

Gender equity and public health outcomes: The COVID-19 experience

Abstract

This paper extends the growing research on the impact of gender equity on public health outcomes using the ongoing Covid-19 pandemic as its research setting. Specifically, it introduces a conceptual model incorporating the impact of gender equity and human development on women's representation in legislature and public health expenditure, and their combined impact with human environment (population density, aging population and urban population) on important public health outcomes in the Covid-19 context, including the total number of tests, diagnosed, active and critical cases, and deaths. Data from 210 countries shows support for many of the hypothesized relationships in the conceptual model. The results provide useful insights about the factors that influence the representation of women in political systems around the world and its impact on public health outcomes. The authors also discuss implications for public health policy-makers to ensure efficient and effective delivery of public health services in future.

Keywords: Covid-19; gender equity; human development; human environment; public health expenditure; public health outcomes

1. Introduction

The unprecedented devastation caused by the ongoing Covid-19 pandemic has aroused public attention on the need for a proper public health policy (Herper, 2020; King, 2020), especially due to the disproportionately large number of infected cases and deaths in the developed countries, led by the United States, followed by Spain, Italy, France, Germany, the United Kingdom and others (Worldometers, 2020). As the debates continue to fix the responsibility for the birth and spread of this deadly virus and the lack of readiness to handle its disastrous impact (Patterson, 2020; Qato, 2020; Smakaj, 2020), public health experts seem to mainly view it through the lens of medicine, epidemiology, and health science disciplines. However, public health is an interdisciplinary subject that involves social sciences, public policy, public education, economics, and management (Jambroes et al., 2014; Tulchinsky & Varavikova, 2014). Hence, a failure to have a proper public health policy may not only lead to a huge loss of human lives; it can also shatter the economy, expose the incompetence of the public bodies including the governments and political leaders, and weaken the confidence of the general public (United Nation, 2020).

In this context, gender equity is recognized as an important factor to influence the quality of public healthcare systems and their outcomes (WHO, 2017). Although women are underrepresented in leadership positions in healthcare, their significance in other leadership positions cannot be underestimated, as evident from the growing numbers of women CEOs, politicians, and heads of governments (Mayer & Oosthuizen, 2020). Women leaders are strong advocates for immunization programs, education and equal employment opportunities (Beaman, Duflo, Pande, & Topalova, 2012). Women senators lobbied for the Breast and Cervical Cancer Mortality Prevention Act in the US (Lee et al., 2014). Gender equity also has positive effects on firm performance and governance (Post & Byron, 2015).

This paper extends the growing research on the impact of gender equity by exploring its impact on public health outcomes using the ongoing Covid-19 pandemic as its research setting. The authors begin with an extensive review of the relevant literature to develop a conceptual model and specific hypotheses about the impact of gender equity and human development on women's representation in legislature and public health expenditure, and the combined impact of public health expenditure along with human environment (population density, aging population and urban population) on important public health outcomes in the Covid-19 context, including the total number of tests, diagnosed, active and critical cases, and deaths. The authors use the data from 210 countries to find support for many hypotheses. The results provide useful insights about the factors that influence the representation of women in political systems around the world and its impact on public health outcomes. The authors also discuss implications for public health policy-makers to ensure efficient and effective delivery of public health services in future.

2. Conceptual background and hypotheses

2.1. Public health

Winslow (1920; p. 30) defines public health as “the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized efforts for the sanitation of the environment, the control of community infections, the education of the individual in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance of health”. In other words, public health is not just about medical science of epidemiology, diagnosis, and cure, and it is also linked to social science, which includes politics, management, welfare, and public policy.

2.2. Public health and gender equity

Past research shows significant psychological and cognitive differences in personality, values, and concerns between women and men. For example, women tend to be more cautious (Lundeberg, Fox, & Puncóchaf, 1994), risk-averse (Agnew, Anderson, Gerlach, & Szykman, 2008; Byrnes, Miller, & Schafer, 1999), and fatalistic (Pandey & Jain, 2017) than men. Women put more emphasis on risk attributes (e.g., possibility of loss) in investment decisions than men (Olsen & Cox, 2001) and perceive more risk in traffic and environmental hazards (Dejoy, 1992; Fllyn, Sloic, & Mertz, 1994). Besides being risk averse, women are also loss averse (Brooks & Zank, 2005). In addition, there is a difference in risk-taking behavior between female and male leaders for the decisions making for themselves and their groups. Ertac and Gurdal (2012) show male leaders take more risk for the decisions made for their own and the groups than male non-leaders. On the contrary, female leaders take less risk on behalf of a group which is lower than that taken individually. These differences in over-confidence and risk aversion levels between females and males make females to be more cautious and take less risk in making decisions. Hence, the authors hypothesize as follows:

H1. Gender equity has a positive effect on, a) representation of women in legislature, and b) public health expenditure.

2.3. Public health and human development

Past research shows that public health outcomes are influenced by indicators of human development, such as education (Ross & Wu, 1995), employment, income disparity etc. because these variables impact the access to public health infrastructure and general health of populations. Human development is related to health condition. Education level and economic condition are factors influencing health status. The well-educated are less likely to have economic hardship. They also have a greater sense of healthiness and healthier

behaviors such as less/no smoking, more physical exercise, and medical check-ups to improve their health. The wealthier people with higher income have greater purchasing power for healthier lifestyle (healthy food, better nutrition, more protected medical insurance). Ross and Wu (1995) find education level has positive effect on health through work and economic condition, social-psychological resources, and health lifestyle. Hence,

H2. Human development has a positive effect on, a) representation of women in legislature, and b) public health expenditure.

H3. Representation of women in legislature has a positive effect on public health expenditure.

2.4. Public health expenditure and Covid-19 outcomes

At the time of writing this paper, more than 4.2 million cases of Covid-19 have been diagnosed worldwide, with about two-third of these cases still active and about 290,000 deaths (Worldometers, 2020). Most recent studies examine these outcomes from a medical or therapeutic perspective (e.g., Murthy, Gomersall, & Fowler, 2020) despite much debate in media on the role of public policy makers, politicians, and general public in the spread of this virus. Past research shows a positive link between public health expenditure and its outcomes (Kim & Lane, 2013), such as infant mortality and life expectancy rates (Nixon & Ulmann, 2006). Hence, it would be expected that greater expenditure on public health infrastructure such as hospitals, ICU facilities and equipment such as ventilators, personal protection equipment (PPE) such as face masks and gowns, and healthcare professionals, would help deliver positive results in the battle against Covid-19. Hence, the authors hypothesize direct effects of public health expenditure on the various Covid-19 outcomes as follows:

H4. Public health expenditure has a positive effect on the total number of Covid-19 a) tests, b) diagnosed, c) active, and d) critical cases, and e) a negative effect on the number of deaths.

2.5. Public health and human environment

Human environment, which consists of elements such as population density, urbanization, and age structure, is a major factor influencing public health. World Health Organization reports the negative impact of high population density and urbanization on mental and physical health (WHO, 2020a, b). Rapid urbanization in most countries in the last few decades has led to inadequate housing, congested public transport, poor hygiene, and high pollution level (air, water, and noise), which results in physical and mental health problems (WHO, 2020b). In fact, infectious diseases and epidemics (e.g., tuberculosis, pneumonia) are also more likely to happen in densely populated and urban areas (WHO, 2020a, b). As higher population density is expected to lead to more active transport, more perceived stress and smoking, it has negative effects on mortality (Beenackers, Groeniger, Kamphuis, & Van Lenthe, 2018) and health conditions (Greiner, Li, Kawachi, Hunt, & Ahluwalia, 2004). Similarly, age structure of a population affects the social (e.g., social protection), economic (e.g., labor force), and health (e.g., healthcare for elderly) systems and policies of a country. The functioning of the immune system declines with age, which influences the physical strength of the elderly to respond to infection. There is a negative relationship between physical health condition and age (Ma et al., 2009; Sun et al., 2011). Hence, as follows:

H5. Number of tests for Covid-19 are influenced positively by a) population density, b) aging population, and c) urban population.

H6. Number of deaths due to Covid-19 are influenced positively by a) population density, b) aging population, and c) urban population.

Figure 1 shows the conceptual model summarizing all these hypotheses.

< Insert figure 1 about here >

3. Methodology

This paper uses publicly reported indicators to operationalize all the constructs. All the measures for gender equity, women in legislature, human development, public health expenditure and human environment are from the year 2018 or earlier; whereas all the public health outcomes related to Covid-19 are the current figures. This temporal separation between the predictor and outcome variables helps eliminate any concerns about endogeneity or reverse causality (Mertens, Pugliese, & Recker, 2017). Moreover, all the measures are either indices or ratios, to avoid confounds due to any other between-country differences. Table 1 shows the sample profile using three levels for each characteristics.

< Insert table 1 about here >

- *Gender equity*. Reversed score for Gender Inequality Index, which is a composite index ranking countries in terms of gender gap with three dimensions: reproductive health, empowerment, and labor market participation (UNDP, 2020).
- *Women in Legislature*. Percentage of females elected to the legislative body of a country (World Bank, 2020).
- *Human development*. Human Development Index (UNDP, 2020) is a composite index ranking countries in terms of human development based on three dimension indices, life expectancy index, education index, and income index.
- *Public health expenditure*. Current expenditure on public health by a country as a percentage of its GDP (UNDP, 2020).

- *Public health outcomes.* Five indicators related to Covid-19 pandemic (Worldometers, 2020), including a) number of tests performed to diagnose a Covid-19 case, b) number of diagnosed cases (patients diagnosed with Covid-19 infection), c) number of active cases (currently infected patients), d) number of critical cases (those in serious condition e.g., admitted to ICU), and e) number of people dead due to Covid-19. All these indicators are divided by the country's population to avoid any possible confound due to the wide variation in the size of populations for the countries in the sample.
- *Human environment.* Three indicators reported by UNDP (2020). Population density is the number of people (in millions) per square kilometer. Population above 65 years (%) is the ratio of people above the age of 65 years to the total population. Urban population (%) is the proportion of population living in urban areas.

4. Data analysis and results

The authors use path analysis with SmartPLS 3.0 to test all the hypotheses because they have a relatively small sample ($N=210$) of secondary data with many ratios and other artifacts that may not be normally distributed and their conceptual model is quite complex with many construct and relationships (Hair, Risher, Sarstedt, & Ringle, 2019). All the VIF (Variance Inflation Factor) values are less than the recommended cut-off value of three, hence multicollinearity is not a concern (Hair et al., 2019). Next, R-square values are high for many outcome variables (e.g., number of tests = 0.13, diagnosed cases = 0.28, and deaths = 0.45), hence the model explains a significant proportion of variance in these variables. High values of the blindfolding-based cross-validated redundancy measure Q^2 also confirm the predictive accuracy of the PLS path model (Hair et al., 2019). Finally, a low SRMR (0.054) and high NFI (0.86) also show a good model-fit in view of the many missing values in the dataset.

Table 2 shows the correlations and descriptive statistics for all the variables and Table 3 reports the results of the path analysis. First, *gender equity* has significant positive effects on *women in legislature* ($\beta = 0.49, p < .001$) and *public health expenditure* ($\beta = 0.25, p < .01$), hence both H1a and H1b are supported. Next, *human development* has an unexpected negative effect on *women in legislature* ($\beta = -0.21, p < .001$) and a non-significant positive effect on *public health expenditure* ($\beta = 0.10, p > .30$), however *women in legislature* has a significant positive effect on *public health expenditure* ($\beta = 0.23, p < .001$), hence H2a and H3 are supported but not H2b. *Public health expenditure* has a positive effect on the *number of diagnosed* ($\beta = 0.17, p < .05$) and *critical* ($\beta = 0.20, p < .01$) cases but no significant effect on the other outcomes (*number of tests*, *active cases* and *deaths*), hence H4b and H4d are supported but not H4a, H4c, and H4e. Finally, both *aging population* ($\beta = 0.24, p < .05$) and *urban population* ($\beta = 0.22, p < .01$) have significant positive effects on the *number of tests* but only *urban population* has a significant positive effect on *number of deaths* ($\beta = 0.12, p < .05$), hence only H5b, H5c, and H6c are supported and not the remaining hypotheses.

< Insert tables 2 & 3 about here >

5. Discussion and implications

Health experts argue that women should be involved in all stages of public health management, including planning, decision-making, and emergency response systems, because they account for about half the world's population and are the primary care-giver for the young, the elderly, and sick people in most households and healthcare facilities (WHO, 2017). However, despite these calls, women continue to be under-represented in top national and global healthcare organizations (WHO, 2017) and even government and legislatures (UNDP, 2020). This paper addresses these calls for greater representation of women in leadership roles by exploring the impact of gender equity on public health outcomes during

the ongoing Covid-19 pandemic. Using publicly available data for 210 countries, the authors analyze the impact of gender equity and human development on women's representation in legislature and public health expenditure, and the impact of public health expenditure and human environment (population density, aging population and urban population) on Covid-19 outcomes (number of tests, diagnosed, active and critical cases, and deaths).

The results show a clear evidence of the importance of women's role in managing public health outcomes, with the strong positive effects of gender equity and the proportion of women in legislature on public health expenditure, which in turn shows significant impact on the number of diagnosed and critical cases but not on the number of deaths. However, the unexpected negative effect of human development on women in legislature and no significant effect on public health expenditure suggests a relook at the definition of human development. Moreover, the lack of any significant impact of public health expenditure on the number of tests or deaths may indicate possible mismanagement of public health systems due to unclear policies and priorities in many countries during this crisis, which has already led to calls for improvement in future (Patterson, 2020; Qato, 2020). Both aging population and urban population have significant positive effects on the number of tests but only urban population has a positive effect on the number of deaths, which is not surprising as these two population segments have been the worst hit by the Covid-19 outbreak so far (Keil, Connolly, & Ali, 2020). Interestingly, population density has no impact on the number of tests or deaths, which suggests some biases in the way these tests are being conducted and the deaths are being reported (Kwiatkowski & Nadolny, 2020).

There is growing evidence that the COVID-19 crisis impacts men and women in different ways, including healthcare workers, patients, their family members and the society at large; and therefore, the measures to address this crisis and its outcomes should take these gender

differences into account (Linde & Gonzalez, 2020; Papp, & Hersh, 2020). For example, women tend to be more vulnerable at home and in the workplace, due to which they are more likely to suffer the economic impact of Covid-19 crisis (Linde & Gonzalez, 2020). Moreover, women comprise 70% of the global healthcare workforce and their experiences during the COVID-19 pandemic are significantly different to those of their male counterparts, especially due to the unique risks and vulnerabilities faced by women due to “deep-rooted inequalities and traditional gender roles” (Papp & Hersh, 2020). Therefore, public health agencies and policy makers need to look at the COVID-19 pandemic through a gender lens in order to identify and implement the most effective policy responses.

All the issues identified in this paper, such as under-representation of women in leadership positions, possible mismanagement of public health systems and inconsistent or incorrect reporting of the public health outcomes in this context, need to be addressed not only for a quick economic recovery in the aftermath of this Covid-19 crisis but to also prevent and manage such disasters in future. Clearly, Covid-19 has revealed the vulnerabilities of the modern civilization and economic systems, wherein the so-called developed countries account for most of the diagnosed cases and deaths, although it is still early days and we need to wait to see its impact on the less developed countries in Asia, Africa and Latin America, before we can make a full assessment and recommendations, especially about the role of gender equity in managing this crisis.

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Figure 1. Conceptual model

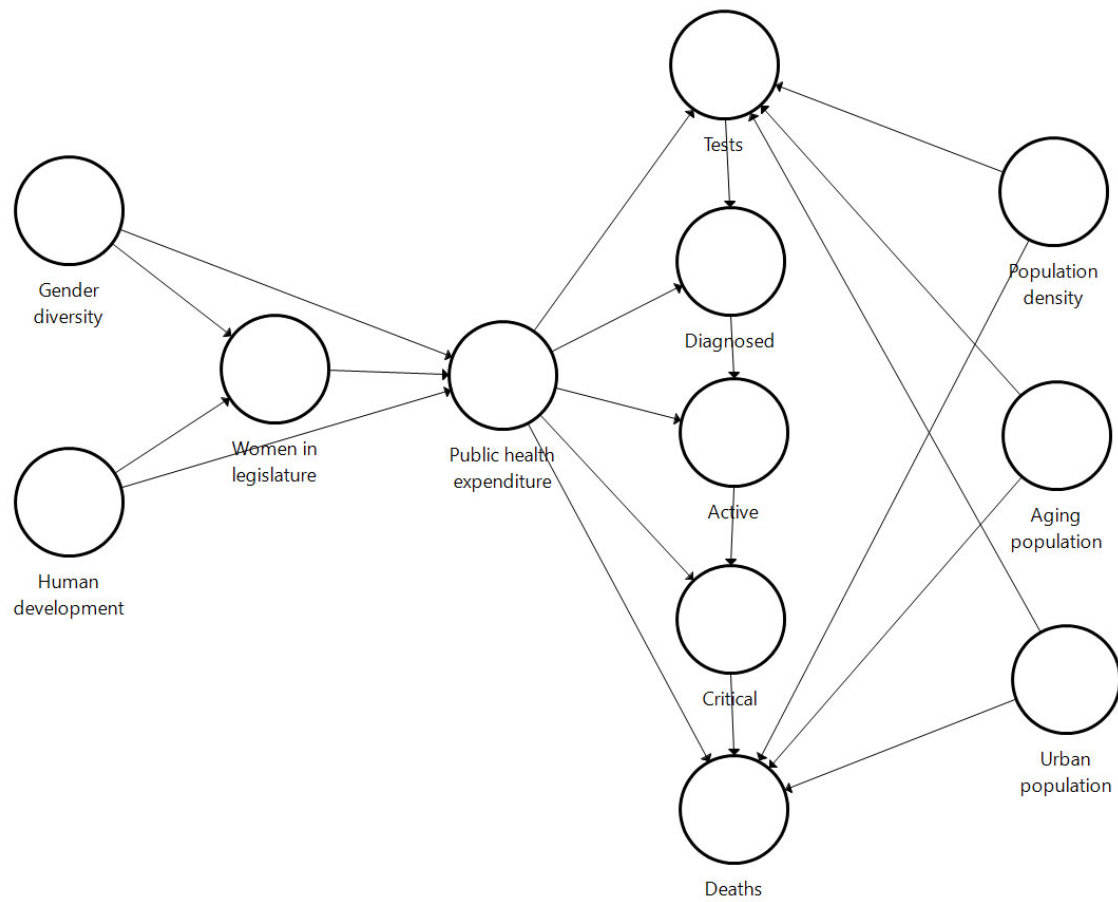


Table 1. Sample profile (N=210)

Sample characteristics	No. of Countries	%age	Sample characteristics	No. of Countries	%age
Gender Inequality Index			Active cases per million population		
< 0.25	53	34.2%	< 100	115	54.8%
0.25 - 0.50	63	40.6%	100 - 500	57	27.1%
> 0.50 - 0.75	39	25.2%	> 500	38	18.1%
Human Development Index			Critical cases per million population		
< 0.50	20	11.6%	< 20	101	77.7%
0.50 - 0.75	67	39.0%	20 – 50	15	11.5%
> 0.75	85	49.4%	> 50	14	10.8%
Women in Legislature (%)			Deaths per million population		
< 20%	70	40.0%	< 20	124	77.5%
20 - 40%	88	50.3%	20 – 100	25	15.6%
> 30%	17	9.7%	> 100	11	6.9%
Public health expenditure (% of GDP)			Population density (per Sq. Km.)		
< 5%	50	29.8%	< 100	111	53.4%
5 - 10%	100	59.5%	100 – 500	75	36.1%
> 10%	18	10.7%	> 500	22	10.6%
Tests per million population			Population above 65 (%)		
< 1000	52	34.9%	< 10%	111	64.9%
1000 - 5000	50	33.6%	10 - 20%	48	28.1%
> 5000	47	31.5%	> 20%	12	7.0%
Diagnosed cases per million population			Urban population (%)		
< 100	106	50.5%	< 50%	57	32.4%
100 - 500	56	26.7%	50 - 75%	65	36.9%
> 500	48	22.9%	> 75%	54	30.7%

Note: Total number of countries for each characteristics is subject to availability of data.

Table 2. Correlations and descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12
1. Gender equity	1.00											
2. Human Development Index	.80**	1.00										
3. Women in Legislature (%)	.37**	.15	1.00									
4. Public health expenditure (% GDP)	.41**	.32**	.34**	1.00								
5. Tests per million population	.50**	.44**	.13	.15	1.00							
6. Diagnosed cases per million population	.56**	.43**	.24**	.36**	.32**	1.00						
7. Active cases per million population	.54**	.41**	.23**	.33**	.23**	.96**	1.00					
8. Critical cases per million population	.44**	.33**	.25**	.41**	.21*	.85**	.85**	1.00				
9. Deaths per million population	.41**	.34**	.23**	.38**	.20*	.84**	.83**	.89**	1.00			
10. Population density (per Sq. Km.)	.14	.18*	-.02	-.04	.04	.10	.10	.08	.02	1.00		
11. Population above 65 (%)	.77**	.63**	.31**	.53**	.40**	.54**	.50**	.39**	.39**	.06	1.00	
12. Urban population (%)	.61**	.60**	.13	.30**	.37**	.35**	.36**	.29**	.26**	.21**	.47**	1.00
Mean	.35	.72	23.59	6.55	10060	586	406	22	31	482	8.50	60.12
Standard deviation	.19	.15	12.11	2.62	30047	1405	1025	53	104	2164	7.14	22.81

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3. Path analysis (SmartPLS 3.0) output

Hypothesized relationship	Standardized Beta coefficient	Result
H1a: Gender equity → Women in legislature	0.49***	Supported
H1b: Gender equity → Public health expenditure	0.25**	Supported
H2a: Human development → Women in legislature	-0.21*	Not supported
H2b: Human development → Public health expenditure	0.10	Not supported
H3: Women in legislature → Public health expenditure	0.23***	Supported
H4a: Public health expenditure → Number of tests	-0.08	Not supported
H4b: Public health expenditure → Number of diagnosed cases	0.17*	Supported
H4c: Public health expenditure → Number of active cases	-0.01	Not supported
H4d: Public health expenditure → Number of critical cases	0.20***	Supported
H4e: Public health expenditure → Number of deaths	0.08	Not supported
H5a: Population density → Number of tests	-0.02	Not supported
H5b: Aging population → Number of tests	0.24**	Supported
H5c: Urban population → Number of tests	0.22**	Supported
H6a: Population density → Number of deaths	-0.01	Not supported
H6b: Aging population → Number of deaths	0.08	Not supported
H6c: Urban population → Number of deaths	0.12*	Supported

* p < .05; ** p < .01; *** p < .001