 1 Graph illustrating differences in funding between fee-for-service (Department of Veteran Affairs [DVA] schedule) and capped-fee (national efficient price [NEP] schedule) models for each individual deidentified patients. A significant majority of patients find hospital-based income (NEP) short of out-of-hospital-based models (DVA).

them. Despite this CF models are not new to dentistry and have been used previously with evidence suggesting they encouraged choosing less complex patients and therefore a reduction in the range of care provided (Ellis, 1998). This in itself is contrary to the essence of SND where the specialty is defined by the complexity of conditions in different patients (Sundaresan et al., 2018). In contrast, the use of FFS models in dentistry is associated with patients being overtreated (Ellis, 1998). For example, its use in the United Kingdom's National Health Service revealed it tended to favor higher paying, invasive, and complex dental treatments (Ellis & Vidal-Fernández, 2007). While it is thought that in a public system where dentists are salaried this is less likely to be an issue, the introduction of incentives and targets can be the driving force to performing more services without having a positive impact on oral health quality (O'Reilly et al., 2012). While previous Australian studies have compared and contrasted the use of CF and FFS payment schemes, dental care in these schemes is always partly funded by the patient (Conquest et al., 2015, 2017, 2021). In contrast, dental treatment as part of the work-up for HNC management at FSH or OHCWA is not self-funded. This is an important point of difference because previous studies have investigated the efficiency of current funding models, they all include part-payment from the patient and therefore not comparable to the present study's results (Conquest et al., 2017, 2021).

A CF model is useful in a hospital setting where there is a high volume of patients. Therefore, clinics with shorter appointments will allow for more patients to be reviewed in a defined period. However, dental treatment times can vary depending on the treatment provided. The results of this study highlight an important discrepancy in the funding of hospital-based specialist dentistry. In facilities that are structured around the delivery of medical care, ABF is designed to capture consultation appointments and treatment provision using different ABF measurements. The disparity appears to be more pronounced in our study with SND clinic activity being recorded in line with other outpatient clinics as opposed to in an admission where the types of procedure(s) performed are captured. As evidenced in this present study, FFS models appear to be better funded as they record treatment provided; however, the difference seen in funding models may be exaggerated in the present study. SND involvement in the multidisciplinary care of head and neck cancer involves preparing patients for their management in a time-constrained setting to allow for oncology treatment to commence without delay. As a consequence, there is the preference to have more treatment completed in a session to render patients *dentally fit* before cancer therapy. However, these extended treatment sessions are not captured in a funding structure based solely on the number of times a patient is reviewed. Further, the treatment needs of individual patients can vary considerably (Sundaresan et al., 2022), accounting for the variation in expected funding generated in both models. In this present study, outliers may have skewed results. For example, it is unsurprising that only 14% of patients required no dental intervention given the burden of oral disease in this population (Sundaresan et al., 2022). Similarly, while only 13% of patients required removal of their remaining teeth, variation was seen in the number of teeth removed as well as the number of appointments to complete this which may account for the range in funding estimates in both ABF models. This study shows that differences in how activity is captured result in clinics based at stand-alone dental facilities appearing to be more productive.

Having different interpretations of ABF in Australia is not exclusive to Western Australia—for example, general dental services provided by the New South Wales Government can include dentistry provided by salaried practitioners as a CF model as well as an FFS scheme through private practitioners with both modes of service existing to improve access to care. Conquest et al. (2017) reviewed these arrangements: while the CF model performed less efficiently, the FFS model was more costly (Conquest et al., 2017). Despite the results of the study suggest advocating using FFS models in hospitals, a third model that reflects the unique characteristics of patients seen in a hospital environment may be more appropriate. While both ABF models investigated in the present study have their advantages, they do not capture, nor are they designed to capture, the added complexity patients with special health-care needs present with (Bateman et al., 2010; Sundaresan et al., 2018; United Kingdom Government, Department of Health, 2007). While transferring from an ABF structure used in outpatient clinics to one based on hospital admissions would better record and measure the dental treatments provided, there is currently no tool in place in hospitals to measure the complexity a patient for dental treatment presents with.

Unlike the other dental specialties where there are added technical skills that separate themselves from those of a general dental practitioner, the complexity in SND is more a reflection of the considerations medical, social, and cognitive factors patients may present with when designing and delivering a treatment plan (Bateman et al., 2010; Sundaresan et al., 2018). While the results of the present study can be generalized to suggest that the generated funding be increased by an 81.7% supplement to align with stand-alone dental facilities, this would fail to take into consideration patient complexity as the driving force behind an SND ABF structure.

Recording patient complexity is well-used in medicine. For example, anesthetists for the past 60 years have routinely recorded a score to assess and communicate a patient's comorbidities (Eakin & Bader, 2017). A review of the literature describing the complexities patients with special health-care needs present with shows previous studies have categorized patient complexity using the definition by the Royal Australasian College of Dental Surgeons; however, these umbrella terms do not provide detail as to what attributes specifically constitute *complexity* (Sundaresan et al., 2018). Similarly, a New Zealand study investigated if the number of comorbidities could be used to define complexity; however, this was revealed to be an inaccurate reflection of what constituted complexity with SND specialists more likely to see patients with fewer comorbidities but required sedation and/or behavioral management techniques (Sundaresan et al., 2018).

A more appropriate model to characterize complexity in the SND context may be the British Dental Association's case mix model, which attempts to account for patient-specific factors that contribute to complexity (Bateman et al., 2010). Before the publication of the BDA Case Mix Tool (CMT), the British Society for Disability and Oral Health commented that contracts needed to reflect the additional time and resources required to provide dental care for patients with special health-care needs (United Kingdom Government, Department of Health, 2007). The CMT was developed to characterize the complexity of patients requiring dentistry to provide a more appropriate funding formula (Bateman et al., 2010). Various authors have commented that patients with special health-care needs require additional time for dental treatment given the unique considerations each patient presents with (Bateman et al., 2010; Sundaresan et al., 2018). Frequently, it is these same considerations such as medical complexity, capacity to consent, and need for adjunctive sedation techniques as reasons for specialist referral (Faulks et al., 2023; Sundaresan et al., 2018).

The case mix model measures patient complexity against six criteria: ability to communicate, ability to cooperate, medical status, oral risk factors, access to oral care, and legal and ethical barriers to care (Bateman et al., 2010). Each category is scored individually and then summed to provide a score that is banded into a level of complexity. The use of such a model can be used by hospitals to understand the challenges of caring for patients with special health-care needs, and better characterize both the specialist input required and value of services provided. A variation of this tool is currently used in France, where once a complexity threshold is reached, practitioners are provided with a subsidy (Faulks et al., 2023). An advantage of using such a tool is that complexity is recorded at each appointment—as Bateman et al. (2010) note patient complexity can vary between appointments; however, this is largely seen in the population with an intellectual disability where adjunctive sedation techniques and issues surrounding informed consent are present (Bateman et al., 2010).

CONCLUSION AND POLICY IMPLICATIONS

While ABF is used to measure the activity of health services, there are discrepancies in current models. Consequently, dental departments in hospitals are perceived to be inefficient and expensive. Additionally, no funding tool captures the added complexity for patients with special health-care needs. For funding to reflect the considerations of special needs dentistry more accurately, a funding tool should capture the dental treatment provided as well as the complexity of each patient. Further research should focus upon developing a better model to capture both the activity undertaken and the complexity of these patients.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support this study cannot be publicly shared due to ethical or privacy reasons and may be shared upon reasonable request to the corresponding author if appropriate.

ETHICS STATEMENT

Ethics approval was obtained from the University of Western Australia Human Research Ethics Office (RA/4/20/6403) and Fiona Stanley Fremantle Hospital Group's Governance Evidence Knowledge Outcomes (GEKO) committee (Quality Activity 35120).

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RESEARCH ARTICLE

COVID-19 and 2020 presidential election speeches: A content analysis of pandemic campaign rhetoric

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Abstract

This study examines how public health issues were communicated during the 2020 US presidential campaign, particularly those concerning the global COVID-19 pandemic. Using content analysis, we examined the available campaign speeches of the two major candidates, Donald Trump and Joseph R. Biden. We examined how the candidates discussed the COVID-19 pandemic and vital areas of public health in those speeches. Analysis of these speeches found little discussion on healthcare in general and little to no discussion on the vital areas of public health. We also found that COVID-19 statements were not as prevalent as we anticipated, given the unprecedented scope of the pandemic. Even during a pandemic, public health matters received very little attention during a Presidential campaign. Public health topics accounted for less than 1% of the content in candidates' official speeches. Given that elites help increase knowledge of public health concerns and influence policy, the lack of attention given to the pandemic in the 2020 general election cycle is surprising, if not alarming.

KEYWORDS

2020 Presidential Election, COVID-19, health policy, President Biden, President Trump, public health communications

Key points

- The language used by US presidential candidates and other political elites can have an effect on health policy, health outcomes, and public health.
- During the 2020 US presidential election, Donald Trump and Joseph R. Biden paid little attention to public health issues in their campaign speeches.

- Political elites can help increase public awareness regarding health issues. The minimal discussion of health issues during the 2020 US presidential campaign is surprising and alarming for public health.

INTRODUCTION

Building upon past research on how United States presidential candidates communicate issues of public health (Abroms & Lefebvre, 2009; Hatcher & Vick, 2018; Zucker et al., 2015), we analyze the 2020 general election speeches of Donald Trump and Joseph Biden, the candidates nominated by the two major political parties. This election presents a unique opportunity to explore whether public health issues received increased attention in campaign rhetoric during the global COVID-19 pandemic. Given that presidential candidates attract significant attention from citizens, the media, and policy elites, and because their language can affect public policy outcomes (Zaller, 1992), analyzing what the candidates said about COVID-19 in their 2020 campaign speeches matters. The data we include are major campaign speeches for the 2020 general election cycle. Unfortunately, data is limited because the campaign was conducted during the COVID-19 pandemic and campaign events were restricted due to public health concerns. Despite being in the midst of a global public health crisis, it is surprising that both candidates seldom addressed public health concerns, including COVID-19.

Communication by political elites about the problems facing society can impact the public policies adopted to address these problems (Kiousis et al., 2013; Zaller, 1992). Concerning public health, the rhetoric used by political elites can influence the knowledge, opinions, and behavior of citizens (Bernhardt, 2004; Koch, 1998). Hindman and Yan (2015) find that ideology, political affiliation, and source of news information can increase the divide between an individual's belief gap and knowledge gap. The COVID-19 pandemic and the partisan response to public health measures provide evidence of this influence (Widmann, 2022). Studies found that conservatives were less likely to view COVID-19 as a health threat while also being more likely to embrace conspiracies about the virus and its spread (Calvillo et al., 2020; Scacco & Coe, 2021). Even before the disagreements over COVID-19 vaccines, Klem Thomsen (2017) found that arguments by elites against vaccination led to lower vaccination rates and increases in treatable illnesses. Zucker et al. (2015) found those survey respondents who heard Republican presidential candidates criticize the HPV vaccine were more likely to discuss problems associated with the treatment compared to respondents who were not exposed to the criticism from the politicians. Therefore, it is important that political elites talk about public health issues and include evidence-based solutions to problems (Freimuth & Quinn, 2004; Lezine & Reed, 2007). However, recent evidence suggests elites do not devote much attention to health-related matters. Hatcher and Vick (2018) find that in the 2016 presidential campaign, Hillary Clinton and Donald Trump spent very little time on public health matters in their campaign speeches, thereby hindering efforts to improve overall health outcomes. Once elected, President Trump rarely focused on public health matters before the pandemic, except to emphasize his party's attempts to dismantle the Affordable Care Act (Hatcher, 2020).

It is an understatement to note that Trump's speaking style is different from that of other modern presidents. As we cite in this paper, political scientists, communication, and rhetoric scholars have analyzed the effect of Trump's communication style on policy and, more broadly, democracy in the United States and as Mercieca (2020) soundly describes, there is a “rhetorical genius” in Trump's speaking style. It is a speech style where Trump often does not use proper terms or politically agreed-upon descriptions. Thus, this needs to be taken into account when analyzing Trump's speeches.

Following the tumultuous 2020 Presidential election, scholars have examined Presidential communications to dissect their role in the electoral outcome. Hart notes that while Trump's speeches were three times longer than Biden's, they were less effective due to his paranoid style (Hart, 2022). While Trump indulged his ego with rhetoric about grievances and victimhood, Biden, in contrast, kept a lower profile and focused on voters and mobilizing the vote. Although the study did not focus specifically on health care or COVID-19 messaging, it acknowledged Biden's consistent mask-wearing provided a totemic reminder that he took the pandemic seriously and that Trump was managing the crisis poorly. Johnson examined the different forms of protective masculinity in election communications (Johnson, 2022). He found that Trump's exclusionary, macho, protective hypermasculinity was undermined by his poor management of the pandemic, including contracting COVID-19 himself, which was likely a factor in his electoral defeat. In contrast, Biden's socially inclusive and empathetic protective masculinity attempted to make voters feel safer, unified, and hopeful.

Given the role that social media plays in our political process, studies examined the role of Twitter in the 2020 election. In an analysis of Trump's 3226 tweets and Biden's 1142 tweets, Abbas and Zahra (2021) found ideological stands around the following themes: COVID-19 policies, environmental issues, racial unrest, and the economy. Biden's COVID-19 tweets emphasized Trump's failure to take the virus seriously, the President's failed response, and Trump's efforts to dismantle the Affordable Care Act. Biden also emphasized mask-wearing and his commitment to free and safe vaccines. Trump's tweets emphasized China and large case numbers due to testing, as well as the vaccine that his administration helped fund. The contrast between their tweets demonstrates how communication about health-related issues can advance or hinder a community's efforts to promote public health (Bernhardt, 2004). The mainstream media also potentially played a role in the communication about the pandemic. Much like the issue of climate change, COVID-19 was covered differently by media platforms, with liberal-leaning outlets criticizing the trump administration as downplaying of the risks while conservative-leaning outlets suggested that Democrats used the pandemic to scare people for political reasons (Calvillo et al., 2020). This work also found Republicans may not discern real from fake news headlines as accurately as Democrats. While work on “fake news” tends to focus on political news, fake news about health-related topics is also widespread (Waszak et al., 2018). Clear and evidence-orientated communication regarding pandemics can positively affect the public's awareness of future pandemics (Lin et al., 2016).

Since COVID-19 was a major factor in 2020, talk about the pandemic should dominate the presidential campaign. However, conventional wisdom suggests that Trump may avoid talking about COVID-19 since many viewed his administration's handling of the pandemic as a failure. This reality suggests it would then be advantageous for Biden to discuss COVID-19 often, however, in a study of Biden's tweets, Meeks (2022) finds that healthcare represented only 10.4% of Biden's tweets in the primary and 5% during the general election cycle, whereas COVID-19 represented 3.1% in primary and 11.8% in general. Meeks speculates that healthcare mentions decreased in general because Biden shifted to focus on COVID-19. In terms of substance, structural topic modeling clusters and keyword-in-context showed Biden advocated for the Affordable Care Act instead of Medicare for All, where he could highlight his experience and policy victories. Ultimately, while Biden did address healthcare and COVID-19, it was not a central theme in his social media communications.

Research shows that presidential statements can influence the news media coverage of health-related issues, which can affect the policymaking process (Koch, 1998; Lin et al., 2016), and health communication can be used in a positive manner to address medical problems and lessen health disparities (Freimuth & Quinn, 2004). Therefore, it is essential to examine the health-related communications of political elites during a global pandemic which this study attempts to do.

METHODS

We analyze the campaign speeches by presidential candidates, Donald Trump and Joseph Biden. The data are taken from The American Presidency Project.[1] For Trump, we pulled the campaign documents from the completion of the Republican National Convention to Election Day (August 27, 2020 until November 3, 2020). For Biden, we pulled the campaign documents from the Democratic National Convention to Election Day (August 17, 2020 until November 3, 2020). These campaign speeches, remarks, and statements represent the content data analyzed in the study. We used Nvivo to analyze the content in Trump and Biden's campaign speeches. There were 24 speeches for Biden with 108,107 total words. For Trump, there were 15 speeches, totaling 196,692 words. To broaden the content analysis beyond keywords, we used word tree analysis to examine the material around health-related searches. Word tree analysis takes searched words and allows the researcher to visually examine other phrases used around these pre-determined words.[2]

RESULTS

Table 1 displays how often the candidates discussed COVID-19, the pandemic, healthcare in general, and public health. The most striking finding of the content analysis is the limited discussion about COVID, public health, and healthcare in general in these speeches. Trump only mentions "health" 64 times (0.03% of total Trump words), and Biden mentions "health" 159 times (0.14% of total Biden words). Out of all the words used in the speeches by both candidates, only 0.07% of them included "health." Therefore, while Biden was more focused on health than Trump, the attention to the topic was minuscule overall.

When talking about health care, Trump focused on the topic generally, whereas candidate Biden focused on health issues related to COVID-19. The comparison of the

TABLE 1 2020 Presidential campaign speeches, COVID-19, pandemic and health-related comments.

Campaign speeches and the presidential candidates							
	Number of campaign speeches	Number of words	General health comments (% of words)	COVID-19 (% of words)	Pandemic (% of words)	Healthcare (% of words)	Public health (% of words)
Joseph Biden	24	108,107	159 (0.14%)	117 (0.11%)	88 (0.08%)	50 (0.05%)	19 (0.02%)
Donald J. Trump	15	196,692	64 (0.03%)	16 (0.008%)	38 (0.02%)	49 (0.02%)	1 (0.00%)
Both candidates	39	304,799	223 (0.07%)	133 (0.04%)	126 (0.04%)	99 (0.03%)	20 (0.00%)

Note: The table includes data on the public health communications of the Democrat and Republican party nominees in the 2020 presidential election. The data are taken from The American Presidency Project (See: https://www.presidency.ucsb.edu/advanced-search?field-keywords=&field-keywords2=&field-keywords3=&from%5Bdate%5D=08-27-2020&to%5Bdate%5D=11-03-2020&person2=200301&category2%5B0%5D=63&category2%5B1%5D=65&category2%5B2%5D=68&category2%5B3%5D=423&items_per_page=100&). For Trump, we pulled the campaign documents from the completion of the Republican National Convention to 2020 Election Day (August 27, 2020, until November 3, 2020). For Biden, we pulled the campaign documents from the Democratic National Convention to 2020 (August 17, 2020, until November 3, 2020).

usage of COVID-19 in their speeches is remarkable. While both candidates dedicated only a few words in their speeches to COVID-19, Biden used the phrase significantly more than Trump (117 times compared to 16 times). The same is true for the use of the word "pandemic." This is consistent with the theory that Trump would want to minimize the pandemic and his perceived mishandling of it, but, surprisingly, Biden did not mention the pandemic more.

Our analysis in Table 2 builds on work by Hatcher and Vick (2018), examining how Donald Trump and Hillary Clinton discussed public health issues in the 2016 campaign. In Table 2, we show that in 2020, Trump and Biden only dedicated a few words in their speeches to the major issues of public health, which include wellness and diet; disease prevention; workplace standards; and vaccinations (American Public Health Association, 2022). One of the most prominent findings is how Biden dedicated more words in his speeches to vaccinations than Trump, even though one of the primary pandemic responses of the Trump Administration was to promote the development of vaccines for COVID-19 through its Operation Warp Speed.

To account for Trump's speaking style and to examine the material used around key healthcare words, we used word tree analysis to review the broader content of the speeches. In particular, we looked at the related material pulled from word trees associated with "health," "healthcare," and "pandemic." Additionally, we searched for offensive and racist terms that Trump used during the pandemic, such as "China flu" and "Wuhan flu." Even from the expanded analysis, we found both candidates dedicated little of their official campaign speeches to discussing health-related issues. The collection of official speeches is a small part of the communications during a presidential campaign. However, they are important campaign documents that have been the focus of analyses conducted in political science, communication, rhetoric, political psychology, and other areas of study (e.g., Gleibs et al., 2018; Hatcher & Vick, 2018; Jarvis, 2004; Putri & Kurniawan, 2015). Given the importance of the campaign speeches, it is telling that the candidates dedicated little time to discussing health-related issues, especially during a pandemic.

DISCUSSION

Based on research from the 2016 US presidential election, candidates dedicated small parts of their campaign speeches to discussing health issues, including the major areas of public health (Hatcher & Vick, 2018). However, past research demonstrates that political elites, such as candidates for the US presidency, can influence the public's knowledge of health-related issues as well as public policy (Bernhardt, 2004; Hatcher, 2020).

Despite the 2020 Presidential Election occurring during a global pandemic, we find similar results as past research regarding how infrequently US presidential candidates discuss health and public health during campaign events (Hatcher & Vick, 2018; Hatcher, 2020). Moreover, Trump talked about the pandemic less than Biden, which is in keeping with the theory that he wanted to minimize attention to his administration's failures around COVID-19. Another interesting finding is how Biden discussed even vaccinations in greater detail than Trump. Lastly, perhaps the most interesting finding of the research is in how both candidates, even during a global pandemic, dedicated little space in their speeches to health-related issues. While we anticipated greater focus on public health, at least by the challenger in this particular election, that was not the case.

This paper's analysis contributes to this research by extending the literature to the 2020 campaign and showing how the candidates discussed health issues during the COVID-19 pandemic. As with past research, we found that candidates dedicate small parts of their speeches to health-related issues. The striking finding of this research is how, even during a

TABLE 2 2020 Presidential campaign speeches and public health.

Campaign speeches and the presidential candidates								
	Number of campaign speeches	**Number of words**	**General health comments (% of words)**	**Wellness and diet comments (% of words)**	**Disease prevention comments (% of words)**	**Substance abuse comments (% of words)**	**Workplace standards comments (% of words)**	**Vaccinations comments (% of words)**
Joseph Biden	24	108,107	159 (0.14%)	0 (0.00%)	22 (0.02%	25 (0.02%)	2 (0.00%)	82 (0.08%)
Donald J. Trump	15	196,692	64 (0.03%)	0 (0.00%)	11 (0.001%)	29 (0.01%)	0 (0.00%)	15 (0.01%)
Both candidates	39	304,799	223 (0.07%)	(0.00%)	33 (0.01%)	54 (0.02%)	2 (0.00%)	97 (0.03%)

Note: The table includes data on the public health communications of the Democrat and Republican party nominees in the 2020 presidential election. The data are taken from The American Presidency Project (See: https://www.presidency.ucsb.edu/advanced-search?field-keywords=&field-keywords2=&field-keywords3=&from%5Bdate%5D=08-27-2020&to%5Bdate%5D=11-03-2020&person2=200301&category2%5B0%5D=63&category2%5B1%5D=65&category2%5B2%5D=68&category2%5B3%5D=423&items_per_page=100&). For Trump, we pulled the campaign documents from the completion of the Republican National Convention to 2020 Election Day (August 27, 2020, until November 3, 2020). For Biden, we pulled the campaign documents from the Democratic National Convention to 2020 (August 17, 2020, until November 3, 2020).

pandemic, Biden and Trump dedicated less than 1% of the words in their speeches to health-related issues. And when it comes to major aspects of public health, Biden focused more on COVID-19 and vaccinations than Trump did in his speeches.

Political actors shape our environments by choosing from possible values and world views. Presidential rhetoric defines political reality (Prasch, 2021; Zarefsky, 2004). Because of their prominent positions and access to media coverage, Presidents (and by extension, presidential candidates), define situations and the context in which these situations are viewed by the public (Zarefsky, 2004). According to Prasch (2021), their words tell citizens something about themselves, particularly in moments of crisis. Presidential rhetoric has real effects that can either contribute to or undermine the nation's character. Failing to focus their speeches on the pandemic, or to characterize it with a partisan lens, had real impacts on citizens' perceptions and the appropriate response to the pandemic. Calvillo et al. (2020) found that conservatives with higher levels of approval for Trump were less knowledgeable about COVID-19 and viewed it as less of a threat. The authors suggest that polarized perceptions of a crisis could limit collective action required to address the threat at the community level. Scacco and Coe (2021) also speculated that conservatives not viewing the virus as a threat might have compounded the damage of the federal coronavirus response.

Our analysis of attention to the COVID-19 pandemic by presidential candidates in the 2020 election would be incomplete if we did not acknowledge the existence of another nationwide crisis occurring at the same time. According to Martin (2021), Biden's defeat of Trump during a global pandemic following months of racial reckoning and protests after the high-profile killing of George Floyd by police, shaped a contentious campaign season that included attacks against women, people of color, and immigrants. Scholars like Hardeman et al. (2020) argued that police violence, the racial inequities in COVID-19 exposure and health care, and other forms of structural racism compounded the public health crisis and led some to refer to this as "twin pandemics." Manning (2020) refers to the "Time of Two Pandemics" that was acute, chronic, and acute-on-chronic with the compounding loss of coronavirus casualties and the high-profile killings of Breonna Taylor, Ahmaud Arbery, and George Floyd. These events resulted in African Americans struggling to cope with two destructive pandemics simultaneously.

Attention to this twin pandemic also played a role in the 2020 presidential contest. Bowleg (2020) asserts that Trump's re-election campaign denied that COVID-19 was disproportionately claiming the lives of Black, Indigenous, and Latinx people. Bowleg further argued that Trump's ineffective response to the pandemic unnecessarily exacerbated pain and suffering and impacted racial/ethnic minorities more dramatically. Winderman (2021) argues that Trump downplayed or ignored the gravity of the coronavirus, which left Biden to fill the rhetorical gap. While Biden did speak more about the pandemic than Trump, he emphasized national unity and largely downplayed its impact on minorities and did not address the parallel pandemic of high-profile killings by police officers (Winderman, 2021).

The data analyzed in this study were limited by the lack of campaign events, particularly by the Biden campaign in the 2020 election cycle. The study only looks at a small number of campaign statements. This is the same approach taken by Hatcher and Vick (2018). However, as we noted in the results section, we recognize these limitations but still hold that the campaign speeches are important political messaging, where these types of vital health issues should be discussed, especially during a campaign waged amid a global pandemic. Additionally, it needs to be noted that Trump's speaking style is atypical, and as we've noted earlier in this paper, a style that he has used to purposely not follow standard terms to divide listeners and unify his supporters in a demagogic manner (Mercieca, 2020). For example, instead of discussing the pandemic directly, Trump may utilize his demagogic style and use terms such as "Wuhan flu." In his formal speeches, we did not find many examples of these communications. We did find that instead of talking about the pandemic directly, Trump criticized the Obama Administration's handling of "swine flu." We took this and other atypical speaking patterns into account when conducting our analysis. As noted, we used word tree analysis to help ensure that we were not missing key statements from Trump that standard content analysis may miss because he often does not reference specific terms and uses his own catchphrases. We still found that he dedicated little space in his formal speeches to discussing health-related issues.

CONCLUSION

Our content analysis of the major campaign speeches by the 2020 presidential candidates shows a striking lack of discussion regarding health, in general, and the COVID-19 pandemic, in particular. In fact, less than 1% of the words in the campaign speeches dealt with health-related issues. Of course, these speeches are focused on many public policy areas, but given the saliency of the COVID-19 pandemic at the time, we thought more parts of the candidates' speeches would be dedicated to health-related issues. In terms of how the candidates did discuss the pandemic, Biden tended to focus on the pandemic more than Trump. Surprisingly, Biden dedicated more space in his speeches to the topic of vaccination, which is interesting given the Trump Administration's emphasis on its role in launching vaccine Project Warp Speed. While it is beyond the scope of this project, given that we know political elites can influence policy outcomes with their rhetoric, Trump's failure to tout his achievements on the campaign trail may have facilitated the reluctance to get vaccinated by his supporters.

ETHICS STATEMENT

IRB approval was not needed for the research reported in this paper because the data were publicly available.

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ENDNOTES

[1] See: https://www.presidency.ucsb.edu/advanced-search?field-keywords=&field-keywords2=&field-keywords3=&from%5Bdate%5D=08-27-2020&to%5Bdate%5D=11-03-2020&person2=200301&category2%5B0%5D=63&category2%5B1%5D=65&category2%5B2%5D=68&category2%5B3%5D=423&items_per_page=100&

[2] Jain et al. (2023) provide a strong example of how word tree analysis can be used.

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COMMENTARY

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Patient-reported outcomes in the Kingdom of Saudi Arabia: An insight for a healthcare system undergoing reform

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Abstract

Patient-reported outcomes (PROs) are closely related to the delivery of high-quality care and services. Patient-reported outcome measures (PROMs) are the tools used to measure the PROs. Despite the challenges and barriers associated with using PROs and PROMs, measuring PROs is valuable for a patient's health status and advancing evidence-based medicine. Real-world implementation of PROMs may especially open possibilities for healthcare systems under reform, such as Saudi Arabia. This paper highlights the concepts of PROs and PROMs. Moreover, it distinguishes between PROs and other concepts such as patient experience, quality of life, and patient satisfaction. It also explores the available literature in Saudi Arabia and the world regarding PROs and their role in improving healthcare systems. Last, this paper advocates for utilizing the national and comprehensive tools of PROMS in different levels and disciplines.

KEYWORDS

Health sector transformation program, Patient-reported outcome measures (PROMs), Patient-reported outcomes (PROs), Saudi Arabia

Key points

- Patient-reported outcomes provide an opportunity to engage patients in their care, enhance shared decision making, and improve care effectively and safely.
- Integrating patient-reported outcome measures (PROMs) in patient care has been associated with improving patient safety and patient experience and helping achieve more patient-centered care.
- Related literature demonstrated some limitations that might hinder the effective implementation of PROMs,

related to the integrity of data and lack of methodological standardization of PROMs data.
- Patient-reported outcomes are poorly addressed within the Saudi literature, and the utilization of PROs is also underdeveloped and needs further consideration.
- There is an excellent opportunity for researching and implementing PROMs in the healthcare setting in Saudi Arabia, which is currently undergoing a major transformation.

INTRODUCTION

Patient-centered care is the main pillar of global healthcare systems. Recent healthcare system reforms recognize the importance of patients' feedback and engagement in decision making (e.g., patient experience, patient satisfaction, and patient-reported outcomes). Patient engagement is defined by the World Health Organization (WHO) as an approach in healthcare that empowers patients with data and information to help them participate in decision making regarding their health and in line with their priorities (World Health Organization WHO, 2016).

One way to engage in patient-centered care is by implementing patient-reported outcomes (PROs). PROs provide an opportunity to engage patients in their care, enhance shared decision making, and improve care effectively and safely (WHO, 2016). In the coming years, PROs are expected to play a more prominent role with the shift of global focus in healthcare to more patient-centered healthcare, thus giving patients a greater say in what matters to them when receiving care (WHO, 2016). The current focus on enhancing the engagement of patients in their care and the rapid technological advancements also play a role in the shift to a healthcare system that focuses on patients to create value and deliver effective and safe care. This development in how healthcare is delivered is essential for countries looking to improve health and work on improving the well-being of their citizens and residents (Squitieri et al., 2017).

Healthcare systems undergoing reform, such as in Saudi Arabia, aim to improve the healthcare system by promoting process efficiency, quality of care, and reducing costs. The health sector transformation program in Saudi Arabia (i.e., Vision 2030) aims to improve the healthcare system and the quality of care and services provided for patients and their families through a value-based care model (Vision 2030, 2022). The reform promotes a patient-centered culture through initiatives that enhance the participation and engagement of patients through data interaction and the use of technology to help them participate in decision making and therefore strive toward enhancing the quality and excellence of care.

However, patient-reported outcomes are poorly addressed within the Saudi literature, and the utilization of PROs is also underdeveloped and needs further consideration. In this paper, we highlight the main concepts of patient-reported outcomes. We also distinguish between PROs and other related approaches, such as patient experience, quality of life (QoL), and patient satisfaction. Moreover, we explore the available literature regarding PROs in Saudi Arabia and their role in the national health sector transformation program. Finally, we explore the potential of applying PROMs, its applicability, and challenges in the healthcare setting in Saudi Arabia.

WHAT ARE PROS?

PROs are measurements that collect information directly from the patient on their perception of the care they have received and their health status (Food and Drug Administration [FDA], 2009). The American FDA defined a PRO as "any report of the status of a patient's health condition that comes directly from the patient without interpretation of the patient's response by a clinician or anyone else" (FDA, 2009). The key in PROS is the emphasis on the patient's perspective of care and aftercare. These outcomes do not merely represent the clinical outcomes and the morbidity outcomes of patients but go beyond that to assess patients' subjective perceptions of their health status and their families' perspectives (Johnston, 2022). For example, improving a biomarker does not always lead to a better QoL from the patient's perspective, emphasizing that sometimes the clinical outcomes might not truthfully represent the patient's experience (Weldring & Smith, 2013). Patient-reported outcome measures (PROMs) are tools that measure PROs, and they differ from the evaluation and assessment that the healthcare providers submit from their observations (Busse et al., 2019). PROMs enable patients to report on QoL concepts, daily functioning, symptoms, and other aspects of their health and well-being over time (Australian Commission on Safety and Quality in Healthcare, 2022). PROM concepts are more concerned with the patient's subjective feelings such as fatigue pain, physical dysfunction, depressive mood, feelings of well-being, general health, satisfaction with treatment, reports of adverse effects, and treatment adherence (Cella et al., 2015). Some PROM tools measure the degree of burden of the symptoms. For instance, functional assessment of chronic illness therapy, fatigue scale, and other tools that focus on reporting indices of disease-specific symptoms such as dyspnea-specific tool for chronic obstructive pulmonary disease (Smith et al., 2010; Yount et al., 2011), and pain interference measure, which measures the effect of pain intensity on functioning capabilities (Amtmann et al., 2010).

PROMs can be collected via various tools such as interviews, self-completed questionnaires, diaries, and different applications on smartphones or computers. There is no unified way of collecting PROMs, which is probably contributing to making it a challenge during implementation (Boyce et al., 2014). According to the National Quality Forum (2023), the implementation of PROMs requires building the infrastructure in the system that enables capturing patients' reported outcomes regularly and using that data to improve performance measures.

To label PROMs, it is imperative to distinguish them from patient experience, QoL, and patient satisfaction. According to the National Health Services (NHS) in the United Kingdom, patient experience is "what the process of receiving care feels like for the patient, their family, and caregivers" (NHS, 2010). It is a core element of quality, aligning with clinical excellence and patient safety. At the same time, patient satisfaction represents the information related to the provider's success at meeting the expectations of most relevance to the service users (Xesfingi & Vozikis, 2016). It is related to a patient's assessment of quality alongside his/her healthcare experience (Almahmoud et al., 2023). It is being seriously evaluated in various medical care settings as an indicator of healthcare quality parallel with other dimensions of quality such as accessibility, safety, relatedness, acceptability, effectiveness, and efficiency (Busse et al., 2019). Moreover, QoL is another subjective assessment of patients' experience in health. According to the WHO, "QoL is an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns" (The WHOQOL Group, 1998).

The NHS in England, UK has been among the first to implement PROMs in some clinical conditions since 2009, along with the United States and Canada (Black, 2013; Sutherland et al., 2021). This use of PROMs across countries could allow for comparability between and within countries. Therefore, PROMs could be specifically useful for healthcare systems undergoing reform by contributing to evidence for policymakers on the impact of healthcare reforms on patient outcomes and identifying system characteristics that produce the best outcomes (Berwick et al., 2017).

SIGNIFICANCE OF PROMS IN CLINICAL PRACTICES AND SETTINGS

PROMs are crucial to evaluate the implication of treatment options on an individual's functioning capabilities and QoL (Greenhalgh, 2009). PROMs enable patients to be involved in therapeutic choices and directly contribute to clinical evaluation (Wilson et al., 2019). Moreover, implementing any successful value-based care treatment relies on the routine use of PROMs in clinical practice (Traeger et al., 2019). For instance, recent research in orthopedics surgery reported that using PROMs helped assess the outcome of the intervening procedure in patients who underwent total joint arthroplasty by recording the score variation at pre- and postoperative settings and considered it an index for the efficiency of the conducted surgical intervention (Davis et al., 2020). Likely, reports related to physical therapy and rehabilitation indicated that measuring the outcome reported by patients who administer lower back pain therapy is substantial because it attributes the clinicians' evidence-based practice regarding the prognosis of cases, as well as adjustment of the treatment goals (Kamper et al., 2011; Kennedy et al., 2011).

PROMs could be implemented in diverse healthcare settings. Kynoch et al. (2022) conducted a scoping review on the implementation of patient-reported data within acute healthcare contexts across mainly the United Kingdom, Canada, and North America. The study reports that utilization of data from PROMs could improve patient care; however, the comparability of PROMs from different healthcare contexts was challenging due to methodological variations. The study authors recommend the engagement and training of staff as one of the suggestions to overcome the challenges of implementing PROMs (Kynoch et al., 2022).

Furthermore, the literature has shown that PROMs support patient–provider communication and the subsequent care processes and outcomes in clinical care (Greenhalgh et al., 2018). Integrating PROMs in patient care has been associated with reducing the gap between the patients' and clinicians' points of view of the treatment provided, thus improving patient safety and patient experience, and helping achieve a more patient-centered care (Doyle et al., 2013; National Quality Forum, 2023). A qualitative study on practitioners using PROMs in different ways to enhance patient care showed an increasing interest in using PROMs in primary care settings as tools for screening, patient monitoring, and public health surveillance (Wheat et al., 2018). The study showed that using PROMs improved patients' ability to manage their health, communicate better, engage in their health journey, and decide more interactively (Wheat et al., 2018). Another systematic review of long-term use of PROMs showed that the routine use of PROMS increased the rate of discussion of patient outcomes during consultations (Kotronoulas et al., 2014). This is specifically important in the context of Saudi Arabia, which is moving toward improving the role of primary care. PROMs use in primary care can lead to several advantages, and it empowers patients in their clinical care journey.

PROMS IN SAUDI ARABIA

PROMs could be specifically useful in healthcare systems undergoing reform, such as Saudi Arabia. PROMs can be disease-specific outcome measures that measure the change in health status after a clinical intervention or a performance improvement

(Sutherland et al., 2021). These measures allow for the identification of variations among different patients or systems and recognize the practices that lead to the highest benefit to promote them and reduce the ineffective processes or interventions (Black et al., 2016; Øvretveit et al., 2017).

PROMs' use and implementation in healthcare are growing for multiple reasons. First, to improve screening, monitoring, and communication at the individual level; second, to support clinicians and governments in decision making in monitoring the general population's health and assessing their QoL (Wu & Snyder, 2012). Third, PROMs are further considered as one approach to listening to the patient's perspective in a patient-centric healthcare system and creating value-based care by providing a way of measuring health outcomes from the patient's perspective (Australian Commission on Safety and Quality in Healthcare, 2022; National Quality Forum, 2023; Squitieri et al., 2017). The latter purpose of PROMs is specifically very crucial in the context of Saudi Arabia with the new 2030 vision of healthcare transformation. Two of the main themes of this transformation are creating value-based care and a patient-centered healthcare system (Ministry of Health Saudi Arabia [MOH], 2022b). Therefore, applying and using PROMs in the healthcare system in Saudi Arabia should be of great advantage and priority.

The Kingdom of Saudi Arabia is undergoing major healthcare transformation as part of its national transformation program under Vision 2030. According to the health sector transformation strategy, “the health sector transformation program aims to restructure the health sector in Saudi Arabia to be a comprehensive, effective and integrated health system that is based on the health of the individual and society” (Vision 2030, 2022). The transformation focuses on applying principles of value-based care through public health and disease prevention approaches; applying a new model of care, promoting a patient-centered culture, improving access to care through digital solutions, and improving the quality of care provided (Ministry of Health Saudi Arabia MOH, 2022b). The strategy also puts the patient at the center of its attention through the application of evidence-based standards (Vision 2030, 2022).

The approach to patient-centered care will constitute most of the patients' experiences in the coming years. Patients' experiences are one of the most important strategic directions for the health sector transformation program in line with the Saudi Vision 2030. The Kingdom has taken patients' experiences as a top priority for the development of health services. Several projects have been launched, including the National Project for Measuring Patients' Experience at health institutions and Patient Experience Measurement Program (PEXM) (Ministry of Health Saudi Arabia MOH, 2022a). PEXM aims to enable beneficiaries (patients and their families) to engage in quality improvement by measuring their satisfaction with various health services in MOH's facilities through surveys designed for each visit separately (Ministry of Health Saudi Arabia MOH, 2022a). Therefore, applying and using PROMS in the healthcare system in Saudi Arabia should be of great advantage and priority.

PROM's research and application globally have shown evidence that it contributes to enhancing the quality of care. Nonetheless, a growing body of research detected inadequate routine use of PROMs in Saudi Arabia for several reasons (Al-Muqiren et al., 2017; Alshaeri et al., 2020; El-Sobkey & Helmy, 2012).

Only a few studies on PROMs in Saudi Arabia are available. One study validates the Arabic translation of the available short-form survey of PROMs (AboAbat et al., 2020). Another study uses PROMs to measure type 2 diabetes outcomes in Saudi Arabia (Gelhorn et al., 2020), and a third examines the preparedness for using PROMs among orthopedic surgeons in Saudi Arabia (Alshehri et al., 2020), their study indicated that the use of PROMs in orthopedic surgery was limited despite interest among physicians. The reasons raised by the study participants indicated that a lack of proper knowledge and training on how to use PROMs and the perception that they are time-consuming are among the top barriers to implementation and use (Alshehri et al., 2020). Similarly, another study examined the use of PROMs among lower back patients in Saudi Arabia and indicated a lack of proper training among clinicians and physiotherapists on how to use these PROMs (Alhowimel et al., 2021).

The literature on PROMs use in Saudi Arabia is limited; however, it shows a window of opportunity to build on the existing knowledge to cover any gap in the literature. In addition, there is a window of growth in the Kingdom to establish specialized centers that offer practical solutions for training and enhancing the knowledge of healthcare providers in using PROMs in Saudi Arabia and the region.

The infrastructure of digital health and the adequate technology required to use PROMs is well established in Saudi Arabia. This comes with the tremendous effort invested in the healthcare system to improve the infrastructure for digital health to enhance patient care effectively and safely (MOH, 2018). Saudi Arabia has become one of the fastest-growing markets for digital health globally (AlBasri et al., 2022). This change has been particularly prominent in the post-coronavirus disease 2019 era, which sped up the digital health strategy of the Kingdom (Al-Kahtani et al., 2022).

POTENTIAL CHALLENGES

Related literature demonstrated some limitations that might hinder the effective implementation of PROMs (Boyce et al., 2014; Calvert et al., 2013; Glenwright et al., 2023; Nielsen et al., 2020; Squitieri et al., 2017). Calvert et al. (2013) referred to the health professionals' concerns related to the integrity of data and possible obstacles that arise while interpreting information based on poorly reported outcomes. Similarly, Squitieri et al. (2017) in their analysis and summary of the patient-reported outcomes health conference reported that with a lack of methodological standardization of PROMs, data would be invalid and comparison would be difficult. Likewise, Alhowimel et al. (2021) report the lack of Arabic versions of PROMs as a barrier to their data collection from patients. A systematic review categorized limitations and enablers of PROMs within four themes: data collection (practical), valuing the data (attitudinal), making sense of the data (methodological), and utilization of data for proper decision making (impact). Also, it highlighted technology as an elementary factor in processing data efficiently (Boyce et al., 2014). For example, operational and financial barriers and uncertainty among clinicians regarding the significance of the PRO practice. Variations of PROs exist in assessment methods, variables, content, and timing (Nielsen et al., 2020), as well as the integration of the PROS workflow to existing electronic medical records (Glenwright et al., 2023). A study by Falavigna et al. (2017) aimed to identify the status of worldwide use of PROMs and potential barriers to their implementation in routine spine care in different areas (Latin America, Europe, Asia Pacific, North America, and the Middle East). The results showed that more than 30% of spine surgeons do not use the PROM questionnaire routinely. This lack of use appears to occur because of a lack of knowledge regarding their importance, absence of reimbursement for this extra work, minimal financial support for clinical research, the cost of implementation, and lack of concern among physicians.

These barriers pose a challenge in terms of PROMS comparability between countries, with the lack of standardization in sampling methods and case definitions (Sutherland et al., 2021). Some of the suggestions to overcome those barriers discussed in the literature are training of staff and preparing the infrastructure such as proper health information systems for properly following standardized methodological processes (Kynoch et al., 2022; Squitieri et al., 2017).

Earlier, PROMs were only developed for clinical purposes; however, their role has been expanding to include improving the quality of care and reducing inefficiencies. Therefore, different outcome measures might be needed for different purposes (Squitieri et al., 2017; Sutherland et al., 2021). Therefore, proper leadership, building a proper infrastructure of information systems, and staff training are required to overcome barriers to implementation of PROMs. Moreover, the collaboration of various clinical disciplines and institutions to share information, expertise, and lessons learnt is highly recommended for reducing potential limitations of integrating PROMs successfully in healthcare systems.

CONCLUSION

There is an excellent opportunity for researching and implementing PROMs in the healthcare setting in Saudi Arabia. The use and implementation of PROMs will enhance the quality of care effectively and safely to engage the patient and improve their QoL. It also has the potential to improve cost-effectiveness by reducing the use of unnecessary treatments or improvements that do not yield a benefit. The potential benefits of PROMs provide evidence for policymakers on the impact of healthcare reforms on patient outcomes to identify system characteristics that produce the best results. In this paper, we highlighted the readiness of the healthcare system in Saudi Arabia to implement PROMs and its challenges. Future research could focus on understanding the knowledge and perceptions of clinicians and health-care providers as well as patients in Saudi Arabia and the MENA region on PROMs and their willingness and preparedness to work on it. In addition, future research could focus on understanding the barriers to implementing PROMs in healthcare settings and how to overcome them.

AUTHOR CONTRIBUTIONS

All authors contributed equally to this manuscript. All authors read and approved the final version of the manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS STATEMENT

Not applicable.

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COMMENTARY

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BSL-4 laboratories, combatting conspiracies, and using a culture-centered approach to improve risk and crisis communication in a One Health framework

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Abstract

The COVID-19 pandemic continues to pose a global zoonotic disease threat, highlighting the importance of developing strategies to combat new viruses and variants stemming from climate change and animal populations. A multidisciplinary approach is needed to address dis/misinformation surrounding such research. Collaborations across disciplines aid in actual responses to public health emergency events as well, easing the transition to a new equilibrium and impacting planning for future events. Russian disinformation regarding the joint work of Americans and Ukrainians as part of the Biological Threat Reduction Program is evidence of the need to educate the public about the real risks and benefits of zoonotic disease research. As seen in the recently released National Biodefense Strategy, political leaders in the United States are becoming more explicit about embracing a One Health framework for biodefense and public health emergency preparedness. This has significant benefits in terms of policy making by helping to dispel dis/misinformation, build trust in disease surveillance data, and give frontline workers such as those in the agricultural sector a voice in the conversation with which to share their expertise. A communication complex perspective applied through a culture-centered approach to a One Health model aims to improve risk and crisis communication. This unique strategy will help government leaders as well as those in relevant sectors to speak to the unique questions and concerns of a particular population. Among other things, this helps to avoid an ineffective "cookie-cutter" approach messaging. In this manuscript, we argue that coconstructing a cultural understanding of human, animal, and environmental health practices within a unique culture will lead to a specialized risk and crisis communication plan accepted by local communities.

KEYWORDS

BSL-4 laboratories, one health, risk communication

Key points

- The increasing spread of mis/disinformation in the area of infectious disease research necessitates that facilities like biosafety level 4 (BSL-4) labs more actively and productively engage with the public.
- The One Health model is a useful way to frame engagement because it provides opportunities for members of the public to directly engage in activities like surveillance which can increase buy-in regarding public health preparedness and response activities.
- When engaging with the public it is important to remember that, particularly on issues like infectious disease, a culture-centered approach that takes into account existing perceptions, attitudes, and knowledge is important to establish a relationship of trust.

INTRODUCTION

The COVID-19 pandemic is the most convincing evidence yet of the necessity of a One Health approach to protecting against emerging infectious disease threats. Humanity must be prepared for more frequent spillover events wherein diseases jump from animals to people. Biosafety level 4 (BSL-4) laboratories will be important resources for better understanding existing viruses, how they might evolve, and how to protect against them.

However, such institutions are under greater suspicion due to disinformation and misinformation regarding the origins of the SARS-COV-2 virus. Such misleading information can distract from a One Health mindset by drawing attention away from the interconnections between human and animal health and the environment. One Health is a framework that has gained increasing adherence during the pandemic as an effective form of collaboration (Queenan et al., 2017). One Health is about more than interdisciplinary research and action, but rather involves a shared worldview that changes or threats to the health of people, animals, and/or the larger environment can have deep and widespread repercussions which requires buy-in from a diverse range of experts (Gibbs, 2014). The framework is particularly concerned with the problems of climate change and cross-species disease, which are increasingly found to be inextricably linked. One Health attempts to address these risks through a foundation of interdisciplinary efforts, including research collaborations as well as work in the areas of clinical care, education, and surveillance.

Therefore, more attention must be paid to how to protect greater public trust toward these facilities. One potential approach to building trust is to better incorporate a range of stakeholders into surveillance activities focused on zoonotic threats. This promotes a One Health mindset by involving individuals such as farmers, veterinarians, and conservationists into detection efforts.

By integrating such experts into the data collection process, a higher degree of trust toward zoonotic research laboratories in the public generally can be developed. Key to promoting trust is an effective risk and crisis communication strategy which makes clear the risks and benefits of zoonotic research and how relevant actors will respond to an emergency event. As these laboratories operate at the frontline of pandemic events, it is vital that they are ready to clearly and transparently inform the public. The goal of employing a One Health strategy against public health emergencies, recently articulated in the National Biodefense Strategy, can only be realized if BSL-4 labs are expanding our knowledge of such diseases and the public is trusting and receptive of that information.

In order for One Health to be effective as the foundation for infectious disease response, a number of elements are required. First, there must be political support for the approach (Farag et al., 2019). Before the COVID-19 pandemic, there was bipartisan legislation introduced in the US Congress to integrate numerous federal agencies in a One Health framework to better prepare for and respond to a health emergency (Text-S.861–117th Congress, 2021–2022). Given that there is bipartisan legislation being developed to reform the US government's preparedness system more generally (US Senate Committee on Health Education, Labor, and Pensions, 2021), it seems feasible that such legislation could also be raised again. Whether it could pass given the extreme polarization in American politics is another matter. A key aspect of this political support is funding (Farag et al., 2019). In the past, the US government has shown a willingness to make major investments in public health preparedness in the wake of an event, but the investment erodes over time (Watson et al., 2017). With the field of public health becoming more politicized (Hardy et al., 2021), even the initial investment could be a source of contention.

We argue a One Health approach is only possible through communication, which requires a fundamental understanding of effective communication strategies. We apply the theoretical framework of a culture-centered approach (CCA, Dutta, 2008) to effectively include all constituencies involved in animal, environmental, and human health. We first explore media hysteria, conspiracy theory, and mistrust. This provides a foundation for the next area of focus on community support to build trust, which leads to our discussion on surveillance as a tool to promote trust and the One Health framework.

COMBATING CONSPIRACIES AND GAINING TRUST

Barriers in communication between scientists and nonscientists, among other groups, have proven problematic in the past (Gregory, 2005), giving rise to misinformation, disinformation, and conspiracy theories (Nie, 2020). This is why One Health should be used, not only to justify the creation of a facility but as a tool for its ongoing operations. The necessity of appropriate risk and crisis communication for biological laboratories conducting research on zoonotic pathogens continues to be a point of discussion in the United States but has recently come to the forefront with the Russian invasion of Ukraine. News outlets in the United States highlight the fear of potential lab leaks and distrust of biological laboratories (Achenbach, 2023). Efforts to track emerging pathogens and joint American–Ukrainian work to decommission chemical and biological weapons from the Soviet Union become fodder for a Russian disinformation campaign in an attempt to justify the invasion (Collins & Collier, 2022). The spread of such stories by domestic news outlets as well as foreign adversaries is indicative of the need to educate the public about the work of such facilities and the realities of the risks and benefits.

Contrary to popular belief, the media do not tell us what to think. They do tell us what to think about (see McCombs & Shaw, 1972; McCombs, 2005). What the media want us to think and talk about is often motivated by two factors: increasing ratings and distracting audiences away from topics power-holders seek to keep behind closed doors. Furthermore, sexy and sensational topics gain the most attention. As a result, the media have commonly promoted false, or misinformed, narratives that negatively impacted perceptions of public health topics (Traish et al., 2017).

Relying on more sensational aspects of an issue, as a means of capturing attention, the media have devised ways of manifesting new fears, illnesses, and anxieties within a society, creating urgent recognition and action (Chaiuk & Dunaievska, 2020). As a result, people rush to their computers seeking information from any source that will provide a salve to their concerns. Add in the speed of information sharing today, thanks to the popularity and structure of social media platforms, and misinformation created by media outlets spreads faster than an STI across a college campus. Furthermore, users are sharing information before reading it. According to a 2016 study in the Washington Post, nearly 60% of stories shared on Twitter and other platforms were not read before sharing (Dewey, 2016).

Take for example the media hysteria that took place in 2014. The Ebola crisis in West Africa generated media stories suggesting the virus could create a similar epidemic in the United States. While cases of Ebola were found in the United States, only 11 people were impacted, with all but one recovering; the media frenzy had people all over the country fearful that our own crisis had erupted. According to Traish et al. (2017), "two-thirds of Americans [were] expressing worry about a large-scale domestic Ebola outbreak" (p. 14).

Looking specifically at the level of accurate information shared on social media at this time, Sell et al. (2020) examined over 72,000 tweets that included the word Ebola. From a random sample of 3113 tweets, and excluding any tweet making jokes about the virus, the researchers found 10% of Ebola-related tweets contained false or partially false information, 25% framed by political viewpoints, 28% provoked reader response or promoted discord, and 42% contained risk elevating messages. Of the tweets reviewed, rumors focused on government conspiracy were found to be the most common. Finally, while comparing tweets with true information to tweets with misinformation, the greater percentage of tweets with misinformation were found to also be political in nature.

Globally, misinformation about Ebola spread across media influencing people's perceptions and behaviors. International researchers Richardson et al. (2019) analyzed the impact of media narratives finding that many people suffering from Ebola virus disease (EVD) blame their own false beliefs for the outbreak's spread. Observing how the narrative of mistrust circulated among members of the media, the academy, health ministries, and frontline response teams. From their research, it was clear that the information disseminated was reinforcing a particular paradigm of causality in the spread of Ebola that obscured the structural determinants of health. Such studies illuminate the importance of understanding how disease outbreaks are often politicized and rampant with miscommunication.

Similar to previous situations, the perceptions of COVID-19 have been severely impacted by both media hysteria, political ideologies, and deep-seated fears surrounding the threat of biowarfare which began during the mid-twentieth century (Nie, 2020). Thus, the spread of present-day conspiracy theories reflects longstanding and damaging trends. Additionally, such information deepens mistrust and animosity between countries while increasing nationalistic ideologies. Not to mention that threats associated with biological warfare and bioterrorism are real and growing.

Many factors are correlated with the distrust of science, including religious belief, level of education, political affiliation, socioeconomic status, and psychological orientations (Kabat, 2017). For instance, experts themselves have publicly raised questions about the safety and even the necessity of such labs with concerns focusing on possible leakage of pathogens as well as the potential development of biological weapons (Cyranoski, 2017). Republican leaders, such as Senator Tom Cotton, have also hinted that the virus was a bioweapon (Stevenson, 2020); this rhetoric, albeit to a lesser extent, likely encouraged some Republicans to adopt related beliefs. At the same time on the other side of the planet, Chinese media outlets blamed the United States as the source of the virus while praising their leader, Xi Jinping, as having "strengthened the areas of weakness and successfully closing the loopholes exposed by the epidemic" (Nie, 2020, p. 567). These remarks were taken by some commentators as a tacit admission of the lab origins of SARS-CoV-2. Although scientific research and reputable media outlets have denounced the theory that the novel coronavirus was genetically engineered or was a bioweapon (e.g., Andersen et al., 2020; Barclay, et al., 2020), the fact that the virus is not human-made does not necessarily exclude the possibility that the virus escaped the lab by accident (Field, 2020; Guterl et al., 2020), especially given the leakage of dangerous pathogens from other labs similar to Wuhan (Nie, 2020). Thus, if the goal is to continue developing and supporting the essential work being done in BSL-4 Labs to better understand and be able to treat the most dangerous pathogens, then we must strive to ensure effective communication with communities about high-profile, evolving scientific issues.

COMMUNITY SUPPORT

Gaining, and keeping, community support is a key factor for any Biosafety lab. To obtain support, labs must gain the trust of community members which relies on open communication about the goals of the lab and the risks involved (Kanabrocki, 2011). While BSL-4 Labs institute a range of safety measures, numerous accidents have taken place. Many unreported or misreported incidents turn into media headlines when local watchdog groups learn of an issue and report it to the media allowing suspicion to create the narrative. As stated previously, the media do not tell us what to think, but especially in times of crisis, it does play a crucial role in offering people information and updates related to what is happening around them. Thus, the media play an integral role in shaping public opinion and thus influences public attitudes and behaviors. Studies have shown that when facing situations that increase levels of uncertainty, people use the media to create a sense of reality (Camaj & Weaver, 2013).

Understanding the role media can play in shaping thoughts and behaviors it becomes imperative to think about the ways various media channels shape the narrative. Professional media outlets will have various agendas and audiences, while social media channels have their own. Though there is always overlap, thinking critically about intermedia agendas will be essential. Audiences typically look to professional media for facts and information about current situations while social media channels are used to discuss and share information about said situations. Both forms of media allow for a reduction of uncertainty, however, when not used strategically both can also raise ambiguity.

When working with media, communication teams within BSL-4 Labs often focus on reducing perceptions of risk. However, scholars such as Stirling (2010) propose that in times of uncertainty, experts should be mindful of not over-simplifying their messages. Often the uncertainty felt by communities can be ignored by experts as they know the policies in place. At the same time, community members might perceive potential risks that may lay outside the knowledge and view of those in the lab. As a means of easing uncertainty and increasing trust, communication between labs, community leaders, and media outlets must be used strategically.

Actively involving veterinarians, farmers, ranchers, and others in communication and other activities could help to dispel the influence of dis/misinformation (Andrews, 2002). Part of the communication breakdown between public health/medical authorities and the general public stems from a barrier to understanding and therefore a distrust of public health data.

Communication strategies must directly address this concern. Joint participation in surveillance activities could also contribute in this regard.

SURVEILLANCE AS A TOOL TO PROMOTE TRUST AND THE ONE HEALTH FRAMEWORK

As outlined in the recent update to the National Biodefense Strategy (The White House, 2022), biological threats pose risks to all forms of life on earth and present threats to the economy, national security, and the general social order. Therefore, the way in which we communicate about risk must respect the connections between the social, economic, agricultural, and environmental systems. Risk communication should be carefully coordinated across constituencies. The goal is not only to create shared understanding, but also to elevate trust in data and information by allowing representatives from different constituencies to directly participate in the assessment, analysis, and communication of risk. Goal 1, objective 2 of the Strategy makes this explicit: “Ensure that domestic and global biothreat detection, biosurveillance, and information systems are coordinated, integrated, and capable of enabling timely bioincident prevention, detection, reporting, assessment, response, and recovery” (The White House, 2022, p. 10). Many can have a role in the realization of this goal, from agricultural producers to veterinarians to epidemiologists and other scientists.

When considering the value of surveillance in this context, it is important to note that it is an activity that is carried out both horizontally and vertically. An example of surveillance being carried out horizontally would be stakeholders from the same community, such as farmers, veterinarians, and public health practitioners, partnering in the collection and analysis of information. Of course, in the United States, such information will also be transmitted to the state and federal authorities as well, who will conduct their own analyses and draw their own conclusions. Some of the mistrust of data during the COVID-19 pandemic stemmed from distrust of information stemming from the federal level and the belief that the federal government was incentivizing actors at the local level to exaggerate the pandemic's severity. This distrust of top-down data fueled distrust of local officials as well. In preparation for a future zoonotic outbreak, we propose incorporating a broader cross-section of the public into the data collection process in hopes of making it less remote. In communities where BSL-4 labs are present, this will mean that more members of the public will be both monitoring for laboratory accidents and providing the laboratories with samples with which to work.

The goal of improving surveillance capacity (The White House, 2022, p. xii) presents opportunities to advance a One Health approach by, for example, incorporating agricultural livestock producers into the data collection process (Thumbi et al., 2019). Such an approach gives them not only an active role, but hopefully by doing so creates more confidence in the system. Farmers should be given a voice in the development and implementation of such policy frameworks, and consideration should be given to those factors which encourage participation (Karali et al., 2014). In keeping with a “whole-of-society approach” (The White House, 2022, p. 8), the government and the public must recognize that biological risks in the agricultural sector represent general health risks as well. By this same token, biological laboratory personnel and farmers must come to a joint understanding of shared risks–zoonotic laboratories study potential threats to their livestock to address potential outbreaks, but a risk exists that viruses could escape from labs and harm their livestock populations. If such understanding can be established during risk communication, it could help to facilitate more honest and direct communication in the event of an incident.

The same could be argued for similar systems at the state and local level. The system of coordination must be managed by executives and legislatures to allow equitable input, while delegates to the coordinating bodies will need to assertively represent those for whom they speak. For example, the Strategy recommends, "recruitment of One Health experts and dedicated animal disease epidemiologists, who are critical frontline workers for animal disease control at relevant state and territorial agencies and departments, in all 50 states" (The White House, 2022, p. xi). Agricultural officials must take responsibility for making sure that domesticated animals receive as much attention as animals in the wild, while representatives of agencies like the Centers for Disease Control and Prevention (CDC) must strike the appropriate balance between the economic interests of farmers and the safety of society. Multidisciplinary approaches to public health crises within a One Health framework can help to produce such balanced solutions, while avoiding the economic and social repercussions of policies such as the indiscriminate and unnecessary culling of livestock (Sleeman et al., 2017).

While One Health may have a number of challenges in regard to implementation (dos S. Ribeiro et al., 2019), it can also present opportunities to win buy-in from the larger community in regard to efforts like disease surveillance (Karimuribo et al., 2017). Such community support could help to bridge the gap between biological laboratories conducting research on pathogens and community members skeptical of such facilities (Schurer et al., 2016). With misinformation and disinformation surrounding such facilities, it is imperative that biological research laboratories have effective risk and crisis communication plans in place to educate the public about the dangers associated with the facilities and to clearly communicate about any accidents or other threats emerging from the facilities.

Having appreciable preparedness and response plans in place is another element of successfully incorporating One Health into an infectious disease response. The US government developed plans to deal with threats, such as influenza, before the COVID-19 pandemic (Centers for Disease Control and Prevention [CDC], 2017); however, such planning was not adequate to deal with characteristics specific to the coronavirus, including asymptomatic spread (Gottlieb, 2021). One Health planning must include adequate surveillance across the human and animal populations to detect threats, take appropriate action, and coordinate across agencies to mitigate disruption to society, as well as develop and/or deliver countermeasures to protect the public (Ferri & Lloyd-Evans, 2021). All of these elements will require an epidemiologic and diagnostic approach that draws data from both animal and human populations and appreciates how interconnected the risks are for animal and human populations (Johnson et al., 2018). It is also important to be mindful that the value of scientific capability to a public health response is diminished if the public does not trust the information created and act upon it. A transparent system for crisis communication must also be developed to provide clear messaging in the case of an emerging threat that the public can act upon (Farag et al., 2019).

The concept of One Health can certainly be used to garner support among stakeholders, such as farmers and ranchers. This is particularly true if community members are substantively included in decision-making processes and key, trusted members of the community, such as local veterinarians, speak in favor of them (Ferri & Lloyd-Evans, 2021). The traditions and culture of the population must also be respected during the process (Böl, 2016). Communication is key to overcoming dis/misinformation, establishing trust, and creating a shared understanding of community, risk, surveillance, protection, and collaboration.

COMMUNICATION FOR COMMUNITY PROTECTION

It is important to acknowledge the communication strategies as well as the practical communication that will impact these strategies. Recently in response to the COVID-19 pandemic, the director-general of the World Health Organization (WHO) shared a proposal for strengthening health emergency preparedness, response, and resilience (HEPR) systems capacities (WHO, 2022b). Communication was a vital part of the recommendations in two pillars: governance and systems. In the proposal for governance, strengthening HEPR included elements of crisis communication, including: enhancing transparency, dialog, resolutions in the field (e.g., local context), moving beyond the health sector (e.g., community engagement), and promotion of dialog and cooperation at regional, national, and global levels. In the proposal for systems (2nd pillar) for strengthening HEPR, crisis communication was also a vital part of two of the five core subsystems, collaboration, and coordination. Within the "community protection" subsystem, the two specific features included proactive risk communication and cocreation of interventions through community engagement.

Understanding the significant role communication plays in safety, we suggest BSL-4 labs create teams of communication specialists who interact with the local community to create the best possible risk and crisis communication strategies. BSL-4 facilities should develop a risk communication strategy as well as a plan for crisis communication. We argue that relationships and interactions with the local community should be at the center of this planning while also providing an understanding of encouraged elements of the strategies before creating them. To overcome the communication breakdown, a CCA via the One Health perspective to involve community members in the discussion for planning is necessary. Queenan et al. (2017) recommend the ongoing process of risk and crisis communication planning through public awareness actions on health protection measures. Although human health is only one part of the One Health model, communication invites the opportunity to cooperate and connect with community members impacting and involved with animal and environmental health. An understanding of the important aspects of the strategies should guide team members in their interactions with community members. First, a brief description of risk and crisis communication.

RISK COMMUNICATION

According to the WHO, "Risk communication used to be viewed primarily as the dissemination of information to the public about health risks and events, such as outbreaks of disease and instructions on how to change behavior to mitigate those risks. Thinking on this has now evolved dramatically as social science evidence and new communication and media technologies and practices have evolved in the twenty-first century" (WHO, 2022a). Furthermore, "For public health emergencies, risk communication includes the range of communication capacities required through the preparedness, response, and recovery phases of a serious public health event to encourage informed decision making, positive behavior change and the maintenance of trust". Dickmann et al. (2016) recommend relationship building, engaging with the local communities, including the media, and maintaining a "proactive, transparent, and participatory communication approach" (p. 439) The main principles of risk communication are transparency and engagement with the public. Risk communication and crisis communication are complementary processes.

CRISIS COMMUNICATION

Crisis communication involves timely action in response to a crisis that includes enacting a plan for information dissemination; during the emergency/crisis, there is a high demand for information in an immediate time frame that requires urgent and effective dissemination (Centers for Disease Control and Prevention [CDC], 2014; WHO, 2022a). Having a foundation of trust is essential for timely execution of a crisis communication plan. Given time is of the essence during crisis, a plan must exist before the crisis. Yet, a well-designed and thoughtful crisis communication plan cannot be executed effectively and efficiently without the proactive steps to engage community members in the planning process. A reactive strategy not built on trust will fail during crisis. The planning process for crisis management—and for developing a risk communication plan—requires (and bases success on) community participation, which requires time. An effective process for engaging local communities is taking a CCA to develop an emic understanding (Dutta, 2008).

A CULTURE-CENTERED APPROACH

The CCA is "value-centered and is built on the notion that the various ways of understanding and negotiating the meanings of health are embedded within cultural contexts and the values deeply connected with them" (Dutta, 2008, pp. 2–3). The approach foregrounds the voices of the community members for understanding the problems, priorities, and possible solutions. Dutta (2008) describes the CCA as an "approach to health communication which questions the constructions of culture in traditional health communication theories and applications, examines how the latter have systematically erased the cultural voices of marginalized communities in their constructions of health, and builds dialogic spaces for engaging with these voices" (Dutta, 2008, p. 4). CCA focuses on three elements: structure, agency, and culture—and the interactions between them.

By focusing on culture, agencies can learn the beliefs, values, and practices that influence the meaning of health as well as decisions about health, illness, and risk in a community. A local culture also reveals the structures that influence health choices, including available and limited resources, access to healthcare, and elements of the healthcare system. Of particular interest are the existing structures that maintain and reinforce power of some while simultaneously limiting community participation in health decisions for others. By including community members, particularly those who have previously been excluded, in dialog aimed at forming a cultural understanding, CCA shifts agency from a researcher-oriented perspective to the voices of community members (Dutta, 2008). Through the goal of cultural understanding, CCA offers an interactive, coconstructed process between team member/practitioner and local communities engaged in meaning-making focused on enacting social change.

Taking a CCA requires participation/engagement in unique ways that are specific to local communities. From this approach, team members must realize that a "cookie-cutter" mold will not work for every group of people. The process should start with conversations with community members to learn from the target population about perceptions, attitudes, and existing knowledge (e.g., of the lab, risk, benefits, etc.) before providing information. The team members should base the dialog on genuine concern for the local population and reveal an honest desire to understand practices, norms, and values from within the community—an emic perspective.

Ross and Castle Bell (2017) provide an example of focusing on a specific cultural complex with genuine concern by applying the CCA to their study focused on trans-patient-practitioner communication. The researchers focused on the coconstructed meaning created through narratives regarding lived experiences. By centering on participants' communication experiences, their data revealed advice for health providers and office protocols. During the COVID-19 pandemic, Sastry and Basu (2020) applied the CCA to discourse analysis. They "offer direct and practical ways in which we harness CCA concepts in the service of textual analysis of health discourses" (p. 3). In another application of CCA, Sastry and Dutta (2017) analyze the Ebola epidemic. They argue that "in this model, cultural meaning around health and disease are conceptualized as being dialectically related to structures, or the institutional framework around which health is organized; epidemics thereby attributed to a complex interplay between culture and political economic factors" (p. 11). They go on to say that "CCA provides a broad heuristic framework to conceptualize how communication perspectives can contribute to infectious disease outbreaks" (p. 14) and call for future research to address various questions regarding infectious epidemics, specifically mentioning the "inequities in the flow of disease response" (p. 10). Addressing the complexity of these situations necessitates a complexity-informed way of thinking.

COMMUNICATION COMPLEX

When utilizing a CCA, communication complex (CC) provides an impactful framework for understanding and improving communication practices. CC has two fundamental principles: (1) everything is systemic and (2) communication is bioactive (Parrish-Sprowl, 2012, 2014). Understanding everything is systemic is a way to address One Health's call to shift from a linear approach. Focusing on the bioactive nature of communication can allow for improved trust, relationship building, connection, empowerment, and so on between team and community members. Without spending too much time on the bioactive nature of communication, we at least mention that research demonstrates that we are able to change each other's biology through our interpersonal interactions (e.g., Ayling et al., 2018; Hasson et al., 2012; Ivey & Daniels, 2016; Parrish-Sprowl, 2017; Rakel et al., 2011; Ramachandran, 2011). With this in mind, team members would impact the community members while simultaneously being impacted by the community members. The reflexive relationship can positively impact the understanding of all members as well as improve previously constructed neural pathways by rewiring (changing) existing pathways that may have negative implications from previous experiences. The potential for communication to improve relationships through biology may also have systemic effects on team and community members (Parrish-Sprowl et al., 2020). Since we know trust is important and we develop and enhance trust through interpersonal interactions, establishing relationships between team and community members should be at the core of any communication plan—along with understanding the relationships as reflexive.

COMMUNITY ENGAGEMENT

Interpersonal interactions can improve engagement from community members. Four ways communication impacts engagement include: understanding, preparation, management, and empowerment. Understanding is the fundamental goal of communication that identifies the significant role of connecting with stakeholders to learn about perceptions, concerns and beliefs, knowledge, and practices. Understanding influences preparation and management of rumors, misinformation, and other communication challenges (e.g., conspiracy theories). Through communication, trust, and confidence can build and lead to informed decision-making for both team and community members, resulting in empowerment.

Interactions with community members should inform the construction of risk communication plans. According to WHO guidelines (WHOa, 2022), a risk communication plan should include the following: plan in advance, build trust, engage communities, use multiple channels, and monitor, evaluate, and adjust. Although each part is listed separately, it is important to remember the systemic nature of communication, which helps to understand the impact of each part on the other as well as the continuous effect on the plan. For example, planning in advance may include evaluating the available channels while engaging communities should be on-going, and constant monitoring occurs throughout building trust and planning. This systemic approach may begin to address the call suggested by Queenan et al. (2017) for a shift in One Health to include a systemic, transdisciplinary approach.

PROACTIVE COMMUNICATION PLANS

Decisions regarding a crisis communication plan should be influenced by an understanding of communication as an ongoing process with stakeholders. Keeping in mind the complex nature of communication, developing a communication plan is necessary for situations where risk is a concern and before a crisis occurs. In this planning, there are six areas of communication that require planning: internal communication, spokesperson/representative, media relations, community building, education, and information sharing (du Pre' & Overton, 2021). Like risk communication planning, these areas overlap and influence each other; they are discussed individually here for description only. The aim of internal communication is to determine what constitutes a crisis; who to contact; and what are first signs. Designating a spokesperson creates a representative of the team during crisis who will share information through agreed upon channels. The representative may be the face of the organization during crisis, but efforts made to build good relationships with media professionals before crisis is also a valuable part of the plan to share information. Relationship building also relates to gatekeepers and involved community members before the crisis; building these relationships with sincerity and genuine care creates a foundation of trust and understanding so that during crisis these members can be points of contact for sharing information. Information sharing within the organization should also be a point of education before a crisis on how to handle a crisis and how to gain information during one. This process should also include verifying and updating information before sharing. Completing these elements of planning proactively with the local community members creates a strong foundation *of* communication and *for* communication during heightened states of risk.

CONCLUSION

BSL-4 laboratories conducting research on zoonotic diseases will be on the frontlines of future public health emergencies. Any National Biodefense Strategy incorporating a One Health approach will need to take into account how to integrate the work of these labs with other key stakeholders at the local level such as farmers, veterinarians, and public health officials. With the considerable dis/misinformation spread on-line in the wake of the COVID-19 pandemic, such collaborations are imperative not only to account for the interconnectedness between human health, animal health, and the changing environment, but also to promote higher levels of trust in the work conducted by these labs. Public health preparedness is a national priority, but these labs must coexist with cities and towns. One Health is a foundation for understanding how the interests of community members are actually aligned with the laboratories through collaborative activities and culture-centered communication.

A key area in which stakeholders can collaborate more closely with BSL-4 labs is disease surveillance. Participating in the collection of data for monitoring diseases and for use in laboratory research can help to build trust not only among participating stakeholders but also among the general public who are more likely to trust information if it is produced by a community member like a local veterinarian. Confusion regarding scientific information and recommendations has stemmed in part from so many stakeholders feeling completely alienated from scientific research. Giving more citizens an opportunity for active participation can help to counter this.

However, participation in surveillance activities in and of itself will not be sufficient to counter the effect of dis/misinformation in the event of an accidental release or a new pandemic. Surveillance must be part of a coordinated risk and crisis communication strategy. The CCA should be employed to build trust in advance of an emergency so that if an event does occur messaging about how to respond will be heeded by the affected population. One Health provides a useful framework for helping diverse stakeholders to find common ground in terms of values and to bridge the gaps between different cultural contexts to reach a shared understanding of the risks and benefits posed by zoonotic research and how to respond to a zoonotic disease emergency.

ETHICS STATEMENT

The enclosed manuscript is an original synthesis of information from academic literature and other publicly available sources. The authors have appropriately cited the work of all authors whose work shaped the direction of the manuscript. The manuscript is inspired by the authors' interest in the subject matter and the authors have no conflict of interest. The authors received no funding for the production of the manuscript. All of the authors provided substantial contributions to the manuscript.

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COMMENTARY

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Restoring sight, but short-sighted? Ethical considerations in global cataract missions

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INTRODUCTION

One billion individuals worldwide suffer from preventable vision impairment and this burden is most heavily borne by individuals in low- and middle-income countries (LMIC) (World Health Organization, 2019). Cataract-related blindness accounts for 33%–48% of blindness worldwide despite its ability to be corrected surgically. In many high-income countries (HIC), rates of cataract surgery range from 4000 to 10,000 per 1 million residents/year whereas in some LMIC, less than 500 cataract surgeries may take place per 1 million residents/year (Wang et al., 2016). Cataract surgery is a relatively simple operation requiring only topical anesthesia, has little risk of serious postoperative complications, and has a short rehabilitation period with vision often stabilizing within 1 month (Liu et al., 2017).

Various cataract removal methods exist and are utilized in varying degrees in different parts of the world. Phacoemulsification (PE) is more commonly used in HIC where an ophthalmologist uses ultrasound waves to degrade the lens and replace it with an artificial lens. In LMIC, a technique called manual suture-less small-incision extracapsular cataract surgery (SICS) has gained popularity because it requires less advanced technology, is less expensive, and quicker than PE while having similar outcomes. This is an attractive option for LMIC physicians beset by high patient-to-provider ratios and less advanced technology (Ruit et al., 2007; Venkatesh et al., 2010). While SICS is a mainstay in LMIC, it is variably taught to trainees in the United States. One survey of ophthalmology training programs found that 67% of programs offered SICS training (Zafar et al., 2019). Training may include wet-lab experiences and simulations such as the *HelpMeSee* simulator (Bernhisel & Pettey, 2020; Ramani et al., 2018). The SICS Sim-OSSCAR rubric was designed to assess the ability of trainees to perform SICS in a simulated environment (Dean et al., 2019).

As life-expectancy around the world continues to rise, cataract-related blindness will only be exacerbated in LMIC that lack the resources to combat this disease. One common solution to address global health disparities is short-term medical missions that send physicians from HIC to LMIC for short periods of time (Melby et al., 2016). Cataract missions are often conducted via outreach eye camps that have been shown to have favorable outcomes and are a reproducible model (McMaster & Clare, 2021; Nowak & Grzybowski, 2013). The ability of cataract surgery to restore sight via a relatively quick and safe procedure makes it an attractive (and seemingly uncontroversial) option for physicians trying to improve health on a global scale. The purpose of this paper is to explore the complex ethical issues inherent to cataract missions, across a range of global contexts, and thereby contribute to the discussion of the responsible conduct of these missions.

GENERAL CONSIDERATIONS

When conducting cataract missions, there are several general principles that should be followed regardless of the location of the mission. The American Academy of Ophthalmology (AAO) published an ethical framework for ophthalmologists conducting global ophthalmology in LMIC (American Academy of Opthalmology, 2020). This framework emphasizes crucial points such as ensuring physician and trainee competency and culturally translated informed consent. However, it does not robustly engage with ethical discussions about global medical missions that have taken place for the last two decades. For this reason, this framework only has a partial grasp of the specific ethical issues that can arise when conducting global ophthalmology initiatives. For example, while the AAO laudably emphasizes culturally sensitive communication between the patient and the physician, it does not situate the need for cultural humility within the context of social, economic, cultural, and power differences present when HIC conduct global surgical missions in LMIC.

Cultural humility has been defined as a "lifelong commitment to self-evaluation and self-critique, to redressing the power imbalances in the patient-physician dynamic, and to develop mutually beneficial and non-paternalistic clinical and advocacy partnerships with communities on behalf of individuals and defined populations" (Tervalon & Murray-García, 1998). Medical missions have often been described as neo-colonial due to assumptions of cultural superiority and a prioritization of Western medical paradigms and practices (Bauer, 2017; Mantey et al., 2021; Melby et al., 2016). When individuals move from HIC to LMIC, often from HIC with histories of colonialism, it is easy for these mindsets of superiority to manifest. For example, Ghanian medical professionals felt that visiting medical providers viewed themselves as superior, which in some cases prompted an end to partnerships (Mantey et al., 2021). This can be especially problematic when volunteers have not received pre-trip training regarding cultural humility and country-specific cultural practices that they may encounter (Martiniuk et al., 2012; Melby et al., 2016). Guiles et al. (2022) created a framework to assess four categories of learners participating in global health experiences based on their cultural humility and level of cultural engagement. This framework can help HIC physicians assess the status of their team predeparture so that training can be targeted towards areas of deficiency. This may decrease episodes of negative cross-cultural interactions that can damage relationships and outcomes (Guiles et al., 2022).

While the AAO emphasizes heavy supervision of trainees so they do not operate outside of their abilities, the fact that many of these missions operate outside of local health infrastructure and therefore little regulation leaves the door open for abuse in this way (American Academy of Opthalmology, 2020; Mantey et al., 2021). Even when supervision is present, lack of understanding of the host country by HIC physicians can lead to improper treatment by unreflectively importing Western medical concepts and assumptions. Examples include HIC physicians improperly calculating anesthesia risk due to unfamiliarity with the nutrition or disease status of patients in LMIC and stomach ulcers caused by HIC physicians who administered medication without a proper understanding of patients lack of food and water intake (Bauer, 2017). Additionally, the increase in international experiences for trainees may uncover questionable motivations, such as trainees' curiosity about 'exotic' diseases they may not encounter in their home-country. Ghanian doctors expressed frustration at visitors attempting to treat typhoid fever, something with which they had limited prior experience (Mantey et al., 2021). There also exists the possibility (and anecdotal evidence) that patients who are poor without alternatives for care are used as surgery practice for trainees (Martiniuk et al., 2012; Steyn & Edge, 2019). Patients living in poverty in these scenarios therefore may be (often less than intentionally) exploited by individuals from HIC in ways that echo past colonial practices.

A major critique of medical missions is the way in which they tend to prioritize the interests of HIC physicians rather than properly centering their efforts on the needs of local individuals (Bauer, 2017; Mantey et al., 2021). While cataract surgeons may reasonably assume that everyone with cataract-related blindness desires surgery, this is not always true. Studies have shown that even where cataract surgery is offered freely in LMIC, uptake of cataract surgery is not universal (Aboobaker & Courtright, 2016). Cultural considerations may play into this: women in some African countries were found to not seek out ophthalmic care at a similar rate as men due to society-specific gender roles and the perceived importance of preserving sight for men more so than for women (Aboobaker & Courtright, 2016; Razafinimpanana et al., 2012). Mistrust may exist in a region toward cataract surgery due to the continued use of an outdated method of cataract removal, couching, that has been shown to have high rates of poor outcomes. In areas such as Nigeria, this practice continues in rural areas by traditional healers and may contribute to widespread mistrust of the procedure (Gilbert et al., 2010). These factors create an important intersection of medical practice and culture that further supports cultural competency as an essential quality for individuals conducting cataract missions.

REGIONAL CONSIDERATIONS

While certain principles should be followed despite the location of cataract missions, the specific context of the host country can pose unique ethical challenges. Three categories could be thought of to capture a majority of LMIC where a high burden of cataract-related blindness exists: areas with lower levels of health infrastructure, those with health infrastructure inaccessible due to turmoil, and areas with higher levels of health infrastructure. While this is a simplification, and not all LMIC fit neatly into these categories, this categorization can help shed further light on the ethics of cataract missions conducted around the globe.

Areas with lower levels of health infrastructure

In areas with low levels of health infrastructure, cataract missions may provide the only opportunity for patients to receive treatment thus representing the solution to cataract-related blindness here (Nowak et al., 2009). Cataract missions can be ethically justified in these settings in terms of being a one-time, low-risk, low-cost intervention that significantly improves quality of life in settings where cataracts otherwise would go unoperated. One argument is that life-threatening problems such as food access and emergent medical care should take priority over ophthalmic disease. However, cataract surgery has the advantage of being a single procedure that can remove a significant barrier whereas persistent needs such as food access or long-term medical care require sustained intervention. Despite this overall potential for benefit, ethical challenges inherent to missions conducted in these regions still exist and should be mitigated.

Ophthalmologists entering these regions may especially find themselves in situations where they are performing surgery in circumstances they are not accustomed to. Outside of standard procedural and sterilization equipment, biometry which is often used in HIC to improve outcomes may be unavailable in LMIC (Liu et al., 2017; Nowak & Grzybowski, 2013). Perhaps the most significant barrier is the reliance on SICS as a procedure over PE (Ruit et al., 2007; Venkatesh et al., 2010). SICS is a proven alternative to PE in LMIC and has been shown to be able to be taught to experienced ophthalmologists from HIC who have not received prior training in this procedure (Signes-Soler et al., 2016). While these findings are encouraging, HIC ophthalmologists can avoid potential a learning curve by adequate pre-trip SICS training through wet-lab experiences, incorporation of SICS into global health residency training courses, and simulation experiences. One study found that SICS complication rates declined below 2% once trainees completed around 200 procedures (Gupta et al., 2018). Ensuring competency of HIC physicians before operating on host country individuals via assessment tools like the SICS Sim-OSSCAR can ensure that patients are receiving quality care. A temptation may be importing equipment and technology to provide HIC physicians with familiar operating conditions. This would risk perpetuating cultural superiority by claiming HIC medical knowledge and standards of care are superior to those used in LMIC despite proof of similar outcomes with SICS. It also risks being of negligible benefit if the target area does not have the logistical capacity to facilitate equipment use and maintenance, in addition to increasing the already high cost associated with these trips (Compton et al., 2018).

Due to the rural nature and poverty of these regions, there may be greater language, cultural, and technological barriers that may not be present to the same degree elsewhere. Ophthalmologists should ensure that their trips are accompanied by local professionals who can adequately translate the language and cultural norms to ensure patient safety and autonomy (American Academy of Opthalmology, 2020; Martiniuk et al., 2012; Steyn & Edge, 2019). HIC physicians should partner with organizations that already exist in these regions—including local professionals, NGOs, or governments—that already coordinate and deliver medical care. The West African College of Surgeons and College of Surgeons of East, Central, and South Africa are examples of groups that coordinate surgical care and could be involved in planning new projects (Grimes et al., 2013). Partnering with a local organization provides access to local knowledge of community needs and resources which is an otherwise difficult task for HIC physicians new to an area. This also creates an opportunity for sustained partnership with a region with the possibility of regular return trips (Suchdev et al., 2007). An important aspect of a local partnership is the opportunity to receive feedback about successes and failures so that future missions can be subject to continuous improvement (Guiles et al., 2022; Roberts et al., 2022).

Despite cataract missions filling an otherwise unoccupied medical niche in these regions, a permanent occupancy of this niche by foreign aid may hinder the development of local ophthalmologic infrastructure. Undue reliance on foreign aid has been heavily criticized due to its likelihood of perpetuating inequitable power dynamics between HIC and LMIC and removing an opportunity for a country's capacity to develop (Bauer, 2017; Melby et al., 2016). For example, consistent healthcare aid to a region in Guatemala disincentivized the government to invest in the healthcare of that region (Green et al., 2009). Continual influx of free medical care has been described as creating a parallel healthcare system, where local patients may come to prefer the foreign provision of care because of cost and perceived superiority of HIC physicians (Faktor et al., 2023; Mantey et al., 2021). If local services are devalued, local health professionals may seek livelihoods elsewhere, exacerbating problems of “brain drain” and depleting a country's existing infrastructure. This can create a spiral of increasing dependence on foreign aid (Faktor et al., 2023). In addition, while a country may have a high burden of unoperated cataracts and an overall low health infrastructure, regions within a country are not homogenous. One Guatemalan doctor expressed frustration that visiting teams were serving patients that could have been seen at his practice, when they could have been better deployed to help those in rural and hard to reach places (Green et al., 2009). These diverse and related challenges underline the importance of coordination with local professionals and organizations. Cataract missions may be the most ethically justifiable in regions with low health infrastructure where building long-term ophthalmologic capacity may not be reasonable given poverty and geopolitical instability. However, HIC physicians should try to meet unmet needs while not crowding out the long-term goal of local institutions taking responsibility for meeting the ophthalmological needs of their own communities.

Areas with temporary need

Some regions have a baseline level of health infrastructure but access is limited during periods of turmoil. Cataract missions from HIC to these regions can provide a much-needed stop-gap measure that ensures a continuity of medical care. Additionally, individuals entering areas of turmoil and potential danger to provide for vulnerable communities display laudable qualities of self-sacrifice and compassion. Missions to these regions that require only temporary need may also avoid a common critique that short-term medical missions only apply a short-term fix on immediate needs while ignoring systemic problems that created the crisis in the first place (Bauer, 2017; Martiniuk et al., 2012). While these characteristics help justify cataract missions here, the problem of transitioning from temporary foreign aid back to local infrastructure poses unique ethical challenges.

Governments and organizations that existed before the turmoil may be unprepared for an abrupt departure of aid groups. The “cut and run” method of ending a trip has been criticized for abrupt transitions and poor coordination that leaves host countries unprepared for the continuation of care. When a medical NGO pulled out of Liberia, a vacuum of medical care was created, leaving patients unable to receive their needed follow-ups and the government unprepared to quickly step in (Lee & Ozerdem, 2015). Hunt and Miao (2018) provide a template for an ethical exit strategy for aid groups which emphasizes five key components: transparency for reasons that a mission is ending, predictability with timing and what the host country should expect, participation of the host country in the planning and transition, adaptability to adjust for unpredictable consequences, and evaluation of the effectiveness of the exit. An essential component of this framework is involvement of the host country in the process (Hunt & Miao, 2018). The host country participating in the transition planning and execution helps ensure the inclusion of the perspective of those with the highest stake in the transition outcome.

This scenario also poses the risk of creating dependence on foreign aid if local professionals and organizations that existed before the conflict find their niches occupied by foreign aid groups that have not left or if aid is not tailored to a changing post-conflict environment. Local authorities in Timor-Leste in the 2000s dictated the terms of foreign ophthalmologic aid during a period of turmoil by requesting cataract surgeons initially resolve patient backlogs but then transitioning to funding, training of local staff, and the creation of their own training programs (Wing et al., 2018). The host country dictating the terms of incoming aid allowed HIC physicians to be utilized to the most long-term benefit of the host country. Despite well-meaning intentions of HIC physicians, continual influx of ophthalmologists into Timor-Leste with the sole intent of performing surgery themselves could have preempted the training of local professionals and limited the ability for

Timor-Leste to establish its own infrastructure. Despite the good of providing a stop-gap measure for ophthalmologic care, HIC physicians should conduct cataract missions in periods of turmoil with a focus on the eventual transition back to local infrastructure under terms dictated by the host country.

Areas with higher levels of health infrastructure

In regions that have ophthalmic infrastructure, cataract missions should aim to augment the ophthalmologic infrastructure that already exists; missions focused solely on performing cataract surgery may help remove a backlog of patients but may be inappropriate overall. An influx of free medical care from HIC may harm the existing health infrastructure. Studies have shown that LMIC individuals favor physicians from HIC despite equal expertise of the local physicians (Mantey et al., 2021). LMIC individuals may be incentivized to wait for free care opportunities from international teams, removing business and training opportunities for LMIC physicians (Bauer, 2017; Wall, 2014). Additionally, the high costs of medical missions have been critiqued based on the potential medical supplies a trip's funding could purchase, i.e, purchasing advanced biometry equipment for LMIC as opposed to transporting ophthalmologists and equipment for a short period of time (Bauer, 2017; Mantey et al., 2021; Martiniuk et al., 2012). Donated medical equipment can be costly or a long-term burden on host countries when required training for equipment use is not provided, equipment requires expensive repairs, and equipment is not compatible with host country systems (Compton et al., 2018). One review found that 60%–82.5% of local engineers received no training on donated medical equipment (Marks et al., 2019). When equipment is donated, HIC should ensure proper training of the host country in use of the equipment and ability to use the equipment long-term.

Regions that possess ophthalmic infrastructure present an opportunity to restructure aid relationships between HIC and LMIC from the historical pattern of unidirectional movement from HIC to LMIC to long-term reciprocal partnerships (Melby et al., 2016). As individuals from HIC benefit from global experiences in LMIC, HIC should invite individuals from LMIC to HIC for training and global experiences as well to ensure equal partnership in relationships that historically have been unequal. One systematic review of surgical exchange partnerships found only 1 of 18 published reports documented a bidirectional exchange of learners (Greive-Price et al., 2020). This exchange of trainees was perceived as beneficial by both the HIC and LMIC faculty and trainees. However, they found that the burden of cost was more heavily borne by the LMIC trainees (Baird et al., 2016). HIC partners should be prepared to help minimize financial cost of traveling LMIC physicians to provide equitable opportunity for these experiences. While global experiences can have a positive effect on HIC physicians, a focus should be on capacity-strengthening efforts that train local professionals as well as provide educational support for host country institutions that are beginning to educate their own population (Melby et al., 2016; Wing et al., 2018). Only 2 of the 18 reports of surgical exchange partnerships mentioned educating LMIC professionals whereas 13 of the 18 discussed the education and benefit to the visiting HIC trainees (Greive-Price et al., 2020).

One reported concern about bidirectional exchanges is the potential to exacerbate brain-drain via encouraging LMIC trained physicians to leave their home country after their training. However, four studies found that nearly all LMIC physicians returned to practice in their home country after experiences in HIC indicating that this may be a more theoretical concern (Greive-Price et al., 2020). Between periods of travel, ways to continue capacity building include collaborating in research with an intentional emphasis on LMIC trainees and physicians leading projects as opposed to only HIC physicians (Faure et al., 2021; Ozgediz et al., 2008). Teleconferencing of cases and courses with HIC and LMIC learners has been shown to be effective and can help sustain relationships between individuals and institutions (Hadley & Mars, 2008). Hosting LMIC physicians for education and training should also occur just as unidirectional movement of HIC has been the historical norm. For example, a visiting Ugandan physician was able to use information gained from learning from HIC physicians at a trauma center to augment their trauma response systems (Ozgediz et al., 2008). Most importantly, however, is listening to and prioritizing the needs of LMIC partners so that support and partnership truly provides what LMIC partners need. Such an approach can help to rewrite relationships that have traditionally been dictated by the needs of HIC.

This change in perspective—from beneficent expert to equal partner—will require sacrificial investment in time and financial resources to equitably prioritize educational and medical needs of LMIC partners. While there may be a role occasionally for foreign ophthalmologists to help remove patient backlogs in regions with ophthalmic infrastructure and there is clearly a benefit for HIC trainees to participate in surgical exchanges, the primary goal of ophthalmologists entering these areas should be to play a supportive and capacity-strengthening role as opposed to simply providing free medical care.

CONCLUSION

The efforts and intentions of HIC physicians conducting cataract missions are laudable and their work has made positive contributions to global efforts in restoring sight. While these missions deliver an obvious good for people with unmet needs, a critical focus on ethical issues surrounding them can augment their impact. Specific actions by HIC physicians to mitigate ethical concerns include pretrip training in cultural humility and SICS training. HIC physicians interested in performing cataract surgery should target their efforts to areas of low health infrastructure or in places of turmoil, though attention should be paid in these regions to the effect of such programs on the development of or transition back to a country's own ophthalmologic infrastructure. HIC physicians seeking longer term relationships with a focus on augmenting existing capacity should use trips to areas with high health infrastructure to strengthen capacity instead of focusing on performing cataract surgery. A cross-cutting theme for all these contexts is collaboration and prioritization of the host country's needs. Listening to and trusting the voices of LMIC professionals in the planning and execution of these trips can help reduce problems that arise from well-meaning intentions which can harm host countries on individual and systems-wide levels. This work attempts to provide a starting point for a discussion of problems and potential solutions existing in the current state of cataract missions though it is recognized that many problems are without easy solutions and ideal solutions may be difficult to implement. The perspectives of eye care experts, patients, and communities from LMIC are needed in this discussion to help direct the future direction of global cataract missions.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS STATEMENT

This manuscript is the authors' own original work and is not submitted for publication elsewhere.

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RETRACTION

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RETRACTION: Nosological approaches in studying the incidence rate among dental healthcare workers

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The above article, published online on 15 April 2024, in Wiley Online Library (http://onlinelibrary.wiley.com), has been retracted by agreement between the journal Editor in Chief, Daniel Skinner, the Policy Studies Organization, and Wiley Periodicals LLC. A third party notified the journal of concerns regarding numerous misreported and irrelevant citations in the above article. In coordination with the editors, the publisher contacted the authors regarding the concerns and the authors provided a response. Further investigation found that several citations were not relevant to the study and that data were often misreported from those cited articles. The authors did not provide a compelling reason for inclusion of a majority of the erroneous citations. The editors have determined that the misreported data fundamentally compromise the conclusions of the article. Therefore, the article must be retracted. The authors disagree with the retraction.

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RESEARCH ARTICLE

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Nosological approaches in studying the incidence rate among dental healthcare workers

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Abstract

This paper is aimed at a comprehensive study of the incidence of dentists in the Turkestan region of the Republic of Kazakhstan using the screening study method. The study included 200 dentists from 12 outpatient clinics in Shymkent city, Turkestan region (South Kazakhstan). Data on visits to doctors in the period from 2015 to 2022 were used to investigate the incidence. The average long-term value of morbidity coefficients among the studied medical workers was 995.9 ± 9.9 cases per 1000 people over 7 years. The analysis of the structure of diseases was carried out based on information obtained from sick leave records of the study group of dentists for the period from 2015 to 2022. The dental profession has its own characteristics; the unfavorable factors identified during the study can be divided into three groups: factors related to the treatment process; factors related to the organization of premises in dental clinics; factors related to insufficient ergonomics of dental equipment and instruments; and the quality of filling and dental materials. Six of the same classes of diseases play a leading role in the structure of diseases identified during medical examinations, but their significance is different: in the first place are diseases associated with increased psychological stress (circulatory disorders, psychoneuroses, diseases of the digestive system), diseases associated with forced working position (musculoskeletal diseases).

KEYWORDS

occupational health, physical and chemical factors, professional activities, psychological stressors, temporary incapacity for work

INTRODUCTION

Medical professionals, such as physicians, nurses, and dentists, commonly experience occupational illnesses. Studies indicate that healthcare workers have higher rates of certain diseases compared to the general population due to various occupational hazards they face in their daily practice. Dentists face a high risk of developing occupational diseases due to workplace hazards. Prolonged static postures, repetitive motions, and exposure to infections increase the likelihood of musculoskeletal disorders, respiratory illnesses, and allergies. Mental health issues are also a concern due to emotional strain, long hours, and circadian disruption (Duzhych et al., 2023; Spytska, 2023). Despite these risks, many dentists do not seek medical help or report occupational diseases. This susceptibility can be attributed to several reasons, including a lack of awareness, self-diagnosis, difficulty taking time off, concerns about reputation, insufficient reporting systems, reluctance to relate illnesses to work, fear of discrimination, and a lack of employer support. Dentists are susceptible to both physical and psychological occupational diseases due to postural, infectious, and emotional stresses in their work (Romash et al., 2022). However, healthcare providers from vulnerable groups may face personal and systemic barriers that prevent them from accessing care and reporting work-related health issues. To facilitate the early diagnosis and treatment of occupational diseases, it is necessary to provide better education, resources, policies, and support systems.

Dental assistants have a crucial role in promoting the wellbeing of dentists by optimizing procedure ergonomics, adhering to infection control protocols, sharing tasks, and managing some patient interactions (Ristic et al., 2019). This helps to mitigate occupational health hazards such as poor posture, repetitive motion injuries, infectious exposures, and stress. Additionally, their involvement in clinic setup and sterilization is essential for maintaining a safe work environment. In addition to this, dentists can reduce their morbidity risks by engaging in regular exercise, using ergonomic equipment, participating in screening programmes for musculoskeletal disorders and mental health issues, and stretching daily (Usin et al., 2015). It is important to adopt a synergistic approach that combines self-care and team-based prevention efforts with dental assistants to prolong the careers and enhance the overall health of dentists.

According to Davydov et al. (2019), dentists belong to the category of medical workers with a high incidence of diseases. Various studies confirm the negative impact of several factors of the working environment on the health of dentists. Smagul et al. (2020) identified among the most significant factors influencing the occurrence and development of occupational diseases in dentists the following: the presence of industrial dust; physical factors such as vibration and noise; chemical factors, including acute and chronic intoxication; overload of individual organs and systems; the presence of bacterial aerosols in the working environment. Malsam and Nienhaus (2021) revealed in their study that most dentists (87%) do not seek medical help for the disease at all or do it rarely, which significantly distorts the incidence statistics, leading to its underestimation. Studies show that the nature and level of morbidity in the Republic of Kazakhstan also largely depend on the specialization of dentists (Kasabekova et al., 2020; Ohlendorf et al., 2020; Ospanova et al., 2021; Ruzuddinov et al., 2022). For example, orthodontists are engaged in bite correction and alignment of teeth, which can affect the prevention and treatment of various dental problems. Dental surgeons specialize in performing operations such as tooth extraction or dental implantation. This can be important when assessing risks and preventing complications. Increasing the level of knowledge and skills of dentists of different specializations will help reduce the incidence and improve the quality of dental care in Kazakhstan.

Among dentists and orthopedists, there is a higher prevalence of almost all types of diseases compared to surgeons. However, the most common changes in the cervical spine and related diseases are observed in surgeons. Ear and eye diseases are not observed in surgeons, while dentists and orthopedists have them in 10%–15% of cases. The importance of the working environment for morbidity among dentists is confirmed by a significant dependence on work experience. Thus, according to Osiewicz et al. (2020), 55% of dentists with up to 15 years of experience have cervical spine osteochondrosis, as well as 75% of dentists with 16 to 26 years of experience and 95% of dentists with more than 26 years of experience. Analysis of the world literature data shows that neurotic disorders are the most common in the structure of general morbidity among dentists, accounting for 21.5%, digestive system disorders are in the 2nd place (18.1%), and cardiovascular system diseases are in the 3rd place (17%).

Singer et al. (2019) reported that diseases of the musculoskeletal system and connective tissue occupy fourth place in the structure of morbidity, amounting to 14.5%. According to Ermukhanova et al. (2010), in cases of temporary incapacity for the work of dentists, seven classes of diseases out of 17 make up 92% of the total morbidity structure. These classes include respiratory system disorders (1st place), circulatory disorders (2nd place), digestive system disorders (3rd place), and musculoskeletal diseases (4th place). In the structure of occupational diseases in dentists, allergic dermatitis is in the 1st place (22.6%), dermatitis is in the 2nd place (17.4%), and professional eczema is in the 3rd place (12%). Most of these diseases have a chronic form (94.7%), while acute forms account for only 5.3% due to delays in receiving medical care. According to the data presented by the Department of Internal Diseases of the Faculty of Dentistry of the University of Amsterdam, allergic reactions are one of the most common adverse health changes observed in dentists (Larese Filon et al., 2021). In recent years, the frequency of such reactions has increased from 48% to 57%. This raises serious concerns and requires further investigation of the causes and mechanisms of allergic reactions in this professional group.

Particular attention is paid to latex allergy, which, according to various sources, occurs in 8%–14% of dentists. This is conditioned by the frequent use of rubber gloves during dental procedures. Paradoxically, rubber gloves designed to protect medical personnel from blood-borne infections have themselves become the source of the disease. Latex most often causes allergic reactions in the form of dermatitis and eczema, less often—urticaria or non-cutaneous manifestations, such as rhinitis and conjunctivitis. However, dentists do not always consult specialists, which explains the insufficient study of these complications. This may be due to limited knowledge about the possible causes and symptoms of allergic reactions, or a lack of time and resources to contact specialists. To prevent allergic reactions in dentists, appropriate precautions should be taken, such as the use of alternative materials such as nitrile gloves, which are hypoallergenic. It is also important to train dentists to recognize the signs of an allergic reaction and know how to act in case of its occurrence. Closer interaction with specialists in allergology and immunology can also help in the prevention and treatment of allergic complications in dentists.

The main purpose of this study is to conduct a comprehensive investigation of morbidity among dental professionals by conducting a screening study in the Turkestan region of the Republic of Kazakhstan. The main objectives are: (1) to analyse the overall dynamics of morbidity and temporary disability among dentists over the period from 2015 to 2022 based on medical records; (2) to study the structure of diseases causing temporary disability; (3) to assess the prevalence of diseases detected during medical examinations of dentists. The results of the analysis will help identify the major factors influencing morbidity in dental professionals and develop recommendations for improving their working conditions and health.

MATERIALS AND METHODS

The study data were collected and analysed using standard methods of statistical data processing, such as the calculation of averages and standard deviations. All participants were dental health professionals. The study analysed a wide range of medical documents, including patient sick lists, records of doctor visits, and data on the incidence of dentists. Sick lists provided information about the causes of hospitalizations of patients, diagnoses, treatment, and prognoses of their diseases. These data were useful for determining the most common diseases and trends in the health of the population. Records of doctors' visits provided information about the frequency and reasons for patients' visits to medical specialists.

To collect data on the incidence of dentists, medical documents such as sick lists and records of doctor visits were used. These data were processed and analysed using statistical methods. The initial data processing was carried out, including the calculation of the main characteristics of the data, such as the mean, median, standard deviation, and quantiles. These indicators provide insight into the distribution of morbidity and identify major trends. Methods of inferential statistics were applied to obtain conclusions about the population of dentists based on a sample of medical documents. These methods include calculating confidence intervals, conducting hypothesis tests, and evaluating the significance of the results obtained. To classify the adverse factors identified during the study, they were divided into three groups: factors related to the treatment process; factors related to the organization of premises in dental clinics; factors related to the insufficient ergonomics of dental equipment and instruments, and the quality of filling and dental materials.

Data on the incidence of dentists from 2015 to 2022 provided an opportunity to study diseases related to the professional activities of dentists. This allowed assessing the risk of developing such diseases and identifying factors contributing to their occurrence. Such information was useful for developing recommendations for improving the working conditions of dentists and preventing occupational diseases. The choice of data and research methods was substantiated by the need for a comprehensive study of the incidence of dentists in this region and the determination of risk factors associated with their professional activities. The screening study method provided a general picture of morbidity, and the analysis of the structure of diseases allowed identifying the most significant classes of diseases. This allows the authors to propose recommendations for improving the working conditions of dentists and reducing the risk of diseases in this profession.

RESULTS AND DISCUSSION

The study involved 200 dentists from 12 outpatient clinics located in the city of Shymkent, Turkestan region (South Kazakhstan). The analysis of morbidity was carried out based on doctor visits for the period from 2015 to 2022. The average long-term value of the morbidity rate in the considered group of medical workers engaged in dental care was 995.9 ± 9.9 per 1000 people for 7 years. Changes in this indicator, shown in Figure 1, show that despite a slight decrease in the number of visits to medical and preventive health care (MPHC) facilities in 2018, the incidence rate in the group of dentists stayed virtually unchanged in the following years and remained close to the long-term average.

The analysis of morbidity considering temporary incapacity for work was carried out for the same group of medical specialists and for the same period (2015–2022). Table 1 presents data on the level of morbidity, considering temporary incapacity for work. The observations complement the existing literature and add new aspects to the understanding of this problem.

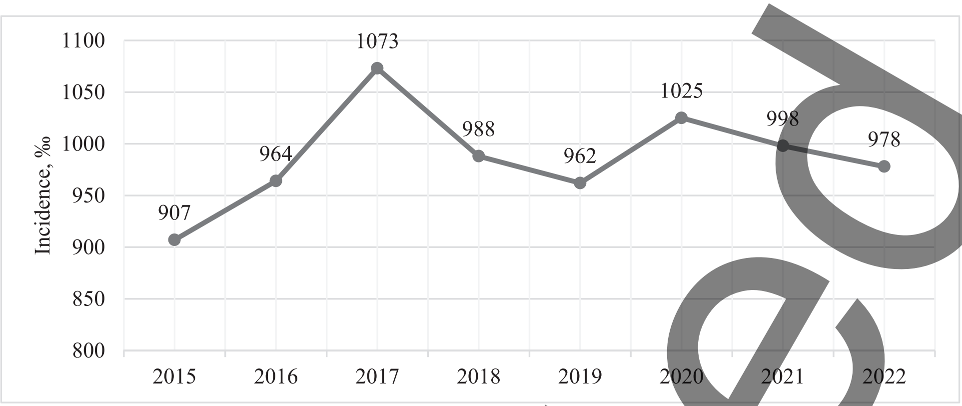

FIGURE 1 Dynamics of morbidity among dentists (2015–2022). *Source*: developed by the authors.

TABLE 1 Diseases with temporary incapacity for work among the studied population of dentists (2015–2022).

Years	Morbidity rate per 100 specialists		Average duration of one case of incapacity
	Cases	Days	
2015	90.12	1199.19	14.1
2016	91.9	979.16	11.1
2017	105.12	1261.46	11.9
2018	91.03	1096.46	13.1
2019	89.12	1126.74	11.9
2020	101.2	1234.22	13.2
2022	98.60	1279.21	11.2
Average for 2015–2022	94.02 ± 0.95	1182.2 ± 37.1	12.4 ± 0.4

Source: developed by the authors.

The presented data reflect the unfavorable trend of morbidity with temporary incapacity for work in the studied group: in accordance with the existing classification of morbidity with temporary incapacity, the morbidity rate per 100 medical specialists should be assessed as moderate and above a moderate level. The significant coincidence of fluctuations in morbidity associated with doctor visits and morbidity with temporary incapacity for work in different periods confirms the similarity of indicators calculated for 100 doctors. These results confirm the previously put forward hypothesis that medical personnel seek medical help primarily to obtain sick leave. The data obtained allow analysing the structure of morbidity, considering one of the options: doctor visits or temporary incapacity for work (Figure 2). At the same time, it can be stated that chronic diseases, if they are present in the studied group, are not reflected in the incidence determined either based on doctor visits or according to data on temporary incapacity for work.

Based on the information obtained from the sick lists, the analysis of the structure of diseases in the group of dentists during a 4-year period (2015–2022) was carried out. It was found that diseases belonging to 16 different classes according to the International Classification of Diseases (ICD-10) were reported during the period. Table 2 shows the average structure of diseases with temporary incapacity for work in medical professionals, including diseases by class.

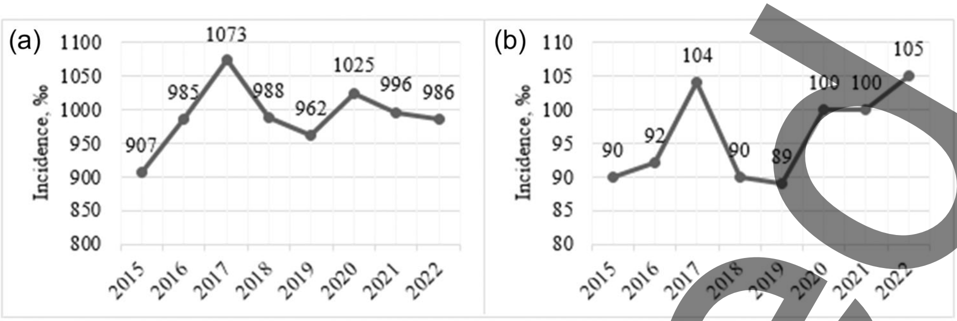

FIGURE 2 Comparative analysis of the level of morbidity in dentists (2015-2022). (a) In terms of appealability; (b) with temporary loss of working capacity for work. *Source*: developed by the authors.

TABLE 2 Structure and frequency of morbidity with temporary incapacity for work by individual classes of diseases (2015–2022).

Disease	ICD-10	Share, %	Number per 100 specialists
Infectious and parasitic diseases	1	0.2	0.17 ± 0.03
Neoplasms	2	0.4	0.14 ± 0.05
Endocrinological, nutritional, and metabolic diseases	3	1.3	1.01 ± 0.06
Diseases of the blood and blood-forming organs	4	0.3	0.25 ± 0.08
Psychiatric diseases	5	3.5	3.37 ± 0.2
Nervous system diseases	6	0.7	1.59 ± 0.1
Diseases of the eye and appendages	7	0.7	1.78 ± 0.2
Diseases of the ear and mastoid process	8	0.6	1.16 ± 0.1
Cardiovascular system diseases	9	11.5	11.26 ± 0.8
Respiratory system diseases	10	52.7	50.73 ± 3.7
Digestive system diseases	11	6.6	6.34 ± 0.5
Genitourinary system diseases	12	3.4	2.88 ± 0.3
Complications during pregnancy and the postpartum period	13	0.9	0.22 ± 0.07
Skin and subcutaneous tissue diseases		1.3	1.51 ± 0.09
Musculoskeletal system and connective tissue diseases		13	11.78 ± 0.9
Accidents, poisoning, injuries		2.9	2.28 ± 0.3
Total		100	96.3

Source: developed by the authors.

As a result of the analysis, the data presented in Table 2 indicate that the most common forms of pathology are respiratory diseases, and in fact, the incidence of these diseases was the highest—50.73 cases per 100 specialists. In the structure of diseases and in terms of morbidity, musculoskeletal system diseases are in the 2nd place—13% and 11.78% per 100 specialists, respectively. Circulatory system diseases occupy the 3rd place (11.5% and 11.26 cases per 100 specialists). Digestive system diseases occupy 4th place (6.6% and 6.34 cases per 100 specialists), mental disorders (psychoneuroses) occupy 5th place (3.44% and 3.37 cases per 100 specialists), and genitourinary system diseases occupy 6th place (3.4% and 2.88 cases per 100 specialists). These classes of diseases account for 91.1% of the total number of registered diseases. Among cases of temporary incapacity associated with respiratory diseases, the highest incidence is observed in acute respiratory diseases and acute respiratory viral infections (e.g., influenza) (67.3%), followed by acute angina, bronchitis, and bronchiolitis (16.9%). Pneumonia often causes temporary incapacity for work in dentists—7.1% of cases and 14.9 days of disablement. Notably, acute forms of pneumonia are more common than chronic ones, but the proportion of chronic pneumonia in the structure of respiratory diseases is significant. Among the musculoskeletal system diseases, joint diseases are the most common, especially osteochondrosis, which accounts for 36.2% of the total number of cases (7.2 cases per 100 specialists). However, the greatest number of days of disablement is observed in sciatica (37.6 ± 0.09), which is 33.5% of the total number of days of disablement associated with musculoskeletal system diseases. The days of disablement due to osteochondrosis are 34.3 ± 0.05 days, which is 27.2% of the total indicator of diseases of the musculoskeletal system.

By analysing the incidence among dentists in the class of circulatory system diseases, it was found that the following diseases are the cause of temporary incapacity for work: coronary heart disease, autonomic disorders, hypertension, phlebitis and thrombophlebitis. In the structure of circulatory system diseases among dentists, vegetative disorders occupy a leading place—53.5% (7.51 ± 0.9 cases per 100 specialists). Thrombophlebitis is in the 2nd place (19.1% or 2.5 ± 0.1 cases), followed by hypertension and ischemic disease (16.2% and 13.4% or 2 ± 0.09 and 1.8 ± 0.08 cases per 100 specialists, respectively). However, the greatest number of days is observed in hypertension (56.12 ± 5.1 days), thrombophlebitis (35.1 ± 3.5 days), and coronary heart disease (27.2 ± 2.8 days) per 100 specialists, which is respectively 43.5%, 27.1%, and 21.1% of the total number of days of disability associated with diseases of the cardiovascular system. Notably, this structure of morbidity with temporary incapacity for work is not typical for specialists, since the leading forms of pathologies among them revealed diseases of the musculoskeletal system and psychoneurosis, which are rarely included in the main classes of diseases. Notably, the percentage of respiratory diseases among dentists is high (53.4%). From the analysis of the nature of the incidence, it follows that it is largely associated with the hygienic aspects of the work of dentists, such as the prevailing working posture (standing), high psychological stress, and significant microbial contamination of the air in the breathing area of dentists. This is confirmed by the fact that there is an increase in the incidence of temporary incapacity due to work experience (Figure 3).

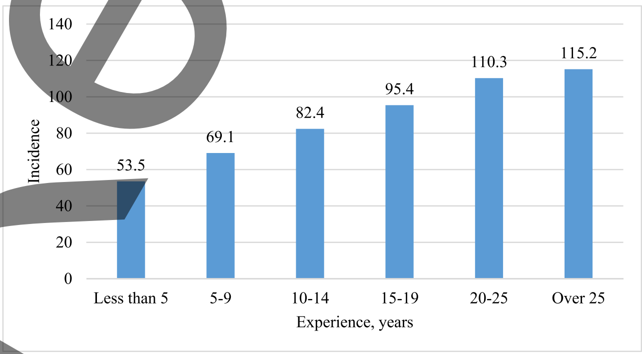

FIGURE 3 Morbidity with temporary loss of working capacity among dental specialists, based on work experience (per 100 specialists). *Source*: the authors.

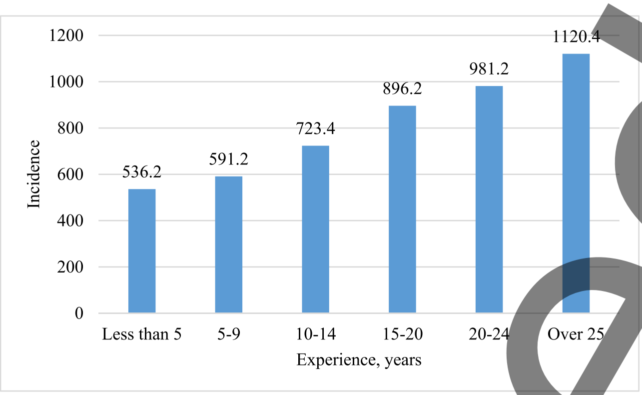

FIGURE 4 Number of days of inability to work among dental specialists, depending on the length of service (for 10 specialists). *Source*: the authors.

During the first 5 years of work, there was a morbidity rate with temporary incapacity for work in the amount of 53.5 cases per 100 specialists. Over time, this level increased and reached 115.2 cases per 100 specialists with a work experience of 25 years or more. The analysis showed a high positive relationship between these indicators, which was confirmed by the calculation of the paired correlation coefficient ($r = 0.99 \pm 0.04$). However, a morbidity study based on visits to a doctor due to temporary incapacity does not provide complete information about the health status of specialists. A more complete overview of existing diseases, including clinical manifestations and latent forms, can be obtained through medical examinations. In addition, a significant dependence of the number of days of disability on work experience was revealed, which is shown in Figure 4. The paired correlation coefficient between these indicators is almost equal to 1.

During the study, a single comprehensive medical examination of a group of specialists in the field of healthcare was organized. In 2021, a team of specialists conducted a survey using the necessary diagnostic tools, including interviews, examinations, and instrumental studies. During the medical examination, both previously known and newly identified diseases were considered, which provided complete information about all chronic and acute diseases in dentists at the time of the examination. The results of the medical examination presented in Table 3 indicate that none of the dentists at the time of the examination showed the absence of any form of disease; several diseases were detected in some of the examined.

As a result, the total number of diseases for every 100 analysed specialists was 132.7. This indicator significantly exceeds the level of morbidity revealed by the analysis of visits to doctors and cases of temporary incapacity for work. In addition, in 95.8% of cases, dentists were aware of the presence of certain diseases, since only 4.1% of diseases (5.53 for every 100 examined) were detected for the first time. These facts confirm that medical workers are extremely reluctant to seek medical help, especially when they need a temporary disability document. Medical examinations of dentists reveal a variety of diseases, among which the most common are circulatory system disorders, predominantly high blood pressure. This condition ranks first among all detected pathologies and accounts for 30.3% of the total number of cases. In 2nd place are psychoneuroses, which account for 16.7% of the total number of detected diseases. Diseases of the musculoskeletal and genitourinary systems occupy the 3rd position, each of them accounts for 14.4% of the total number of pathologies. Endocrine system diseases, such as hypothyroidism, occupy fourth place, while digestive system diseases are fifth (3.7%). Respiratory system diseases occupy the 6th place. Thus,

TABLE 3 Morbidity among dental specialists according to the results of medical examination (M ± m per 100 examined dentists).

		Class				**Total diseases**	
		First diagnosed		**Previously diagnosed**			
Nosological class of the disease	**ICD-10**	**Per 100 examined**	**% of total**	**Per 100 examined**	**% of total**	**Per 100 examined**	**% of total**
Infectious and parasitic diseases	1	-	-	0.91	0.7	0.9	0.7 ± 0.5
Neoplasms	2	0.12	2.3	1.53	1.2	1.6	1.2 ± 0.7
Endocrinological, nutritional, and metabolic diseases	3	0.06	1.2	0.64	0.5	0.7	0.5 ± 0.1
Diseases of the blood and blood-forming organs	4	0.39	6.8	4.23	3.3	4.6	3.5 ± 1.2
Psychiatric diseases	5	0.9	16.7	11.33	8.8	12.3	9.3 ± 1.9
Nervous system diseases	6	0.12	1.7	5.5	4.3	5.6	4.2 ± 1.3
Diseases of the eye and appendages	7	0.12	2.3	6	4.8	6.2	4.7 ± 1.4
Diseases of the ear and mastoid process	8	0.11	1.7	3.3	2.6	3.4	2.6 ± 1
Cardiovascular system diseases	9	1.66	30.3	27.93	21.6	29.6	22.4 ± 2.7
Respiratory system diseases	10	0.21	3.7	14.12	10.9	14.3	10.8 ± 2
Digestive system diseases	11	0.22	3.7	19.66	15.9	20.9	15.9 ± 2.4
Skin and subcutaneous tissue diseases	12	-	-	0.72	0.5	0.7	0.5 ± 0.1
Musculoskeletal system diseases	13	0.78	14.4	18.83	15.3	20.6	15.6 ± 2.4
Genitourinary system diseases	14	0.78	14.2	9.27	7.2	10.1	7.7 ± 1.8
Accidents, poisoning, and injuries	19	0.06	0.9	0.33	0.2	0.4	0.3 ± 0.3
Total		5.53	100	126.3	100	131.8	100

Source: developed by the authors.

statistics on the distribution of these diseases in the structure of all identified pathologies show the following hierarchy: circulatory system diseases occupy 1st place, digestive system diseases are 2nd, musculoskeletal system diseases are 3rd, respiratory diseases are 4th, mental disorders are 5th, and genitourinary system diseases are 6th. These data indicate the importance of carrying out comprehensive studies and providing appropriate medical care to patients with these diseases, considering their prevalence and impact on overall health.

The study presented by Mahmood et al. (2019) investigates the prevalence of respiratory diseases and the practice of protection from exposure to aerosols in dental specialists. In general, the conclusions of their study confirm the results obtained in this paper and other similar studies. One of the main conclusions of the study is that respiratory diseases are associated with aerosols formed in dental practice. This confirms the role of aerosols in the spread of infections and diseases, especially in healthcare workers who are exposed to high-energy instruments and liquids such as blood and saliva on a daily basis. In addition, the study notes that many dentists use protective measures such as masks and safety glasses. However, only a small part of them use high-efficiency filters to purify indoor air. This result also coincides with the conclusions obtained in this study, where it was noted that dental specialists do not always strictly follow the rules of hygiene and are extremely reluctant to seek medical help. The study by Medisauskaite and Kamau (2019) assessed the prevalence of health problems among UK doctors and investigated the impact of occupational stress on the risk of these problems. The results of the researchers' study are of interest and reflect some similarities with the results of this study. Initially, the results showed that a significant part of doctors are experiencing health problems. For example, it was found that 44% of doctors were engaged in binge drinking, and 5% met the criteria for alcohol dependence. The data obtained converge with the results of this study, which also revealed a high prevalence of alcohol consumption among medical professionals. However, it is worth noting that this study focused on dental health professionals, whereas the authors' study, included doctors of various specialities. This may lead to some differences in the prevalence and nature of health problems. Nevertheless, both studies confirm the importance of early recognition of occupational stress to prevent health problems in medical professionals.

The results of the study confirm the relationship between the level of morbidity with temporary incapacity and the work experience of medical workers, in this case, dentists. According to the excerpt from the paper by Ataniyazova et al. (2020), the incidence rate among dentists increases with increasing length of service, especially after 25 years of experience. This means that with the passage of time and the accumulation of work experience, doctors become more susceptible to diseases and require temporary disability. However, it is important to note that the analysis of morbidity, based only on visits to a doctor due to temporary incapacity for work, may not provide complete information about the health status of medical workers. To obtain a more complete overview of the health status of medical workers, various aspects of diseases should be considered, including clinical manifestations and latent forms, which can be achieved through medical examinations. The study also found a significant relationship between the number of days of disablement and work experience, expressed by an almost positive pair correlation coefficient. This suggests that with an increase in the length of service of medical workers, not only the likelihood of diseases increases, but also the duration of periods during which they cannot work. Thus, the results of this study are consistent with the excerpt from the paper provided, confirming the relationship between the incidence of temporary incapacity for work and the length of service of medical workers, in this case, dentists. They also emphasize the importance of using more comprehensive research methods, including medical examinations, to obtain complete information about the health of medical workers and take appropriate measures to prevent and improve their health and well-being.

The study by Zhu et al. (2020), presents the results obtained during the detection of the level of occupational diseases among medical workers for a period of 18 years. The purpose of this study was to investigate the structure and dynamics of occupational diseases in medical workers and to evaluate the effectiveness of the system of periodic medical examinations (PME) to suggest ways to improve them. The results of the study indicate that the effectiveness of PME among medical workers was very low. More than 7.2% of patients who had signs of occupational diseases only identified due to the patients themselves actively seeking medical help. Even the system of clinical examination of the working population, where there is no explicit task of active detection of occupational diseases, has shown a higher level of efficiency compared to PMEs. In light of the results of this study, it becomes clear that the low efficiency of the PME system among medical professionals requires improvement. This means that it is necessary to develop measures and recommendations for more effective detection of occupational diseases and improvement of the situation in this area. Such measures may include raising the awareness of health workers about occupational risks, training in early detection and diagnosis of occupational diseases, and the creation of more effective systems for monitoring and assessing the health of health workers.

Research conducted by Evers et al. (2020), aimed to investigate the prevalence of migraine among dentists and compare the results with previous studies described above. The results of this study showed that the prevalence of migraine among dentists is 35.2%. This value was significantly higher than in the general population (16.8%), as indicated in the above research. Thus, the results of this study confirm that migraine is a more common disease among dental health professionals. The researchers compared the results with other medical specialists, such as neurologists and general practitioners. The results showed that dentists have a higher prevalence of migraine (43.2%) compared to neurologists (32%) and general practitioners (19.3%), which is consistent with the data presented in the above study. This study also examined dentists' attitudes to migraines and their treatment recommendations. It was found that dentists with migraine have a more somatic view of migraine and attach less importance to the biopsychosocial concept of the disease than dentists without migraine. In addition, it was found that the recommendations for the treatment of migraine by migraine dentists differ from the recommendations they gave to their patients. For example, only 40.8% of migraine dentists used triptanes for their own treatment, while 89.6% of them recommended triptanes to patients. Thus, the results of this study confirm that migraine is a common disease among dentists. Migraine among dentists has a higher prevalence than among other medical professionals, such as neurologists and general practitioners (Dobrovanov et al., 2023). Moreover, migraine affects the attitude to the disease and treatment recommendations among dentists. These results are of great practical importance for ensuring the best care for patients of dental speciality suffering from migraines.

This study also drew attention to the psychological state of medical personnel during and after the COVID-19 outbreak. The results of this study converge with the results obtained by Liu et al. (2020), confirming the importance of the psychological health of medical workers during a pandemic. In the current study, similar methods were used, including convenient sampling and the use of psychological scales to assess the psychological state. It was found that after the outbreak of COVID-19 and for several weeks, the psychological indicators of dental medical personnel also decreased. Analysis of the data in the course of this study showed a significant decrease in the overall assessment of psychological problems, and a decrease in indicators related to anxiety, depression, phobias, and other aspects of the mental state. This corresponds to the results indicated in the above study by the researchers. In addition, it was found that dental medical personnel also highlight economic problems, interpersonal problems, and mental health as the main aspects of life most affected by the pandemic. These results converge with those given by Liu et al., confirming that the COVID-19 pandemic has a significant impact on various aspects of the life of medical personnel.

Ahmed et al. (2020) studied the incidence of dental health workers in the context of the current COVID-19 pandemic. The purpose of the study was to assess the level of anxiety and fear of infection among dentists, and to investigate their knowledge of COVID-19 control protocols. COVID-19, caused by the novel coronavirus, has become a global pandemic that has a significant impact on various spheres of life. Medical professionals, including dentists, are one of the groups most at risk of infection because they are in close contact with infected patients. In this regard, conducting a study aimed at assessing the psychological state and level of anxiety among dentists, and investigating their knowledge of COVID-19 control protocols, is an important step for developing appropriate measures and recommendations to ensure the safety of medical personnel. To achieve the same goals, a cross-sectional study was conducted based on an online survey of 650 dentists from the Republic of Kazakhstan. The online survey was conducted from March 10 to March 17, 2020. The questionnaire was developed considering the recommendations and previous research in this area. Chi-squared and Spearman correlation tests were used to control factors and assess the relationship between the responses of dentists and their gender and level of education.

The results of the study showed that more than two-thirds of the dentists surveyed (78%) experienced anxiety and fear of the devastating consequences of COVID-19. This indicates a serious psychological impact caused by the pandemic on this group of medical workers. More than 90% of dentists were aware of the latest changes in COVID-19 treatment protocols, which indicates their good awareness. However, only 61% of dentists actually applied these changes in their practice. This indicates the need for more effective implementation of recommendations and protocols in the daily work of dentists. Additionally, it was noted that the majority of dentists (76%) worked in a hospital environment, with 74% of them working in private clinics, and 20% in public institutions. These data indicate that both private and public institutions are facing challenges and problems related to the COVID-19 pandemic (Chrysostomou, 2022).

The results of this study converge with previous studies conducted in this area (Ahmed et al., 2020; Gurgel et al., 2020; Liu et al., 2020; Nasser et al., 2020). Anxiety and fear of COVID-19 infection are common among dentists in many countries of the world. This confirms the significant impact of the pandemic on the psychological state and emotional well-being of dental medical personnel. At the same time, a good awareness of dentists about the protocols and changes in the treatment of COVID-19 indicates the effectiveness of information campaigns and training programmes conducted for medical professionals. Training and updating knowledge about proper infection control techniques and the use of personal protective equipment play an important role in minimizing the risks of infection and ensuring the safety of patients and staff. However, the low implementation of the modified protocols in practice indicates the presence of obstacles and difficulties in their implementation. This may be conditioned by various factors, such as the lack of resources, restrictions on access to necessary protective and technical equipment. Some dental clinics have faced limited access to protective equipment such as masks, gloves, and disinfectants, which creates real problems in providing a safe environment for work.

More than half of dental practices had to modify their services in accordance with the recommendations for emergency treatment or temporarily close for an indefinite period. This indicates the serious consequences of the pandemic for the dental industry and the need for appropriate measures and support from governments and health organizations. It is important to develop economic support measures for dental clinics and provide them with the necessary resources and equipment so that they can continue to work in a safe environment and provide quality dental care to their patients. In addition, the COVID-19 pandemic has also led to changes in patient preferences and behavior. Some people postpone visits to the dentist because of fears for their health, which can lead to an increase in the complexity of treatment later. It is important to conduct information campaigns for patients to explain to them the safety measures taken by dental clinics and convince them of the need for regular visits to the dentist to maintain oral health. Thus, the dental industry continues to face challenges related to the COVID-19 pandemic. It is necessary to continue to improve the awareness and education of dentists, to provide them with access to the necessary resources and means of protection, and to support dental clinics through economic measures and regular updates of recommendations from health organizations.

CONCLUSIONS

The following conclusions can be drawn from the information obtained on doctor's visits, assessment of morbidity among dental specialists, and the level of morbidity with temporary incapacity for work. As a result of the analysis of medical consultations, the average long-term morbidity rate among dentists was determined, which is 995.9 ± 9.9%. During the period from 2015 to 2022, there were slight fluctuations in the incidence rate. During the same period, the incidence of temporary incapacity for work among dentists was observed, which is 95 ± 1 per 100 dentists. This means that approximately 95/100 dentists were temporarily absent from work due to diseases. Studies show that slight differences between the incidence rates during doctor visits and the incidence of temporary incapacity for work indicate that doctors seek medical help, mainly when they need a sick leave or absence from work. This may be conditioned by the need for rest and recovery, as well as the need to provide documentation for absence from work. It is important to provide dentists with access to medical services and support for their health to minimize morbidity and ensure their effective work.

The greatest importance in the structure of morbidity with temporary disability is attributed to diseases of the respiratory system, musculoskeletal system, circulatory system, mental disorders, and genitourinary system diseases. Diseases of the respiratory system, musculoskeletal system, circulatory system, mental disorders, and genitourinary system diseases are the most significant components in the structure of morbidity with temporary incapacity to work. The number of days of disability and the incidence of temporary disability in dentists are directly and significantly related to work experience, while the coefficient "r" reaches a value of 1. This means that the more experience the dentist has, the higher the number of days they may be absent due to the disease, and the level of morbidity in general. Studies show that dentists with longer work experience are more susceptible to diseases and need more time to restore health. This may be conditioned by increased physical stress and stress that dentists face in the process of work. Given the significant relationship between work experience and morbidity of dentists, it is important to provide them with suitable working conditions, periodic medical examinations, and the necessary disease prevention measures to maintain their efficiency and well-being.

Conducting medical examinations among dentists established that the number of detected diseases is 132.7 per 100 examined dental specialists. This indicator exceeds the morbidity rate determined based on doctor visits and temporary incapacity for work by 33.5-38.7%. The results obtained indicate low medical activity of dentists who prefer independent treatment, since in 95.8% of cases they are aware of their diseases. The same six classes of diseases are observed in the structure of diseases detected as a result of medical examination, but with different degrees of significance. In the first place are diseases mainly caused by increased psychological stress, such as circulatory disorders, mental disorders and digestive system diseases. In addition, the forced working position, which causes diseases of the musculoskeletal system, has a significant impact. Based on the presented findings, it is rational to comprehensively investigate the effect of forced working posture on musculoskeletal disorders among dentists in future studies. This would allow developing ergonomic recommendations and measures to improve the working conditions of dentists and reduce the risk of associated diseases.

AUTHOR CONTRIBUTIONS

Fazladin T. Temurov, Aliya A. Musaeva, and Shkurulla G. Masadikov conceived of the presented idea, developed the theory, and performed the computations. Sanjar A. Allabergenov and Shahrukh A. Abdukadirov verified the analytical methods and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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