Risk correlates for physical-mental multimorbidities in South Africa: a cross-sectional study

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Aims. The aim of this study was to identify the risk correlates for coexisting common mental disorders (CMDs) in the chronic care population in South Africa, with the view to identifying particularly vulnerable patient populations.

Methods. The sample comprised 2549 chronic care patients enrolled in the baseline and endline rounds of a facility detection survey conducted by the Programme for Improving Mental Health Care in three large facilities in the Dr Kenneth Kaunda district in the North West province of South Africa. Participants were screened for depression using the Patient Health Questionnaire (PHQ9) and for alcohol misuse using the Alcohol Use Disorders Identification Test (AUDIT). Data were analysed according to the number of morbidities, disorder type (physical or mental) and demographic variables. Multimorbidity was defined as the presence of two or more disorders (physical and/or mental).

Results. Just over one-third of the sample reported two or more physical conditions. Women were more at risk of being depressed than were men, with men more at risk of alcohol misuse. Those who were employed were at lower risk of having coexisting CMDs, while being younger, HIV positive, and food deprived were all found to be associated with higher risk for having coexisting CMDs.

Conclusion. In the face of the large treatment gap for CMDs in South Africa, and the role that coexisting CMDs can play in exacerbating the burden of chronic physical diseases, mental health screening and treatment interventions should target HIV-positive, younger patients living in circumstances where there is household food insecurity.

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Introduction

In the past decade, there has been a global increase in the disease burden of common mental disorders (CMDs), which include depression and alcohol use disorders (AUD). Depression is now the third leading cause of Disability Adjusted Life Years (DALYs). It is also the leading cause of mental, neurological and substance use (MNS) disorder DALYs (24.5%) globally. AUD are the leading cause of substance abuse disorder DALYs (6.9%) globally (Whiteford *et al.* 2015). Of concern is that depression is two to five times more prevalent in people with other non-communicable diseases (NCDs), such as hypertension and diabetes (Moussavi *et al.* 2007), as well as twice as prevalent in patients with HIV (Ciesla & Roberts, 2001; Nakimuli-Mpungu *et al.* 2011). Alcohol misuse is also higher in HIV and tuberculosis (TB) patients (Lonnroth *et al.* 2008; Neuman *et al.* 2012).

South Africa has an extremely high burden of chronic physical conditions. In 2013, HIV and cardiovascular disease were in the top three highest-ranking causes of years of life lost in South Africa (GBD 2013 Mortality and Causes of Death Collaborators, 2015) and South Africa ranks in the top 20 countries globally with a high TB burden (WHO, 2016). These physical morbidities intersect with a high risk for mental disorders as outlined above. National prevalence studies suggest that 15–24% of people living with hypertension and/or diabetes have a comorbid CMD (Grimsrud *et al.* 2009; Sorsdahl *et al.* 2016). Among people living with HIV, 11.1% are affected by depression and 15.8% by AUD (Freeman *et al.* 2007).

These physical-mental multimorbidities pose a significant public health risk through several routes. In the first instance, CMDs compromise primary and secondary prevention of NCDs and infectious disease through exacerbating modifiable risk factors and self-care, respectively (Prince *et al.* 2007). Second, patients with chronic physical conditions comorbid with depression or alcohol misuse are two to three times less likely to be treatment adherent (Gonzalez *et al.* 2011; Nakimuli-Mpungu *et al.* 2011; Ngo *et al.* 2013).

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Third, comorbid depression compromises the endocrine and immune systems, resulting in greater health decrements (Moussavi *et al.* 2007). Fourth, comorbid mental disorders are associated with greater health care utilisation (Gijzen *et al.* 2001), with a review from high-income countries suggesting that coexisting mental health problems can raise health care costs by 45% per person with a chronic physical condition (Naylor *et al.* 2012).

Coexisting mental-physical conditions thus threaten to overburden South Africa's fragile health system, accelerating the rising burden of NCDs, as well as militating against the containment of infectious chronic disease control, notably for HIV/AIDS and TB. In the context of fiscal constraints and the large treatment gap for CMDs in South Africa, where only one in four people with a CMD receive treatment of any kind (Seedat *et al.* 2008), identifying vulnerable populations would assist in targeted interventions for these populations; examples of these are screening and the provision of medication and/or counseling for mental disorders. Against this background, we report on the burden and correlates for physical-mental multimorbidities among a sample of adults in the North West province of South Africa who are receiving treatment for chronic physical conditions.

Method

Data for this report was derived using a facility detection survey conducted by the PRogramme for Improving Mental health carE in South Africa (PRIME-SA). PRIME is a multinational research consortium comprising five low- and middle-income countries (Lund *et al.* 2012). The overall aim of PRIME-SA was to develop and evaluate integrated packages of care for depression, AUDs and psychosis which could feasibly be scaled up as part of integrated chronic care in South Africa (Petersen *et al.* 2016). The primary aim of the facility detection survey was to evaluate whether clinical detection of depression and AUDs among chronic care patients increased after the implementation of the PRIME-SA package of care.

Study site

The study site for PRIME-SA was the Dr Kenneth Kaunda district in the North West province of South Africa, adjacent to the Botswana border. It has a population of 7 42 822 people, mostly Setswana speaking, with the major economic activities being mining and agriculture. This site was chosen as it was one of three districts where the national Department of Health was piloting an integrated chronic disease approach (Mahomed *et al.* 2014), known as Integrated Clinical Services

Management (ICSM), as part of the re-engineering of primary health care (PHC) for the introduction of national health insurance. As part of the ICSM, all chronic care patients are serviced at a single service point using an integrated set of chronic care guidelines, called Adult Primary Care (APC) also known internationally as PACK (Practical Approach to Care Kit) (Fairall *et al.* 2015). A situational analysis of mental health services indicated that PHC patients in the district are serviced by two psychiatrists (part-time) and two psychologists (Hanlon *et al.* 2014). The facility detection survey involved a cross-sectional study conducted in three large PHC facilities in the Matlosana sub-district.

As shown in Table 1, the Dr Kenneth Kaunda district includes a similar racial ratio of 8 : 2 for Black Africans to other racial groups in the country and a similar ratio of males to females (Statistics South Africa Census 2011). Provincially, a similar percentage of people are in receipt of social grants (Statistics South Africa General Household Survey, 2015), but life expectancy is lower than the national average. While literacy rates in the province are lower than the national average (Statistics South Africa Mid-year population estimates, 2016a), this could be a consequence of the more rural nature of the province, which could also explain the higher unemployment rates (Statistics South Africa Census 2011, Statistics South Africa Quarterly Labour Force Survey 2016b).

Recruitment and study procedures

The same study procedures were used for the two rounds of the facility detection survey (baseline February–April 2014; follow up October–December 2015). Several times every morning in the chronic clinic waiting area, a fieldworker conducted a short oral presentation about the aims and procedures of the facility detection study and asked for volunteers. No mention was made that the study concerned mental health in any way so as to minimise sampling bias.

Patient volunteers were taken to a private room where they were assessed by a trained fieldworker for inclusion in the study. Inclusion criteria were that patients had to be 18 years or older; attending the clinic for treatment for a chronic illness such as HIV, hypertension, or diabetes; and able to comprehend the questions posed in either Setswana (the dominant local language) or English. Having an existing working diagnosis of depression and/or AUD was not an exclusion criterion. Eligible volunteers who then agreed to enroll in the study provided written informed consent. The fieldworker then administered a structured questionnaire, which was programmed into android mobile devices.

The questionnaire was enabled for administration in either Setswana or English, and included items on

Table 1. Demographics

Category	Dr Kenneth Kaunda District				National			
	Black African	Coloured	Indian/Asian	White	Black African	Coloured	Indian/Asian	White
Population by race	81.6%	3.7%	0.7%	14%	80.6%	8.8%	2.5%	8.1%
Gender	M		F		M		F	
	50.1%		49.9%		49%		51%	
Life expectancy (years)	M		F		M		F	
	53.1		59.9		59.7		65.1	
Literacy	89.3%*				93.7%			
Social grants	32.9%*				30.1%			
Unemployment	29.7%				29.8%			

*Provincial figures.

demographic characteristics (i.e. age, sex, education, marital status, children, employment status, income source, food security), the chronic condition(s) for which they were receiving treatment, and screens for AUD and depression. The question on food security asked if the participant or anyone in the participant's household had gone hungry for any reason in the past month (Blumberg *et al.* 1999). Household food insecurity is a recognised indicator of poverty in South Africa, particularly in urban areas where income is required to purchase food (Grobler, 2016). The research assistants were all Setswana speaking, had completed secondary schooling and were trained in the administration of the questionnaire; additional training was provided by a clinical psychologist in the administration of mental health screening tools.

Study participants who enrolled in both study rounds were identified as duplicates and their second survey responses were excluded from the analysis. Duplicates were identified using the informed consent forms that were linked to their study identifiers.

Mental health measures

The Alcohol Use Identification Test (AUDIT) was used for the assessment of AUD. The AUDIT has been validated in the community and PHC contexts in South and southern Africa (Myer *et al.* 2008; Chishinga *et al.* 2011). For this analysis, participants who scored 8 or more on the AUDIT were AUD-positive cases. A prior validation study in Zambia with primary care patients used the same cut-off, which yielded a sensitivity and specificity of 60% for women, and 55% and 50%, respectively, for men (Chishinga *et al.* 2011). The Cronbach alpha for the study sample was 0.86.

Depression was measured using the Patient Health Questionnaire-9 (PHQ-9) which is aligned with the Diagnostic and Statistical Manual (DSM-IV-TR)

diagnostic criteria for the major depressive disorder. A participant cut-off of ≥ 10 was considered to be a depression case. This was based on a prior validation study conducted with a primary care population in South Africa which yielded a sensitivity of 78.7% and specificity of 83.4% (Cholera *et al.* 2014). Patients who responded positively to the PHQ-9 suicide ideation question were referred to the clinic's nurse for further assessment and onward referral if necessary. The Cronbach alpha for the study sample was 0.76.

Statistical analysis

First, we describe the socio-demographic and clinical characteristics of the participants recruited over the two study rounds. For the clinical characteristics, we tabulated the number and proportion of participants who reported any individual chronic physical condition for which they were receiving services at the clinic, and the number and proportion with various physical multimorbidities (defined as having ≥ 2 morbidities – physical and/or mental). Second, within each of these socio-demographic and clinical categories, we calculated: (a) the mean number of physical chronic morbidities, (b) the proportion with physical multimorbidities, (c) the proportion with depression comorbidity and (d) the proportion with AUD comorbidity. Third, we evaluated whether there were associations between selected socio-demographic and clinical characteristics with two outcomes: (a) depression comorbidity and (b) AUD comorbidity.

The characteristics selected were informed by previous international work on physical-mental multimorbidity (Barnett *et al.* 2012). To detect associations, we used logistic regression to estimate prevalence odds ratios (unadjusted) and 95% confidence intervals. For age, we created categories of 18–24, 25–44, 45–64, and

≥65 years, also based on previous work showing that these age categories are associated with physical-mental multimorbidity (Barnett *et al.* 2012); however, we reduced the last age group to ≥65 given shorter life expectancy in South Africa. For education, we created categories corresponding to no education (0 years), some primary education (1–6 years), completed primary education (7–11 years) and completed secondary education (≥12 years). For employment status, we combined those with any kind of paid employment into a category, and combined those who were retired, students, volunteers, or had other employment into a category. For marital status, we used a single category for those who were married or cohabitating, and a category for those who were divorced, separated or widowed.

Ethics

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Ethical approval for the study was obtained from the University of KwaZulu-Natal (South Africa) Biomedical Research Ethics Committee (BE400/13), the University of Cape Town (South Africa) Faculty of Health Sciences Human Research Ethics Committee (412/2011), and the World Health Organization (Geneva, Switzerland) Research Ethics Review Committee (RPC497).

Results

In the first round of data collection, 1310 patients were recruited into the study, while 1352 were recruited in the second round. In total, 111 duplicate study participants were identified. In addition, two participants who did not report a chronic condition were excluded from the analysis, yielding a sample size of 2549. Table 2 describes the socio-demographic and clinical characteristics of the combined sample of 2549 participants.

A total of 76% of the participants were female, of whom 35% had multiple physical morbidities (mean: 1.4 physical morbidities), 9.9% had depression and 2.6% had AUD. Males comprised 24% of the participants, of whom 36% had multiple physical morbidities (mean: 1.4 physical morbidities), 6.7% had depression and 9.2% had AUD. The largest age group in the sample was those aged 45–64 years (45%), of whom 45.6% had multiple comorbidities, 8.0% had depression and 3.7% had AUD. Over half of the participants (56%) had at least some secondary education; of these, 33% had multiple physical morbidities, with 10.2% having depression and 4.8% having AUD. Almost two thirds

(65%) of the participants had only one physical disorder, 31% had two physical conditions and 3.8% had three or more conditions.

The prevalence of depression for patients having one, two or three physical multimorbidities was 8.7%, 9.7% and 13.3% respectively, and the prevalence of AUD was 3.9%, 4.5% and 5.1%, respectively. Large proportions of participants reported that they were at the clinic to receive treatment for HIV (61.3%) or hypertension (52.6%), with fewer presenting for treatment for diabetes (9.2%). The prevalence of another physical morbidity in patients with HIV, hypertension, or diabetes was 36.5%, 56.6% and 88%, respectively. Given that the majority of multimorbid participants had HIV or hypertension, there was a notable proportion (17.6%) who had both these conditions. Of this multimorbid group, 9.8% had depression and 4.7% had AUD. In the smaller group having hypertension and diabetes multimorbidity (7.8%), 9.6% had depression and 4.3% had AUD.

The prevalence odds ratios (unadjusted) for having depression or for having AUD are reported in Table 3 (only significant associations are included).

Relative to men, women had 54% higher odds (OR 1.54; 95% CI: 1.08–2.19) of having depression and 74% lower odds (OR 0.26; 95% CI: 0.18–0.38) of having AUD. Relative to unemployed participants, employed participants had 37% lower odds (OR 0.63; 95% CI: 0.47–0.84) of having depression. Those participants who reported having gone hungry or having a household member go hungry in the past month had 3 times higher odds (OR 3.09; 95% CI: 2.35–4.06) of having depression and 2.5 times higher odds (OR 2.5; 95% CI: 1.71–3.76) of having AUD, compared with those participants who did not have anyone in their household go hungry. Participants with HIV had twice the odds of depression (OR 2.08; 95% CI: 1.53–2.83) and of AUD (OR 2.19; 95% CI: 1.38–3.48) than those who did not have HIV. Participants who had hypertension and diabetes had 55% lower odds of depression (OR 0.45; 95% CI: 0.23–0.89) relative to participants who did not have this physical comorbidity.

Discussion

It is unsurprising that the bulk of participants in this study were women given previous studies which show that women with chronic conditions are the predominant population attending PHC facilities in South Africa (Folb *et al.* 2015). In relation to chronic conditions, HIV was the most common chronic illness, followed by hypertension, with close to one-fifth of the sample having both conditions. These findings reflect not only the maturity of the HIV epidemic in South

Table 2. Demographics and physical-mental multi-morbidities

Characteristic/Category	N (%)	Mean number of morbidities	N (%) with multiple morbidities	N (%) with physical-CMD comorbidity	N (%) with physical-depression comorbidity	N (%) with physical-alcohol comorbidity
All patients	2549					
Sex						
Female	1950 (76.5%)	1.4	35%	12%	9.9%	2.6%
Male	599 (23.5%)	1.4	36%	13.4%	6.7%	9.2%
Age (years)						
18–24	69 (2.7%)	1	7.2%	17.4%	15.9%	2.9%
25–44	1085 (42.6%)	1	23.7%	15.8%	11.8%	5.5%
45–64	1146 (45%)	1.5	45.6%	10.7%	8%	3.7%
65+	249 (9.8%)	1.5	43.4%	1.6%	1.2%	0%
Highest education						
None	164 (6.4%)	1.5	43.3%	7.9%	5.5%	3%
1–6 years	576 (22.6%)	1.5	42.7%	10.2%	7.6%	3.3%
7–11 years	1427 (56%)	1.4	33%	14.7%	10.2%	4.8%
≥ 12 years	382 (15%)	1.3	27.2%	11%	9.2%	3.4%
Employment status						
Unemployed	1024 (40.2%)	1.4	33%	15.2%	12.6%	4%
Employed (full/part-time/piecemeal)	1025 (40.2%)	1.3	31.7%	12.7%	8.3%	5.8%
Other (retired, student, voluntary, other)	500 (19.6%)	1.5	46.2%	4.8%	4%	1%
Marital status						
Single	754 (29.6%)	1.4	31.3%	16.2%	11.8%	6%
Partnered	1197 (47%)	1.4	34%	10%	7.5%	3%
Divorced/separated/widowed	598 (23.5%)	1.5	41.6%	11.4%	9.2%	3.8%
Main source of income						
Salaries	1099 (43%)	1.3	29.2%	11.2%	7.6%	4.7%
Social grants	1162 (45.6%)	1.5	39.5%	12%	9.9%	3%
Other	182 (7%)	1.4	38.5%	14.8%	11.5%	5.5%
No income	106 (4.2%)	1.5	40.6%	19.8%	14.2%	7.5%
Food insecurity index						
No hunger	1734 (68%)	1.4	33.4%	8.3%	5.9%	2.8%
Hunger	815 (32%)	1.4	38.5%	20.4%	16.2%	6.9%
Number of physical disorders						
1	1656 (65%)			11.4%	8.7%	3.9%
2	795 (31%)			13.2%	9.7%	4.5%
3 +	98 (3.8%)			16.3%	13.3%	5.1%
Type of disorder/s*						
HIV	1563 (61.3%)	1.4	36.5%	14.9%	11.3%	5.2%
Hypertension	1342 (52.6%)	1.6	56.6%	9.4%	7.1%	3.1%
Diabetes	236 (9.2%)	2	88%	7.6%	5.1%	2.5%
HIV and hypertension	449 (17.6%)			13%	9.8%	4.7%
HIV and diabetes	20 (0.8%)			10%	10%	0%
Hypertension and diabetes	198 (7.8%)			12.6%	9.6%	4.3%
HIV, hypertension and diabetes	15 (0.6%)			12.2%	9.2%	4.1%

*Disorder categories are not mutually exclusive.

Africa, but also the rising problem of multimorbidity, and the intersection of the HIV and NCD epidemics in particular (Mayosi *et al.* 2012). As mentioned in

the introduction, the problem of multimorbidity has been recognised by the national Department of Health in South Africa. In response, an innovative

Table 3. Associations between sociodemographic and clinical characteristics with mental health co-morbidity among chronic care patients in South Africa

	Prevalence odds ratio for depression comorbidity (unadjusted)	95% CI	Prevalence odds ratio for AUD comorbidity (unadjusted)	95% CI
Sex				
Women	1.54**	1.08–2.19	0.26**	0.18–0.38
Men (Ref)				
Age, years				
25–44				
45–64	0.46**	0.23–0.91		
65+	0.06***			
18–24 (Ref)		0.02–0.24		
Employment status				
Employed	0.63**	0.47–0.84		
Retired, voluntary, student	0.29***	0.18–0.17	0.24**	0.09–0.61
Unemployed (Ref)				
Marital status				
Partnered	0.61**	0.45–0.83	0.50**	0.32–0.78
Single (Ref)				
Income				
Salaried	0.49**	0.02–0.27		
Pension			0.38**	0.17–0.84
No income (Ref)				
Food security				
Insecure	3.09***	2.35–4.06	2.5***	1.71–3.76
Secure (Ref)				
HIV positive	2.08***	1.53–2.83	2.19***	1.38–3.48
HIV negative(ref)				
Hypertension	0.59***	0.45–0.77	0.56***	0.38–0.34
No hypertension (Ref)				
Diabetes	0.50**	0.28–0.92		
No diabetes (Ref)				
Hypertension and diabetes	0.45**	0.23–0.89		
No hypertension or diabetes (Ref)				

Prevalence odds ratio (unadjusted), 95% confidence intervals and *P* values estimated using logistic regression.

p* < 0.05 *p* < 0.001.

integrated approach to management of chronic conditions at PHC level has been introduced (Mahomed *et al.* 2014), called Integrated Clinical Services Management (ICSM). As indicated earlier, underpinning the ICSM are an integrated set of chronic care guidelines for PHC nurses that include mental disorders (Fairall *et al.* 2015), as well as the reorganization of clinical services, so that all chronic patients are seen at one service point irrespective of their condition.

In relation to risk correlates for multimorbidities, some of the findings of this study are unsurprising. For instance, while women were more at risk of being depressed than men, men were more at risk of AUD. These findings are in keeping with local and international literature that indicates women to be more prone to depression and men to AUD (Myer *et al.* 2008;

Tomlinson *et al.* 2009; Chishinga *et al.* 2011; Kessler & Bromet, 2013). Being in a relationship was also protective for depression, which is in keeping with the international literature (Kessler & Bromet, 2013).

Three findings are noteworthy. In the first instance, while older participants (over 44 years) were found to have greater odds for multimorbid physical conditions, physical-mental multimorbidities were found to be more common among younger age groups (<45 years). Barnett and others (Barnett *et al.* 2012) found a similar trend in their study of mental-physical multimorbidities in a sample derived from a database of close to two million people who were registered with medical practices in Scotland.

The finding that mental-physical multimorbidities are more common in the younger, economically active

population is of concern given the negative impact, locally and globally, that CMDs have in terms of lost productivity (Mall *et al.* 2015; Chisholm *et al.* 2016).

Second, household food insecurity, which is an indicator of poverty, particularly in urban areas in South Africa (Grobler, 2016), was highly correlated with both depression and AUD, while being employed or receiving a pension was associated with lower odds of coexisting depression or AUD. These findings support previous work on the relationship between poverty and CMDs in LMICs (Lund *et al.* 2010; Lund *et al.* 2011).

Third, patients with HIV had twice greater odds of having depression or AUD than patients who did not have HIV. This is irrespective of whether the patient had other co-morbid physical conditions. This finding may be attributed to HIV stigma which still prevails in South Africa (Dos Santos *et al.* 2014), and has been found to be associated with greater depression severity in HIV-positive patients (Rao *et al.* 2012).

Together, these three findings show that being younger, HIV positive and/or having household food insecurity places people at greater risk for physical-mental multimorbidities. In the context where comorbid depression and AUD compromise treatment adherence (Nakimuli-Mpungu *et al.* 2011), potentially compromising viral load suppression and the achievement of the last 90 of the Joint United Nations Programme on HIV/AIDS 90-90-90 campaign (UNAIDS, 2014), the need to integrate mental health screening and treatment into HIV-care platforms, particularly in resource-deprived settings, should be a public health priority.

Limitations

There are a number of limitations to this study. First, our sample was a convenience sample where participants were volunteers. The sample may thus not be representative of the population of chronic care patients in the Dr Kenneth Kaunda district, although the chronic care population is likely to be fairly representative of similar populations in other areas of South Africa. Second, we used self-report of physical morbidities. It may be possible that some HIV-positive patients did not report their status due to stigma. Third, we used screening tools (rather than diagnostic criteria) to identify depression and AUD cases, although both tools have been validated for use in South African primary care clinic settings with fairly good positive predictive value. Fourth, given that this is a cross-sectional study, it is not possible to make causal statements. However, the associations found do allow policy planners to note the relative size of different risk groups and the extent to which each group needs mental health services.

Conclusion

The intersection of the HIV and TB epidemics with the burgeoning NCD epidemic has resulted in rising multimorbidities within primary care populations in South Africa (Mayosi *et al.* 2012), with this study showing physical-mental multimorbidities to be higher in more youthful populations. While South Africa is one of the first LMICs to respond to the challenge of multimorbidity through the introduction of an integrated chronic disease management approach, effective identification and management of coexisting mental disorders lags behind the management of physical conditions, with only one in four South Africans receiving treatment of any kind for mental disorder (Seedat *et al.* 2009). This is of concern given that coexisting mental disorders accelerate chronic physical disease acquisition and interfere with treatment adherence, thus threatening the investment made in prevention and treatment efforts for chronic physical diseases. This study indicates that populations most vulnerable to having physical-mental multimorbidities are younger, HIV positive and/or have household food insecurity. In the context of fiscal constraints, it would be prudent to direct mental health screening and treatment efforts towards these vulnerable populations.

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Conflict of interest

The authors declare no conflicts of interest.

Availability of data and materials

The anonymised participant level data will be made publically available 1 year after publication of the paper, in accordance with the PRIME publication and data management policies.

Author contributions

IP led the conceptualization of the study, design and coordination, data analysis including data acquisition, wrote the first draft of the manuscript and made

revisions. SR contributed to data management, data analysis and drafting and revision of the manuscript. TK participated in planning the data collection, data monitoring and manuscript and revisions. OS managed fieldwork and data collection and led coordination of the study and contributed to manuscript revision. AB contributed to the conceptualization of the study, data analysis and drafting and revision of the manuscript.

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