



# BMJ Open Psychosocial determinants of adherence to public health and social measures (PHSMs) in 18 African Union Member States during the early phase of the COVID-19 pandemic: results of a cross-sectional survey

Nandita Murukutla,<sup>1</sup> Ashish K Gupta ,<sup>2</sup> Meena Maharjan ,<sup>2</sup> Cecilia Fabrizio,<sup>1</sup> Emily W Myers,<sup>1</sup> Andrew Johnson,<sup>3</sup> Virginia Nkwanzu,<sup>4</sup> Colby A Wilkason,<sup>5</sup> Natalie Lacey,<sup>6</sup> Akhona Tshangela,<sup>7</sup> Benjamin Djoudalbaye,<sup>7</sup> Amanda McClelland<sup>5</sup>

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For numbered affiliations see end of article.

## Correspondence to

Dr. Nandita Murukutla;  
nmurukutla@vitalstrategies.org

## ABSTRACT

**Objective** The objective of this study was to gain a better understanding of the psychosocial and sociodemographic factors that affected adherence to COVID-19 public health and social measures (PHSMs), and to identify the factors that most strongly related to whether citizens followed public health guidance.

**Design** Cross-sectional study.

**Setting and participants** Nationally representative telephone surveys were conducted from 4–17 August 2020 in 18 African Union Member States. A total of 21 600 adults (mean age=32.7 years, SD=11.4) were interviewed (1200 in each country).

**Outcome measures** Information including sociodemographics, adherence to PHSMs and psychosocial variables was collected. Logistic regression models examined the association between PHSM adherence (eg, physical distancing, gathering restrictions) and sociodemographic and psychosocial characteristics (eg, risk perception, trust). Factors affecting adherence were ranked using the Shapley regression decomposition method.

**Results** Adherence to PHSMs was high, with better adherence to personal than community PHSMs (65.5% vs 30.2%,  $p<0.05$ ). Psychosocial measures were significantly associated with personal and community PHSMs ( $p<0.05$ ). Women and older adults demonstrated better adherence to personal PHSMs (adjusted OR (aOR): women=1.43, age=1.01,  $p<0.05$ ) and community PHSMs (aOR: women=1.57, age=1.01,  $p<0.05$ ). Secondary education was associated with better adherence only to personal PHSMs (aOR=1.22,  $p<0.05$ ). Rural residence and access to running water were associated with better adherence to community PHSMs (aOR=1.12 and 1.18, respectively,  $p<0.05$ ). The factors that most affected adherence to personal PHSMs were: self-efficacy; trust in hospitals/health centres; knowledge about face masks; trust in the president; and gender. For community PHSMs they were: gender; trust in the president; access to running water; trust in hospitals/health centres; and risk perception.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ As a cross-sectional design was used, this study was not able to capture whether the psychosocial and sociodemographic factors affecting COVID-19 public health and social measure adherence changed over time.
- ⇒ Using computer-assisted telephone interviewing offered the opportunity to conduct research during a time where face-to-face methods were not possible and for surveys to be conducted in dispersed urban and rural areas relatively quickly.
- ⇒ On average, the response rate was 75% or more except for three countries (Egypt, Kenya and Guinea Conakry), where it ranged from 48% to 50%.

**Conclusions** Psychosocial factors, particularly trust in authorities and institutions, played a critical role in PHSM adherence. Adherence to community PHSMs was lower than personal PHSMs since they can impose significant burdens, particularly on the socially vulnerable.

## INTRODUCTION

Public health and social measures (PHSMs) were the only line of defence initially available against SARS-CoV-2.<sup>1 2</sup> PHSMs (also referred to as non-pharmaceutical interventions) range from personal measures, such as the use of masks, washing hands and physical distancing, to community-level measures, such as school and market closures and restrictions on gatherings. PHSMs work by limiting transmission of pathogens/diseases, slowing their trajectory and providing time for the implementation of additional control and response measures, including the preparation of the health system and



the development of treatments and vaccines.<sup>1 3</sup> With WHO's announcement of an international pandemic on 11 March 2020, most countries across the world immediately implemented PHSMs. In Africa, with high rates of endemic and emerging diseases and its generally fragile health systems, the effect of the pandemic was expected to be devastating. Consequently, countries across Africa were also quick to call for the implementation of PHSMs early in the pandemic.<sup>4-6</sup>

To be effective, PHSMs, particularly for respiratory infections such as SARS-CoV-2, require social and behavioural changes at scale and over a significant period of time. Consequently, PHSMs for COVID-19 were expected to be highly disruptive and achieving sustained adherence was expected to be a challenge.<sup>7</sup> Fortunately, the social and behavioural sciences offer crucial insights on how adherence may be improved.<sup>8-11</sup> Most social and behaviour change theories recognise the range of factors, from the individual to the societal and environmental levels, that affect human judgement and decision-making. Contrary to early theories positing that behaviour change could be achieved by improving information and knowledge (ie, engaging the 'cognitive' factors) through linear unidirectional information flow from the communicator to the audience, current approaches recognise the dynamic, two-way nature of communication and the crucial influence of mediating 'affective' factors in motivating behaviour change; these include perceptions of personal risk (the belief that the health threat is credible, personal and imminent) and self-efficacy, or confidence in one's ability to change behaviour.<sup>12 13</sup> Thus, current social and behavioural theories recognise that simply engaging cognitive factors through the provision of information about health threats is not always sufficient to motivate adherence to public health guidance; it is also critical to address affective factors, in particular people's perceptions of personal risk and their self-efficacy, to motivate adherence to recommended guidance.

To strengthen PHSM implementation in response to the COVID-19 pandemic, a number of efforts sought to draw lessons from the 1918 influenza pandemic.<sup>14</sup> To aid response efforts, including PHSM implementation, a few studies examined the psychosocial factors affecting adherence to PHSMs during the COVID-19 pandemic. Yet, most of these studies were conducted in high-income countries.<sup>15 16</sup>

The Partnership for Evidence-Based Response to COVID-19 (PERC) was formed in March 2020 to inform the implementation of PHSMs across African Union (AU) Member States. PERC is a public-private partnership comprising Africa Centres for Disease Control and Prevention; WHO; Resolve to Save Lives, an initiative of Vital Strategies; and other private partners. It collects and analyses social, economic, epidemiological, population movement and security data from AU Member States to help determine the acceptability, impact and effectiveness of PHSMs for COVID-19. The purpose of this study was to use the social and behavioural data collected via

PERC to assess the association between psychosocial variables—such as knowledge, trust, risk perceptions and self-efficacy—and PHSM adherence in the context of COVID-19 in Africa. Understanding how these psychosocial factors affected citizens' attitudes and behaviours towards PHSMs can aid governments in addressing gaps to improve adherence as the COVID-19 pandemic continues and for future epidemics.

## METHODS

### Sample and procedure

Nationally representative telephone surveys were conducted by Ipsos, a research company and partner in the PERC consortium, from 4–17 August 2020 in 18 AU Member States: Cameroon, Côte d'Ivoire, Democratic Republic of the Congo, Egypt, Ethiopia, Ghana, Guinea Conakry, Kenya, Liberia, Mozambique, Nigeria, Senegal, South Africa, Sudan, Tunisia, Uganda, Zambia and Zimbabwe. Countries were selected for inclusion based on regional representation, interview feasibility and PERC's ability to obtain timely institutional review board approvals.

In each country, a sample of at least 1200 participants aged 18 years and older participated in surveys conducted by telephone (including mobile phones). In 15 of the 18 countries, the response rate was 75% or more (range 75%–96%); in the remaining three countries (Egypt, Kenya and Guinea) the response rate ranged from 48% to 50%. Samples were generated using simple random sampling, incorporating random digit dialling from national telecommunication agency lists. To make sure the data were representative, sample quotas were established by regions and, within that, by gender (men, women) and by urbanity (urban, rural), in line with national official statistics for each country.

The survey was conducted using a computer-assisted telephone interviewing (CATI) methodology. Interviews were approximately 15–20 minutes long and were facilitated by a structured questionnaire, translated into local languages (for details, see the online supplemental file). Before participants were recruited to participate in the survey, the purpose of the study was explained to them and their informed consent was obtained. Verbal consent and interviews were recorded and transcribed. Data were deidentified and aggregated for analytical and reporting purposes.

### Measures

The survey measured knowledge, attitudes and behaviours towards COVID-19 and PHSMs. The full survey is publicly available via PERC (available at [www.preventepidemics.org/covid19/perc/](http://www.preventepidemics.org/covid19/perc/)); only measures used in this paper are described below. Questions in the survey were ordered to minimise order effects and related biases. The description of measures below does not follow the order in which these were asked in the survey.

**Demographics.** The key demographics recorded in the survey were: age; gender; head of household's level of formal education; household income; access to running water; and whether or not the respondent's home had a separate room in which a sick person could be isolated.

**Adherence to PHSMs** was measured by asking participants to self-report the extent of their adherence to personal and community PHSMs. Cronbach's  $\alpha$  was calculated to estimate the reliability of the items within the personal and community PHSM constructs. Personal PHSMs included three items: 'wash hands with soap or use hand sanitizer more often than usual', 'avoid handshakes and physical greetings' and 'wear a face mask in public when near others' (Cronbach's  $\alpha=0.39$ ). Community PHSMs consisted of four items: 'stop going to the church/mosque', 'stop joining public gatherings and places of entertainment', 'staying home instead of going to work, school or other regular activities' and 'reduce the number of times people go to the market or grocery store' (Cronbach's  $\alpha=0.47$ ). We tested the model presented in this paper with the item 'stop going to the church/mosque' both included and excluded from the community PHSMs composite; since the results were similar for both, we've used the more comprehensive composite with the item included, for this paper. Similarly, an aggregate composite on adherence to all seven items of PHSMs was computed (Cronbach's  $\alpha=0.57$ ). Since the reliability of the aggregates was relatively low, the analysis described in this paper was initially conducted for each of the items separately. Since similar patterns of findings were observed on the individual items, the composites were calculated and are used in this paper to aid readability.

**Psychosocial variables.** The following psychosocial variables from the survey were measured as described below.

- ▶ **Knowledge about COVID-19 preventive measures** was assessed by asking respondents to rate two items: 'washing hands helps prevent getting it' and 'wearing a face mask when around other people prevents the spread of it' on a 5-point Likert scale comprising 'definitely true (1)', 'probably true (2)', 'probably false (3)', 'definitely false (4)' and 'don't know (5)'.
- ▶ **Personal risk perception** was assessed with two items: 'What do you think your level of risk of catching coronavirus or COVID-19 is?' and 'If you were infected by coronavirus or COVID-19, how seriously do you think it would affect your health?'. Both questions were measured on respective Likert scales: 'very high (1)', 'high (2)', 'medium (3)', 'low (4)', 'very low (5)', 'don't know (6)' and 'not at all seriously (1)', 'somewhat seriously (2)', 'very seriously (3)', 'extremely seriously (4)', 'don't know (5)'. A composite of these two items was developed but due to very low Cronbach's  $\alpha$ , individual items have been used in the regression analysis.
- ▶ **Self-efficacy** was measured with a single item, 'I am confident in my ability to follow information and restrictions given by the government to reduce my risk of getting COVID-19'. Participants responded on

a 5-point Likert scale, which was then binary coded: code '1' was 'agree' including 'strongly agree (1)' and 'somewhat agree (2)'; code '0' was 'disagree' including 'neither agree nor disagree (3)', 'somewhat disagree (4)', 'strongly disagree (5)' and 'don't know (6)'.

- ▶ **Trust in public health leadership** was assessed by asking respondents, 'To what extent, if at all, do you trust each of the following individual and organizations' handling of the coronavirus?'. Participants responded on a 4-point scale, which was then binary coded: 'a great deal (1)' and 'a fair amount (2)' were coded '1' as 'high levels of trust', and 'not very much (3)', 'not at all (4)', 'Don't know (5)', 'not heard of the organization (6)' and 'not applicable (7)' were coded '0' as 'Low levels of trust'. A range of people and institutions specific to the respondent's country were presented for assessment, including the following three public health institutions/leaders that were used for this analysis: hospitals/health centres, the country's ministry of health and the president (in those countries with a president).

### Data analyses

Data were cleaned and weighted by gender and urbanity in each country based on the respective national official statistics of that country. There were no missing values in the data. The analysis was performed using Microsoft Excel and SPSS V.25. Variables were dichotomised as described above, except for education: in regression analysis, the category 'no formal education' was made the reference category and coded '0'; 'primary school' was coded as '1'; secondary school as '2'; and 'college/graduation/post-graduation/vocational degree' as '3'. Frequencies, means and relevant bivariate tests, including t-tests for continuous data or  $\chi^2$  test for categorical data, were computed to compare PHSM adherence and non-adherence groups by category of PHSMs (all, personal and community).

Logistic regression models were produced to examine the independent association between participants' adherence to PHSMs (outcome variable) and psychosocial variables, including knowledge about COVID-19, risk perception, self-efficacy and trust in public health leadership (factors affecting adherence). Both unadjusted and adjusted ORs were calculated and are presented. Variables that were statistically significant in the bivariate analysis were included as covariates in the logistic regression models. Covariates included gender, age, education, location (rural/urban), availability of running water, availability of a separate room to isolate if sick, knowledge about mask wearing, knowledge about washing hands, self-reported health status, personal or household self-reported experience with COVID-19, personal risk perception, self-efficacy, trust in president/prime minister, trust in ministry of health/department of health, trust in hospitals/health centres and country.



Analysis was then undertaken to identify the relative ranking of the factors affecting PHSM adherence that were significant in the multivariate regression analysis using the Shapley regression decomposition method.<sup>17</sup> This method allowed us to provide an importance score based on the contribution of each variable to the overall percentage of variance in adherence explained by the logistic regression model (see figures 2–4). This cross-sectional study is reported according to Strengthening the Reporting of Observational Studies in Epidemiology guidelines.<sup>18</sup>

### Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

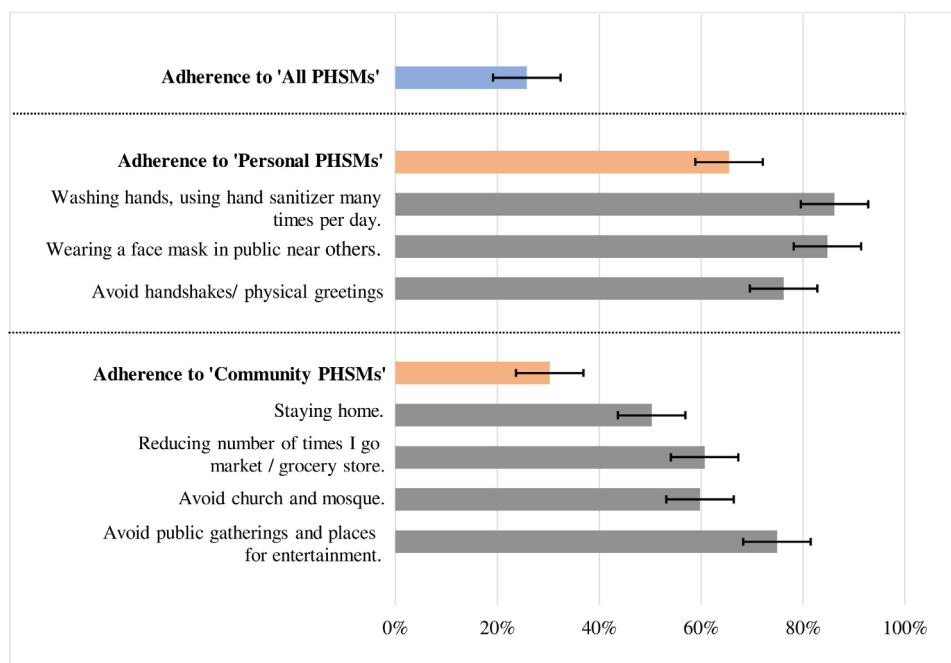
## RESULTS

Characteristics of the sample across all 18 AU Member States are described in [table 1](#). The total sample of 21 600 had a mean age of 32.7 years (SD=11.4); relatively evenly split between women and men (n=10 865; 50.3% women); 58.0% (n=12 528) resided in rural areas; and most of the sample had at least completed high school education (n=16 956; 78.5%). A total of 42.0% (n=9072) reported having a separate room in which sick family members could isolate and 37.0% (n=7992) reported access to running water. Participants self-reported good health status (n=17 518; 81.1% described their health as ‘good’ or ‘very good’). Only 2.1% (n=454) of respondents self-reported that they or a household member had been diagnosed with COVID-19 by the time of the survey.

Levels of self-reported adherence to personal and community PHSMs are described in [figure 1](#). Overall, adherence was higher for personal than for community

**Table 1** Demographic characteristics of the sample population

	Total sample n=21 600
<b>Demographic characteristics</b>	
Age	
Mean (SD)	32.7 (11.4)
Gender	
Men (0)	49.7%
Women (1)	50.3%
Education	
No formal education (0)	8.7%
Primary school (1)	12.8%
Secondary school (2)	37.4%
College/graduation/postgraduation/vocational degree (3)	41.1%
Place of residence	
Urban area (0)	42.0%
Rural area (1)	58.0%
Separate room in house to keep sick isolated	
No (0)	58.0%
Yes (1)	42.0%
Access to running water	
No (0)	63.0%
Yes (1)	37.0%
<b>Health status</b>	
Self-report that general health is ‘good’ or ‘very good’. (1)	81.1%
Respondent or a household member had COVID-19 (Yes, confirmed or unconfirmed). (1)	2.1%



**Figure 1** Adherence to public health and social measures (PHSMs) across all countries.

**Table 2** Unadjusted and adjusted odds of adherence to all PHSMs

	Adherence n=5571	Non-adherence n=16 029	Unadjusted OR	Adjusted OR*
<b>Demographic characteristics</b>				
Age				
Mean (SD)	33.8 (12.2)†	32.4 (11.1)	1.01†	1.01†
Gender				
Men (0)	43.3%	51.9%	Ref	Ref
Women (1)	56.7%†	48.1%	1.41†	1.49†
Education				
No formal education (0)	7.5%†	9.1%	Ref	Ref
Primary school (1)	13.7%†	12.5%	1.34†	1.19‡
Secondary school (2)	42.8%†	35.5%	1.47†	1.14‡
College/graduation/postgraduation/vocational degree (3)	36.0%†	42.9%	1.02	0.95
Place of residence				
Urban area (0)	38.2%†	43.3%	Ref	Ref
Rural area (1)	61.8%†	56.7%	1.24†	1.10†
Separate room in house to keep sick isolated				
No (0)	54.6%	59.2%	Ref	Ref
Yes (1)	45.4%†	40.8%	1.21†	1.01
Access to running water				
No (0)	57.6%	64.9%	Ref	Ref
Yes (1)	42.4%†	35.1%	1.36†	1.19†
<b>Health status</b>				
Self-report that general health is 'good' or 'very good'. (1)	81.0%	81.2%	0.98	1.15†
Respondent or a household member had COVID-19 (Yes, confirmed or unconfirmed). (1)	2.40%	2.0%	1.2	0.95
<b>Psychosocial characteristics</b>				
Knowledge about COVID-19				
Washing hands helps prevent getting it. (1)	96.3%†	94.5%	1.48†	1.29‡
Wearing a face mask when around other people prevents the spread of it. (1)	95.6%†	92.4%	1.70†	1.56†
Personal risk perception				
What do you think is your level of risk of catching COVID-19? (1)	33.3%†	26.8%	1.36†	1.15†
If you were infected by coronavirus or COVID-19, how seriously do you think it would affect your health? (1)	53.0%†	47.7%	1.23†	1.12†
Self-efficacy				
I am confident in my ability to follow information and restrictions given by the government to reduce my risk of getting COVID-19. (1)	92.5%†	89.6%	1.44†	1.25†
Trust in public health leadership				
Hospitals, health centres (1)	81.6%†	74.3%	1.53†	1.15‡
Ministry of health (1)	78.8%†	72.5%	1.66†	1.21†
The president (1)	74.4%†	67.0%	1.62†	1.35†
Country				
Cameroon (0)	2.2%	6.7%†	Ref	Ref
Democratic Republic of the Congo (1)	4.9%	5.8%†	2.5†	2.26†

Continued



Table 2 Continued

	Adherence n=5571	Non-adherence n=16 029	Unadjusted OR	Adjusted OR*
Ethiopia (2)	6.5%†	5.2%	3.68†	2.62†
Ghana (3)	4.8%	5.8%†	2.44†	1.89†
Guinea Conakry (4)	2.5%	6.6%†	1.13	1.04
Côte d'Ivoire (5)	2.5%	6.6%†	1.14	0.93
Kenya (6)	6.3%†	5.3%	3.56†	2.80†
Liberia (7)	3.9%	6.1%†	1.9†	1.60†
Mozambique (8)	8.3%†	4.6%	5.41†	3.98†
Nigeria (9)	4.3%	6%†	2.14†	1.98†
Senegal (10)	6.4%†	5.3%	3.63†	3.32†
South Africa (11)	13.2%†	2.9%	13.51†	10.39†
Uganda (12)	8.1%†	4.7%	5.22†	3.91†
Zambia (13)	3.8%	6.2%†	1.81†	1.43‡
Zimbabwe (14)	8.8%†	4.4%	5.87†	4.90†
Egypt (15)	6.6%†	5.2%	3.79†	4.71†
Tunisia (16)	2.1%	6.8%†	0.92	0.72†
Sudan (17)	4.8%	5.8%†	2.45†	2.37†

\*Covariates: age, gender, education, urbanity, separate room in house to keep sick isolated, access to running water, health status, knowledge about washing hands, knowledge about wearing mask, respondent or a household member had COVID-19, personal risk perception, self-efficacy, trust in president/prime minister, trust in ministry of health/department of health, trust in hospitals/health centres, country.

†At 0.01 significance level.

‡At 0.05 significance level.

PHSM, public health and social measure.

PHSMs (65.5% vs 30.2%,  $p<0.05$ ). Knowledge of personal protective behaviour, including both hand washing and wearing a mask, was almost universal (94.9% and 93.2%, respectively). Personal risk perceptions were generally low; 28.5% reported that their level of risk of catching COVID-19 was high and 49.1% believed that it would severely affect their health. Self-efficacy beliefs were high: 90.4% said that they were confident in their ability to follow government information and restrictions to reduce the risk of catching COVID-19. Levels of trust in public health institutions were also high: 76.2% trusted hospitals and health centres; 74.1% trusted their ministries of health; and 68.9% trusted their president.

#### Bivariate associations with PHSM adherence

Demographic characteristics were significantly associated with PHSM adherence. As indicated in tables 1–4, adherence to both personal and community PHSMs was higher: among older adults compared with younger adults (33.13 and 33.64 years, respectively, unadjusted OR=1.01,  $p<0.05$ ); among women compared with men (52.8% and 57.3%, respectively, unadjusted OR=1.41,  $p<0.05$ ); among those with some formal education compared with those with no formal education (91.8% and 92.3%, unadjusted OR=1.34 and 1.47, respectively,  $p<0.05$ ); in rural compared with urban areas (59.0% and 61.8%, respectively, unadjusted OR=1.24,  $p<0.05$ ); and

among those with access to running water compared with those without such access (39.3% and 40.8%, respectively, unadjusted OR=1.36,  $p<0.05$ ). However, while access to a separate room to isolate the sick was associated with better adherence to community PHSMs (46.4%, unadjusted OR=1.29,  $p<0.05$ ), it was associated with lower adherence to personal PHSMs (41.3%, unadjusted OR=0.92,  $p<0.05$ ).

There was a significant association between health status and PHSM adherence (see tables 1–4). People with 'good' self-reported health status reported higher adherence to personal PHSMs than those with fair to poor health status (83.1%, unadjusted OR=1.43,  $p<0.05$ ); however, those with good health reported lower adherence to community PHSMs compared with those with fair or poor health (79.8%, unadjusted OR=0.88,  $p<0.05$ ). Those who had experienced COVID-19 personally or through a family member reported better adherence to community PHSMs (2.5%, unadjusted OR=1.33,  $p<0.05$ ) than those who had not had this experience, but lower adherence to personal PHSMs (1.9%, unadjusted OR=0.82,  $p<0.05$ ).

Psychosocial variables were significantly associated with adherence. As indicated in tables 1–4, adherence to both personal and community PHSMs was higher among those with better knowledge about the

**Table 3** Unadjusted and adjusted odds of adherence to personal PHSMs

	Personal PHSMs		Unadjusted OR	Adjusted OR*
	Adherence n=14 157	Non-adherence n=7443		
<b>Demographic characteristics</b>				
Age				
Mean (SD)	33.1 (11.4)†	31.0 (11.5)	1.01†	1.01†
Gender				
Men (0)	47.2%	54.3%	Ref	Ref
Women (1)	52.8%†	45.7%	1.33†	1.43†
Education				
No formal education (0)	8.2%†	9.7%	Ref	Ref
Primary school (1)	12.5%	13.4%	1.12	1.17
Secondary school (2)	38.6%†	35.0%	1.32†	1.22†
College/graduation/postgraduation/vocational degree (3)	40.7%	41.9%	1.16‡	1.17
Place of residence				
Urban area (0)	41.0%†	45.2%	Ref	Ref
Rural area (1)	59.0%†	54.8%	1.12†	0.96
Separate room in house to keep sick isolated				
No (0)	58.7%	56.6%	Ref	Ref
Yes (1)	41.3%†	43.4%	0.92‡	1.06
Access to running water				
No (0)	60.7%	67.3%	Ref	Ref
Yes (1)	39.3%†	32.7%	1.33†	1.11
<b>Health status</b>				
Self-report that general health is 'good' or 'very good'. (1)	83.1%†	77.5%	1.43†	1.38†
Respondent or a household member had COVID-19 (Yes, confirmed or unconfirmed). (1)	1.9%†	2.4%	0.82‡	0.87
<b>Psychosocial characteristics</b>				
Knowledge about COVID-19				
Washing hands helps prevent getting it. (1)	96.2%†	92.6%	1.94†	1.71†
Wearing a face mask when around other people prevents the spread of it. (1)	94.8%†	90.1%	1.99†	1.53†
Personal risk perception				
What do you think is your level of risk of catching COVID-19? (1)	30.4%†	24.9%	1.32†	1.11‡
If you were infected by coronavirus or COVID-19, how seriously do you think it would affect your health? (1)	50.6%†	46.3%	1.19†	1.11‡
Self-efficacy				
I am confident in my ability to follow information and restrictions given by the government to reduce my risk of getting COVID-19. (1)	93.1%†	85.1%	2.38†	1.87†
Trust in public health leadership				
Hospitals, health centres (1)	80.0%†	68.9%	1.81†	1.17†
Ministry of health (1)	77.9%†	66.9%	1.92†	1.38†
The president (1)	72.4%†	62.2%	1.69†	1.43†
Country				
Cameroon (0)	4.2%	8.1%†	Ref	Ref
Democratic Republic of the Congo (1)	6.1%†	4.6%	2.52†	2.03†

Continued



Table 3 Continued

	Personal PHSMs			
	Adherence n=14 157	Non-adherence n=7443	Unadjusted OR	Adjusted OR*
Ethiopia (2)	6.4%†	3.9%	3.13†	2.09†
Ghana (3)	6.5%†	3.8%	3.24†	2.30†
Guinea Conakry (4)	4.3%	7.9%†	1.05	0.89
Côte d'Ivoire (5)	5.8%	5.2%	2.13†	1.79†
Kenya (6)	6.8%†	3.1%	4.16†	3.14†
Liberia (7)	5.5%	5.6%	1.91†	1.41†
Mozambique (8)	6.0%†	4.8%	2.39†	1.67†
Nigeria (9)	5.7%	5.2%	2.09†	1.81†
Senegal (10)	7.0%†	2.8%	4.82†	4.87†
South Africa (11)	7.4%†	2.1%	6.57†	5.03†
Uganda (12)	5.7%	5.3%	2.04†	1.46†
Zambia (13)	5.5%	5.7%	1.83†	1.28‡
Zimbabwe (14)	6.5%†	3.8%	3.22†	2.54†
Egypt (15)	5.5%	5.7%	1.84†	2.57†
Tunisia (16)	2.3%	11.7%†	0.38†	0.26†
Sudan (17)	2.9%	10.6%†	0.53†	0.44†

\*Covariates: age, gender, education, urbanity, separate room in house to keep sick isolated, access to running water, health status, knowledge about washing hands, knowledge about wearing mask, respondent or a household member had COVID-19, personal risk perception, self-efficacy, trust in president/prime minister, trust in ministry of health/department of health, trust in hospitals/health centres, country.

†At 0.01 significance level.

‡At 0.05 significance level.

PHSM, public health and social measure.

importance of washing hands (96.2% and 96.0%, respectively, unadjusted OR=1.48,  $p<0.05$ ) and wearing masks to prevent the spread of COVID-19 (94.8% and 95.2%, respectively, unadjusted OR=1.70,  $p<0.05$ ). Adherence to personal and community PHSMs was higher among those with greater personal risk perceptions (tables 2–4) as measured by two indicators: perception about level of risk of catching COVID-19 (30.4% and 32.2%, unadjusted OR=1.32 and 1.30, respectively,  $p<0.05$ ), and if infected by COVID-19 how seriously one thinks it would affect their health (50.6% and 52.1%, unadjusted OR=1.19 and 1.19, respectively,  $p<0.05$ ). Adherence was also higher among those with greater self-efficacy or confidence in their ability to follow government information and restrictions to reduce their risk of COVID-19 (93.1% and 91.8%, respectively, unadjusted OR=1.44,  $p<0.05$ ); and finally, among those who expressed significantly greater trust in public health sources' handling of the pandemic as measured by trust in hospitals/health centres (80.0% and 68.9%, respectively, unadjusted OR=1.53,  $p<0.05$ ), trust in the ministry of health (77.9% and 78.4%, respectively, unadjusted OR=1.66,  $p<0.05$ ) and trust in the president (72.4% and 73.9%, respectively, unadjusted OR=1.62,  $p<0.05$ ).

### Adjusted regression models

The ORs from the adjusted regression models are presented in tables 2–4. Among the demographic variables, most of the observed associations between demographic characteristics and adherence to personal and community PHSMs remained statistically significant, with the following exceptions: while a secondary school education continued to increase the odds of adherence to personal PHSMs, educational attainment was no longer associated with adherence to community PHSMs; while access to running water and residence in rural areas were associated with increased adherence to community PHSMs, they were no longer associated with adherence to personal PHSMs. Access to a separate room in which to isolate the sick was no longer associated with adherence to either personal or community PHSMs.

Among the health status variables, while self-reported good health continued to be associated with increased odds of adhering to personal PHSMs, it no longer improved the odds of adherence to community PHSMs. Self-reported personal experience with COVID-19 was no longer significantly associated with adherence to either personal or community PHSMs. All the psychosocial variables continued to increase the odds of adherence to both personal and community PHSMs.



**Table 4** Unadjusted and adjusted odds of adherence to community PHSMs

	Community PHSMs		Unadjusted OR	Adjusted OR*
	Adherence n=6522	Non-adherence n=15 048		
<b>Demographic characteristics</b>				
Age				
Mean (SD)	33.6 (12.3)†	32.3 (11)	1.01†	1.01†
Gender				
Men (0)	42.7%	52.7%	Ref	Ref
Women (1)	57.3%†	47.3%	1.50†	1.57†
Education				
No formal education (0)	7.7%†	9.1%	Ref	Ref
Primary school (1)	13.9%†	12.3%	1.34†	1.13
Secondary school (2)	41.6%†	35.5%	1.39†	1.07
College/graduation/postgraduation/vocational degree (3)	36.8%†	43.0%	1.02†	0.94
Place of residence				
Urban area (0)	38.2%†	43.7%	Ref	Ref
Rural area (1)	61.8%†	56.3%	1.25†	1.12†
Separate room in house to keep sick isolated				
No (0)	53.6%	59.9%	Ref	Ref
Yes (1)	46.4%†	40.1%	1.29†	1.02
Access to running water				
No (0)	59.2%	64.7%	Ref	Ref
Yes (1)	40.8%†	35.3%	1.26†	1.18†
<b>Health status</b>				
Self-report that general health is 'good' or 'very good'. (1)	79.8%†	81.7%	0.88†	1.06
Respondent or a household member had COVID-19 (Yes, confirmed or unconfirmed). (1)	2.5%†	1.9%	1.33†	1.05
<b>Psychosocial characteristics</b>				
Knowledge about COVID-19				
Washing hands helps prevent getting it. (1)	96.0%†	94.5%	1.41†	1.19‡
Wearing a face mask when around other people prevents the spread of it. (1)	95.2%†	92.3%	1.64†	1.45†
Personal risk perception				
What do you think is your level of risk of catching COVID-19? (1)	32.2%†	26.9%	1.30†	1.14†
If you were infected by coronavirus or COVID-19, how seriously do you think it would affect your health? (1)	52.1%†	47.8%	1.19†	1.10‡
Self-efficacy				
I am confident in my ability to follow information and restrictions given by the government to reduce my risk of getting COVID-19. (1)	91.8%†	89.8%	1.27†	1.16†
Trust in public health leadership				
Hospitals, health centres (1)	80.5%†	74.3%	1.43†	1.10‡
Ministry of health (1)	78.4%†	72.3%	1.39†	1.23†
The president (1)	73.9%†	66.7%	1.42†	1.31†
Country				
Cameroon (0)	2.3%	7.0%†	Ref	Ref
Democratic Republic of the Congo (1)	4.7%	5.9%†	2.37†	2.18†
Ethiopia (2)	6.1%‡	5.3%	3.43†	2.52†
Ghana (3)	4.5%	6.0%†	2.24†	1.80†
Guinea Conakry (4)	2.6%	6.8%†	1.12	1.04

Continued

Table 4 Continued

	Community PHSMs			
	Adherence n=6522	Non-adherence n=15 048	Unadjusted OR	Adjusted OR*
Côte d'Ivoire (5)	2.4%	6.9%†	1.02	0.86
Kenya (6)	5.9%	5.4%	3.27†	2.64†
Liberia (7)	3.7%	6.4%	1.72†	1.50†
Mozambique (8)	8.2%†	4.4%	5.54†	4.19†
Nigeria (9)	4.2%	6.2%†	2.02†	1.92†
Senegal (10)	5.8%	5.4%	3.16†	2.91†
South Africa (11)	11.8%	2.9%	12.26†	9.77†
Uganda (12)	8.6%	4.2%	6.09†	4.71†
Zambia (13)	3.7%	6.4%	1.74†	1.40†
Zimbabwe (14)	8.4%	4.3%	5.74†	4.90†
Egypt (15)	6.4%	5.2%	3.7†	4.55†
Tunisia (16)	3.6%	6.4%	1.68†	1.35†
Sudan (17)	6.9%	5.0%	4.11†	4.02†

\*Covariates: age, gender, education, urbanity, separate room in house to keep sick isolated, access to running water, health status, knowledge about washing hands, knowledge about wearing mask, respondent or a household member had COVID-19, personal risk perception, self-efficacy, trust in president/prime minister, trust in ministry of health/department of health, trust in hospitals/health centres, country.

†At 0.01 significance level.

‡At 0.05 significance level.

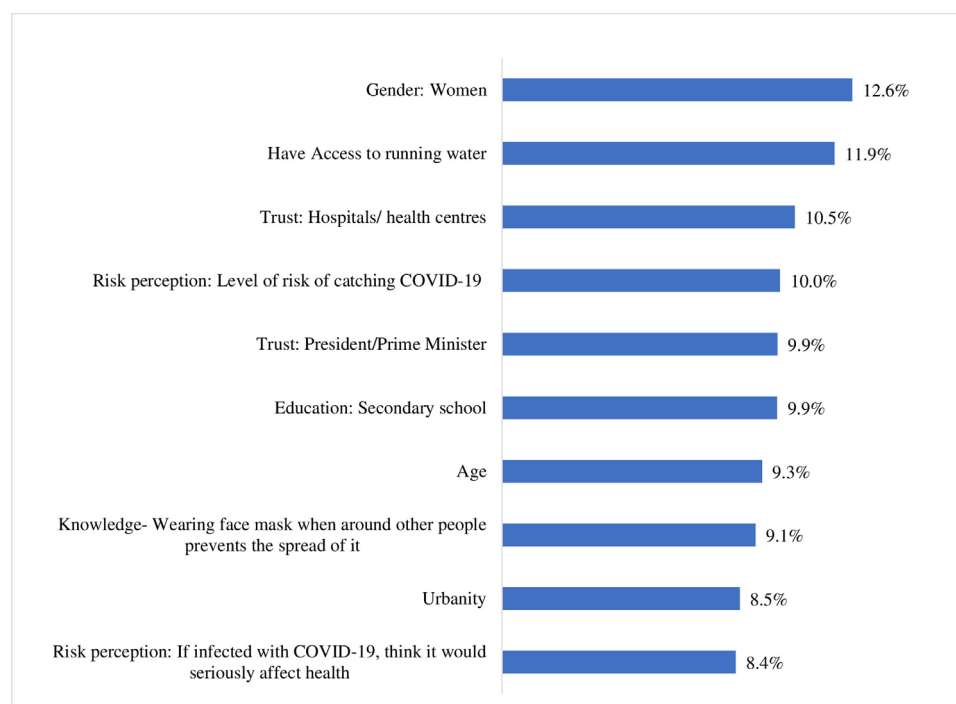
PHSM, public health and social measure.

### Relative importance of factors affecting PHSM adherence

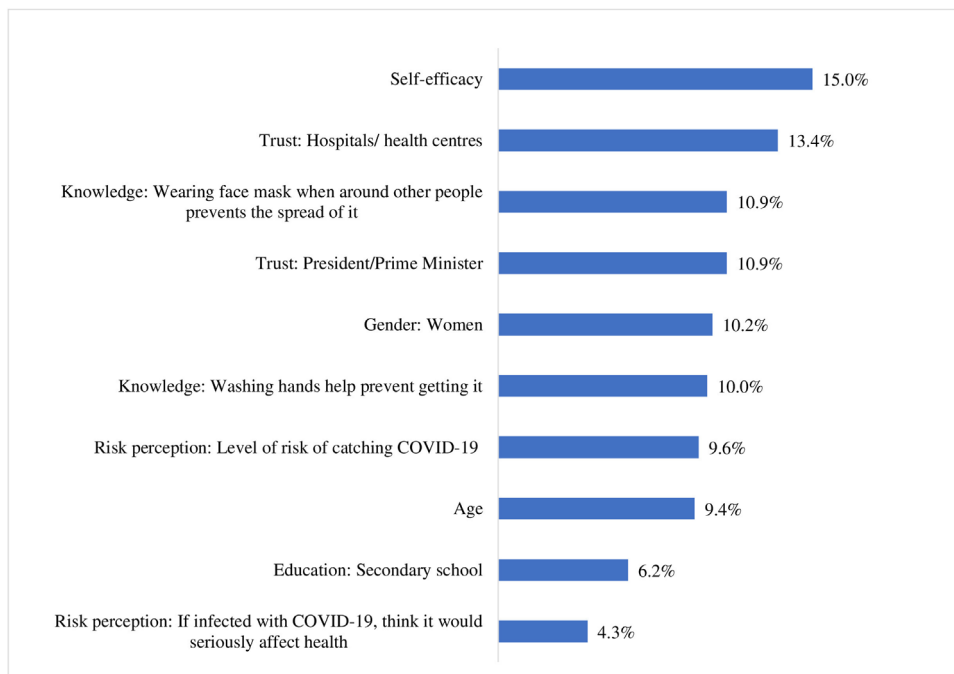
Using the Shapley procedure, the relative importance of the factors affecting PHSM adherence is presented in figures 2–4. The five factors that most strongly affected adherence to all PHSMs were gender, access to running water, trust in hospitals/health centres, risk perceptions

about catching COVID-19 and trust in leadership/president/prime minister.

When examined separately, slight differences were observed in the relative contribution and ranking of each of the factors affecting adherence to personal and community PHSMs. In order of contribution, the factors



**Figure 2** Relative importance of predictors of adherence to all public health and social measures (PHSMs) (Shapley approach)—top 10 predictors.

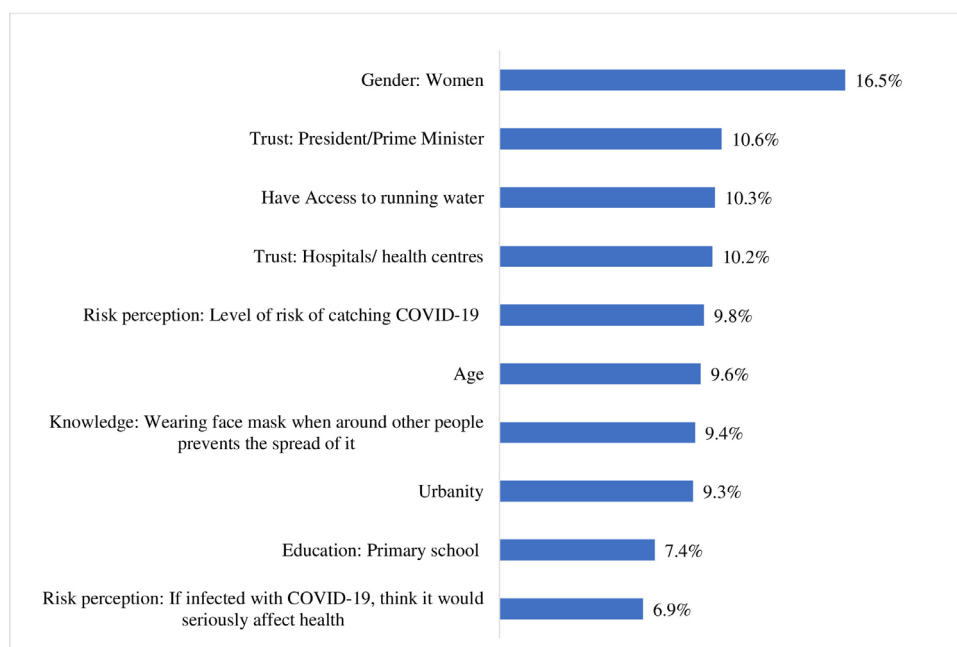


**Figure 3** Relative importance of predictors of adherence to personal public health and social measures (PHSMs) (Shapley approach)—top 10 predictors.

that most strongly affected personal PHSM adherence were self-efficacy; trust in hospitals/health centres; knowledge about face masks; trust in the president; and gender. The top five factors affecting adherence to community PHSMs, in order of contribution, were: gender; trust in the president; access to running water; trust in health centres; and risk perception.

## DISCUSSION

To our knowledge, this study is one of the first to test the psychosocial and sociodemographic determinants of PHSM adherence in African countries during the COVID-19 pandemic. Adherence to PHSMs will continue to be crucial to containing the spread of COVID-19 and lessons learnt from this pandemic may help guide public



**Figure 4** Relative importance of predictors of adherence to community public health and social measures (PHSMs) (Shapley approach)—top 10 predictors.



health responses to future epidemics.<sup>11</sup> Therefore, understanding what makes citizens more or less likely to adhere to guidance will be of continued relevance.

Conducted within the first 6 months of the pandemic, our study finds high levels of adherence to PHSMs in countries in Africa. Adherence to personal PHSMs was generally greater than adherence to community PHSMs, which is consistent with the higher relative burden of community measures.<sup>19–21</sup> Since personal PHSMs are more sustainable and expected to continue to be central to COVID-19 response even as vaccines become more available, this finding is encouraging.<sup>22</sup>

Even after controlling for covariates, there was a significant association between demographic characteristics and adherence to PHSMs: being a woman and older were significantly associated with better adherence to both personal and community PHSMs. While secondary education was associated with better adherence to personal PHSMs, it was unrelated to community PHSMs. Previous research on the social determinants of health has similarly found that women, older adults and those with higher levels of education are more likely to adopt protective behaviours in epidemics.<sup>21 23–25</sup> As noted in this research, this pattern of findings may be at least partially explained by the greater risk perceptions and self-efficacy reported by these groups.<sup>23</sup>

Socioeconomic ability to adhere to PHSMs, particularly community PHSMs, is important to consider in a public health response. Our study found that residence in a rural area and access to running water were both associated with better adherence to community PHSMs but were unrelated to personal PHSM adherence. On the one hand, it is possible that the pattern of adherence in rural areas reported in our data is indicative of the fewer restrictions that applied in such environments, as well as the better ability to maintain physical distancing in areas with lower population density.<sup>26</sup> On the other hand, this pattern of findings, particularly as it relates to access to running water, may also reflect the economic pressures of the urban poor in Africa, and it may be this economic vulnerability that was associated with reduced adherence to community PHSMs.<sup>27</sup> This interpretation is consistent with other research during the COVID-19 pandemic that has found lower adherence among more vulnerable groups: in a study in the UK, for instance, people's reported ability to control their responsibilities and avoid contact with others was significantly associated with adherence to PHSMs.<sup>28</sup> This prior analysis offers a useful distinction between non-intentional non-adherence and intentional non-adherence, with the former being associated with vulnerability and the latter with psychological and antisocial tendencies.<sup>28 29</sup> Understanding this distinction and the roots of non-adherence are important to tailoring relevant policy responses.

All of the psychosocial measures in this study were significantly associated with increased adherence to both personal and community PHSMs. These findings are consistent with a large body of social science studies

and public surveys that have been published since the COVID-19 pandemic began, which have found a similar crucial role played by psychosocial determinants, particularly risk perception and trust in health sources.

The importance of public trust in achieving an effective public health response has been strongly reinforced during the COVID-19 pandemic.<sup>30–32</sup> Trust in government and civic institutions has been described as a key component of the social capital that influences health behaviour.<sup>33 34</sup> Experiences with prior epidemics, including experiences with SARS in Hong Kong and Singapore, demonstrated the central role of trust in leadership in improving behavioural adherence to public health guidance.<sup>10</sup> In the context of the COVID-19 pandemic, with the scale of disruptions and the necessity of strong coordination and leadership, trust in government leadership has proven pivotal; surveys of public behaviour have documented how public adherence to response measures has shifted in response to government actions and the effects of these actions on the mitigation of COVID-19.<sup>35–37</sup> Likewise, in our study, trust in the government and in health institutions emerged as the primary determinant of adherence to both public and community PHSMs.

The early and proactive implementation of strong risk communication and community engagement strategies are central to building and maintaining trust during public health crises.<sup>38</sup> These strategies should address the psychosocial factors this study identified as strongly relating to PHSM adherence—including trust in authorities and health institutions and risk perception—and must include frequent, transparent and multidirectional communication with justification for the introduction of different PHSMs using timely, accurate data. Identifying trusted messengers, such as community-based health workers and other community leaders, and engaging communities through these messengers, has emerged as a particularly effective strategy for building trust in public health guidance and institutions during the COVID-19 pandemic.<sup>38–41</sup>

Our finding of the association between risk perception and behavioural adherence adds to a well-established research base on this subject. Personal risk perception, or the belief that a health risk is likely, imminent and severe, combined with a belief that one has the means to protect oneself, are known to be motivators of behaviour change. However, risk perception itself is a dynamic construct that waxes and wanes, and measures of risk perception in a cross-sectional survey offer only a snapshot in time.<sup>42 43</sup> Risk perception can fluctuate in response to both changes in the disease situation and factors unrelated to the disease situation; for example, media reports of the epidemic<sup>44</sup> and political partisanship<sup>45 46</sup> have been shown to colour interpretations of data and perceptions of personal risk. Hence, it is crucial for governments and public health programmes to continually monitor the public's risk perceptions and to manage risk communication and community engagement so that



public perceptions and actions are commensurate with public health needs.

There were a number of study limitations worth noting. First, the research was cross-sectional and therefore unable to capture the dynamic nature of the associations described in this paper. Nonetheless, this study offers important insights into determinants of behavioural adherence that may be measured again in future longitudinal analyses. An analysis of how changes in trust in authorities and health institutions over time affect adherence to PHSMs would be particularly important to build on findings from this study. In a related vein, the CATI-based survey methodology itself had strengths and limitations. On the one hand, it offered the opportunity to conduct research during a time where face-to-face methods (the standard pre-COVID in many countries) were not possible to use and it enabled surveys to be conducted in dispersed urban and rural areas relatively quickly. The limitation was that the survey was bound by the sample lists, and though these did contain landlines and mobile phones, it may not have been fully representative of the population. Simple random sampling methods and data weighting were applied to make the survey samples as robust as possible. Second, because of the broader commonalities in patterns of association observed across countries, this study presents the findings for the 18 countries together; it does not describe the study findings within each unique country's context and experience of the pandemic. Future analyses that consider and contextualise individual country experiences, including disease status and stringency of policy responses, may build on the findings described here and offer crucial insights on the influence of the wider disease context. Third, future studies may consider the role of additional factors that affect behavioural adherence. For instance, while self-efficacy in this study encapsulated confidence in ability to follow both personal and community PHSMs, it is possible that participants may have had self-confidence in their ability to follow one set of guidelines and not the other. It would be worthwhile for future studies to examine the self-efficacy dimension more deeply in the context of the kind of guidance offered. Finally, while social desirability bias may be an issue in this study, as with all survey research, attempts were made to minimise bias, including through the implementation of best practices on interviewing and questionnaire construction, using validated questions where possible.

Similarly, given this study's timing early in the pandemic, there were relatively few participants with self-reported experience of COVID-19 and this variable was consequently non-significant as a determinant of adherence. However, it would be worthwhile for future studies to consider the influence of this variable—along with other variables related to the disease context and experience, such as health system experiences—in shaping behavioural adherence.

## CONCLUSIONS

Behavioural adherence is often the result of a complex set of factors, ranging from the structural to the psychological. Recognition of this, through continual measurement and tailored responses to the facilitators and barriers of behaviour change, can significantly strengthen the public health response to epidemics.

Our study provides insight into the complex range of factors that influence social and behaviour changes in response to public health guidance. Community PHSMs imposed significant burdens on individuals and communities, and our analyses suggest that social vulnerabilities, including the inability to physically distance, affected adherence to guidance. The recognition that at least some instances of non-adherence may be the result of such 'non-intentional' barriers is crucial to a policy response that seeks to improve adherence through an alleviation of the burdens imposed by PHSMs. On the other hand, our study also identified a number of psychosocial predictors of behavioural adherence—in particular, trust in public health authorities. Our findings suggest that strong risk communication and community engagement that reinforces trust in public health authorities may improve adherence to guidance.

### Author affiliations

<sup>1</sup>Vital Strategies, New York, New York, USA

<sup>2</sup>Vital Strategies, New Delhi, India

<sup>3</sup>Ipsos, London, UK

<sup>4</sup>Ipsos, Kampala, Uganda

<sup>5</sup>Resolve To Save Lives, An initiative to Vital Strategies, New York, New York, USA

<sup>6</sup>Ipsos, Washington, District of Columbia, USA

<sup>7</sup>Africa Centres for Disease Control and Prevention, African Union, Addis Ababa, Ethiopia

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#### ORCID iDs

Ashish K Gupta <http://orcid.org/0000-0003-1735-3323>

Meena Maharjan <http://orcid.org/0000-0003-2830-7226>

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