# **RESEARCH ARTICLE**

# **Evaluation of Health Awareness and Perceived Health Status among Men in Limpopo Province, South Africa**

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## Abstract:

**Background:** Men's health has emerged as an important public health concern requiring new healthcare interventions and increased resources. Knowledge about one's own health influences engagement in preventive behaviours including health-seeking behaviour in men.

**Objective:** This study assessed health awareness and perceived health status among men in the Limpopo Province of South Africa.

**Methods:** A quantitative cross-sectional design was used to administer a self-administered questionnaire on 387 men conveniently available in randomly selected communities. The data were analysed using a Statistical Package for Social Science (SPSS) version 29.0. for windows. Descriptive statistics and inferential statistics were used. The significance level was set at 0.05, and all tests were two-tailed. Ethical approval was granted by the University of Venda Research ethics committee with reference number FHS/21/PH/26/1215, and permission was also obtained from community leaders.

**Results:** The majority (68%) of men knew that smoking poses a risk of developing lung cancer, and more than half (51%) knew it was not normal to experience pain when urinating. Health care workers were the main source of health formation, with about 75% of men receiving health care from these practitioners. More than half (54%) of men perceived their health status to be in good condition six (6) months before the study.

*Conclusion:* However, they lacked knowledge that too much alcohol was harmful to their health. The majority of men received health information from healthcare workers and perceived their health status to be in good condition six months before the study. There is a need for education about the impact of too much intake of alcohol on health.

Keywords: Awareness, Health-seeking behaviour, Health status, Knowledge, Men.

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### **1. INTRODUCTION**

Men's health is a holistic, comprehensive approach that addresses the physical, mental, emotional, social, and spiritual life experiences and health needs of men throughout their lifespans [1]. Men's health has emerged as an important public health concern requiring new healthcare interventions and increased resources. Men's health outcomes are problematic globally, regionally, and nationally. Traditionally, men's health problems have been related to sexual and urinary systems. However, the health needs of men extend beyond reproductive organs and include all problems that they face, especially those that are more serious in the male population. This includes lifestyle behaviours that are considered personal and



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private [2]. Male life expectancy was 3.6 years shorter than female life expectancy in the UK in 2015. Men take more risks with their health and are less likely than women to be aware of disease symptoms [3]. Men's health, including both general and sexual health, has often been neglected, consequently impacting morbidity and mortality [4].

Men have been observed to use primary care services less frequently than women, with likely impacts on health outcomes. Pinkhasov et al. (2010) [5] indicate that men in the United States utilise healthcare services and visit doctor's offices less often than women. Moreover, men are also less likely to seek preventive care, hospice care, and dental care visits and have fewer hospital discharges compared to women [5]. Men who spend a long duration infected by diseases such as STIs untreated have an increased chance of HIV infection, becoming severely ill, and dying from the disease [6]. Bibiano et al. (2019) [7] attest that men display more chronic health conditions and die more frequently than women from the main causes of death. Globally, 52% of all deaths recorded in 2012 from Non-Communicable Diseases were male, and males were more likely than females to die prematurely from Non-Communicable Diseases (NCDs) in almost every country [8].

Knowledge about behaviours, including health-seeking ones, has implications for engagement in preventive behaviours, including health-seeking behaviour in men. However, most studies that sought to uncover factors in men's poor health-seeking behaviour focus much on what prevented men from engaging in health-seeking behaviour, including utilising available health services. For instance, studies conducted by Mthembu (2015) [9] and Uwimana et al. (2023) [10] focused on factors influencing the health-seeking behaviour of men. Their studies did not focus on assessing the knowledge men hold about their general health as a factor that can impact their seeking behaviour. Therefore, it is not known if men have enough knowledge about their general health and how they view their health. This study aimed to assess health awareness and perceived health status among men, contributing to an understanding of men's poor healthseeking behavior as a global public health concern. In this study, the researchers report on the study of 387 men whose knowledge of health awareness and perceived health status was assessed.

### 2. MATERIALS AND METHODS

## 2.1. Study Setting

This study was conducted in 3 selected districts municipalities of Limpopo Province. The province has about 5.8 million people and is rated as the fifth-largest population in South Africa [11]. There are 454 clinics, 26 community health centres, and 41 Hospitals, with some being specialised, tertiary, district, and regional hospitals in Limpopo Province [11]. Most of the residents in Limpopo take about 15-29 minutes to reach the nearest health facility, and the majority walk there, followed by those who use public transport to reach health facilities [12]. Limpopo consists of several ethnic groups with different cultures practiced.

### 2.2. Study Design

A cross-sectional design was used to conduct the study in the Mopani, Vhembe, and Capricorn districts of Limpopo province. The design was chosen because it allowed the researchers to collect data numerically to easily evaluate men's health awareness.

### 2.3. Study Population and Sampling

Simple random sampling was used to select 5 villages/communities in each district. Convenience sampling was then used to select 400 men aged 18 years and older from the chosen villages/communities to participate in the study in May 2024. The sample size of the men participating in the study was determined using Slovin's formula to ensure fair representation of men in the selected districts.

### 2.4. Data Collection Tools

The questionnaire was developed by researchers following a literature review, identification of gaps, and formulation of the research question. The questionnaire was taken to experts in the field for validation to ensure content validity. The questionnaire was pre-tested with 10% of respondents who did not form part of the study to identify problems. The instrument was developed in English and translated into Xitsonga, Tshivenda, and Sepedi versions. Translation was done by qualified language practitioners in these languages to accommodate participants who were not proficient in the English language. The questionnaire comprised closed-ended questions. The instrument consisted of demographic information about participants, health awareness, views on health status, and health service utilisation. In May 2024, recruited and consented men were given questionnaires to complete.

#### 2.5. Data Management and Analysis

The data were coded into the Statistical Package for Social Sciences (SPSS) Version 29.0. and cleaned to ensure quality. Descriptive statistics were used to describe demographic characteristics, health awareness, perceived health status, and health service utilisation, which were then presented in charts and frequency tables. A chi-square test was performed to measure the association between health awareness and the use of health services and the respondents' level of education. The significance level was set at 0.05, and all tests were two-sided.

# **3. RESULTS**

A total of 400 questionnaires were distributed, and 387 were correctly filled out and returned with a response rate of 97%. The average age of respondents was 36 years, with the youngest respondent being 18 years and the oldest being 71 years old. There were about 10 years of differences in the age of most respondents, as indicated by a standard deviation of 10.38. About 66% of respondents were single, and 44% held tertiary qualifications. Moreover, about 59% were unemployed, while 62% lived with extended family members. Most (41%) men lived in the Mopani district, and 65% were Christians, as shown in Table 1.

## Table 1. Respondents demographic information.

Marital Status	Frequency (f)	Percentage (%)
Single	257	66
Married	102	26
Divorced	16	4
Cohabiting	5	1
Widower	7	2
Level of education		
Never been to school	5	1
Did not finish primary	6	2
Primary	29	8
Did not finish high school	17	4
Secondary	138	36
Been to tertiary but did not finish	21	5
Tertiary	170	44
Employment status		
Employed	103	27
Unemployed	225	59
Self-employed	52	14
People living with		
Wife and children	82	21
Wife only	14	4
Children only	22	6
Alone	29	8
Extended family members	235	62
District		
Mopani	159	41
Vhembe	130	34
Capricorn	97	25
Religion	•	
Christian	251	65
Islam	3	0.8
Hinduism	2	0.5
African traditional religion	125	33

# Table 2. Health awareness assessment.

	Response			
Statement	Yes f (%)	No f (%)		
Cancer is the leading cause of death among men	271(72%)	107(28%)		
More men die from lung cancer than any other type of cancer	212(55%)	171(45%)		
Men only need 1 hour of physical activity per week	206(54%)	177(46%)		
Men should undergo regular screening tests	203(53%)	178(47%)		
Testosterone levels in men diminish with age.	235(62%)	147(38%)		
Men have different nutritional needs than women.	210(55%)	171(45%)		
Men are more likely than women to gain belly weight	238(62%)	148(38%)		
Sitting in a hot tub can decrease a man's sperm count.	198(52%)	185(48%)		
Men are more likely than women to die from injury in the workplace.	209(54%)	176(46%)		
Men are more likely than women to attempt suicide.	221(57%)	164(43%)		
Smoking increases the likelihood of lung cancer	264(68%)	122(32%)		
Blood in urine is one of the symptoms of prostate cancer	242(63%)	140(37%)		
Men should examine their testicles regularly	228(60%)	152(40%)		
It is normal to have pain when urinating	195(51%)	189(49%)		
It is normal for men to have problems with an erection	211(55%)	175(45%)		
Drinking too much alcohol is good for men's health	211(55%)	174(45%)		

### 3.1. Men's Health Awareness

The findings revealed that the majority of men (72%) knew that cancer was the leading cause of death among their population. Moreover, it was known by most men

(55%) that more men die from lung cancer than any other type of cancer, while a 203 participants (53%) knew that they should undergo regular screening tests. Furthermore, the majority (62%) knew that testosterone levels diminish

with age, and a high number 210 (55%) knew that, as men, they have different nutritional needs compared to women. The study findings further indicate that a high number of 238 (62%) knew that as men, they had a higher probability of gaining belly weight compared to women. Moreover, the study findings indicate that more than half (52%) of men knew that sitting in a hot tub decreases sperm count. Additionally, the study findings show that more than half (54%) of men knew that, as men, they have a higher probability of dying from work-related injuries at work than women.

Moreover, the study findings show that most (57%) men knew they were more likely to attempt suicide than women, and 264 (68%) men were aware that smoking poses a risk of developing lung cancer. Over and above that, the study findings indicate that the majority (63%) of men were aware that urinating urine containing blood is a symptom of prostate cancer. A high number of 228 (60%) knew they should regularly examine their testicles to detect prostate cancer. Moreover, the findings study shows that more than half (51%) of men knew it was not normal to experience pains when urinating, and 55% knew that it is normal for men to experience erection problems. The study findings also show that 55% were not aware that consuming too much alcohol is bad for men's health, as presented in Table 2.

### 3.2. Sources of Health Information

The study findings revealed that the majority (75%) of men received information from healthcare workers, followed by those who used the internet (51%) to get information, as shown in Fig. (1). The findings of the study revealed that about 54% of men perceived their health status as being in good condition for the past six months before the study (Fig. 2).

# 3.4. Association between Participants' Level of Education and Health Awareness

Men with tertiary education were more aware of cancer being the leading cause of death in men compared to men with other educational levels. There was a statistically significant association between the level of education and awareness of cancer as a cause of death in men (p=0.006). Moreover, 122 men with tertiary education agreed that drinking alcohol was good for men's health, while 90 men with high school education disagreed with the statement, as shown in Table **3**. Therefore, there was a statistically significant association between level of education and knowledge of alcohol effects in men's health (p<0.001).

# 3.5. Association between Health Awareness and Use of Health Services

Awareness of cancer being the leading cause of death in men was associated with the use of health services(p<0.001). Moreover, awareness of undergoing regular screening tests was associated with the use of health services(p<0.001). There was also a statistically significant association between awareness of blood in urine as a symptom of prostate cancer and the use of health services (p<0.001). Health awareness on the recommended period of physical activity per week, regular screening tests, diminishing testosterone levels with age, men's nutritional needs, and risk of smoking were not associated with the use of health services among men (p>0.05) as presented in Table **4**.







Fig. (2). Respondents perceived health status.

# Table 3. Association between level of education and health awareness.

	Level of Education						-	Pearson X <sup>2</sup>	
Health Awareness	Never been to School	Did not Finish Primary	Primary	Did not Finish Secondary School	Secondary School	Been to Tertiary but did not Finish	Tertiary	Phi and Cramer's V (P-value)	N
Cancer is the leading	ng cause of dea	ath among men				•		18.1	377
Yes	5	5	20	13	79	15	134	00.219	
No	0	0	8	4	53	6	35	(0.006)	
More men die from	lung cancer t	han any other ty	pe of canc	ær			-	10.7	
Yes	3	0	15	12	82	12	87	0.168	382
No	2	5	14	5	53	9	83	(0.095)	
Men only need 1 ho	our of physical	activity per wee	k				-	9.59	
Yes	5	4	17	11	74	8	86	0.159	382
No	0	1	12	6	61	13	84	(0.143)	
Men should underg	o regular scre	ening tests		•				4.20	380
Yes	2	3	17	12	73	12	83	0.105	
No	3	2	12	5	61	9	86	(0.649)	
Testosterone levels in men diminish with age.						5.30			
Yes	3	4	15	14	85	12	101	0.118	381
No	2	1	14	3	51	8	68	(0.505)	
Men have different	nutritional ne	eds than women	I.	•		•		6.62	380
Yes	3	3	11	12	69	11	100	0.132	
No	2	2	17	5	66	10	69	(0.356)	
Sitting in a hot tub	can decrease	a man's sperm c	ount.					4.21 0.105	382
Yes	3	3	13	10	67	14	87		
No	2	1	16	7	70	7	82	(0.648)	
Men are more likely than women to die from injury in the workplace.						16.5			
Yes	3	4	19	11	79	17	76	0.208	384
No	2	1	10	6	58	4	94	(0.011)	
Men are more likely than women to attempt suicide						15.28			
Yes	2	4	15	13	64	15	108	0.199	384
No	3	1	14	4	73	6	62	(0.018)	
·					-				

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(Table 3)	contd
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	Level of Education						-	Pearson X <sup>2</sup>	
Health Awareness N	Never been to School	Did not Finish Primary	Primary	Did not Finish Secondary School	Secondary School	Been to Tertiary but did not Finish	Tertiary	Value Phi and Cramer's V (P-value)	N
Smoking increases	the likelihood	of lung cancer		-		-		7.62	385
Yes	4	3	19	13	103	16	105	0.141	
No	1	2	10	4	35	5	65	(0.267)	
Blood in urine is on	e of the sympt	oms of prostate	cancer	_			_	2.72	381
Yes	4	3	20	12	89	13	100	0.85	
No	1	2	9	5	47	8	68	(0.842)	
Men should examine their testicles regularly						10.27			
Yes	3	4	15	11	83	18	93	0.165	379
No	1	1	14	6	50	3	77	(0.114)	
It is normal to have	pain when uri	inating						6.15	383
Yes	2	1	16	12	64	9	85	0.127	
No	3	4	13	5	73	12	84	(0.406)	
It is normal for men to have problems with an erection						4.35			
Yes	1	3	16	12	74	11	94	0.106 (0.629)	385
No	4	2	13	5	64	10	76		
Drinking too much alcohol is good for men's health						46.6			
Yes	3	2	17	11	48	8	122	0.349	384
No	2	3	12	6	90	13	47	(<0.001)	

# Table 4. Association between health awareness and use of health services.

Haalth Augurage	Use of Health Serv	Pearson X <sup>2</sup> value		
Health Awareness	Yes	No	(P-value)	
Cancer is the leading cause of death among men	10.86			
Yes	130	139	0.171	
No	70	34	(<0.001)	
More men die from lung cancer than any other type of can	icer		4.18	
Yes	121	88	0.105	
No	79	88	(0.041)	
Men only need 1 hour of physical activity per week			0.002	
Yes	108	95	0.002	
No	93	81	(0.962)	
Men should undergo regular screening tests		•	13.4	
Yes	123	75	0.189	
No	76	100	(<0.001)	
Testosterone levels in men diminish with age	0.161			
Yes	125	107	0.21	
No	74	69	(0.688)	
Men have different nutritional needs than women				
Yes	117	91	0.068	
No	82	84	(0.688)	
Sitting in a hot tub can decrease a man's sperm count			0.64	
Yes	103	91	0.013	
No	99	83	(0.800)	
Men are more likely than women to die from injury in the	1.81			
Yes	115	88	0.69	
No	87	88	(0.178)	
Men are more likely than women to attempt suicide				
Yes	117	99	0.17	
No	85	77	(0.743)	

Health Awareness	Use of Health Se	Use of Health Services		
	Yes	No	Phi &Cramer's V (P-value)	
Smoking increases the likelihood of lung cancer	4 64			
Yes	150	112	0.111	
No	53	64	(0.031)	
Blood in urine is one of the symptoms of prostate of	cancer		13.27	
Yes	144	93	0.188	
No	57	81	(<0.001)	
Men should examine their testicles regularly	0.465			
Yes	121	102	0.035	
No	76	74	(0.495)	
It is normal to have pain when urinating	0.200			
Yes	97	89	0.023	
No	104	87	(0.655)	
It is normal for men to have problems with an erec	tion It is normal for men to	have problems with an erection	0.353	
Yes	108	99	0.31	
No	95	77	(0.552)	
Drinking too much alcohol is good for men's health	6.262			
Yes	98	108	0.129	
No	104	68	(0.012)	

#### 4. DISCUSSION

(Table 4) contd

This study assessed health awareness and perceived health status of men in Mopani, Vhembe, and Capricorn district municipalities of Limpopo province. Men in this study knew about cancer being the common disease that kills men and lung cancer being prevalent among the male population and its risk factors. They were also knowledgeable about the importance and need to undergo regular screening tests. These findings align with those of Dlamini *et al.* (2022) [13], where participants demonstrated awareness of lung cancer and its risk factors.Moreover, men were also aware that testosterone levels diminish with age. The knowledge can be attributed to their literacy level and access to health information both on social media and educational programs that provide information about men's health, such as the MINA program [14]. However, a particular concern is that men continue to underutilize health services that offer screening services. This suggests that there are some reasons and factors that make men not participate in screening services offered at health facilities.

Furthermore, the study revealed that men were aware that blood in the urine is a symptom of prostate cancer and that they should regularly examine their testicles. This study's findings differ from the findings of Maladze et al., (2023) [15], who found that men in their study demonstrated inadequate knowledge about prostate cancer and the majority had never undergone a prostate cancer screening. This indicates that some men miss out on educational programs and health information about men's health, while others have access to it. However, a study conducted [16] found that 91.7% of men in their study had heard of prostate cancer, while 93% had never undergone testing for it. This suggests that while some men may lack in-depth knowledge about prostate cancer, they are at least aware of its existence. The study also discovered that men were aware that they have specific

national needs as men and are at high risk of gaining belly weight compared to women. This suggests that men are aware that their behaviors and lifestyle choices contribute to gaining abdominal weight, which impacts their health. This is supported by a study by Donnachie et al. (2023) [17], which found that men in their study expressed a desire to enhance their body build or size and reported deliberate attempts to achieve a healthy weight. Furthermore, men in this study recognized that sitting in a hot tub can adversely impact sperm count levels.. This indicates that when men gather in social circles, they discuss topics related to manhood and share information about reproductive health, including sexual matters. Moreover, men in this study were aware that they were more likely to die from work-related injuries than women. This suggests that men understand the risks associated with their often physically demanding work, which can lead to harm or death, as it is sometimes a necessity. Stergiou-Kita et al. (2015) [18] assert that men accept the risks in their work and endure pain without complaint, which contributes to the loss of life from workplace injuries. Men in this study knew that, they are more likely to commit suicide compared to women. This suggests that men know that they have challenges in making rational decisions, mostly find it difficult to deal with stressful situations, and are likely to end their lives. However, despite the knowledge men hold regarding the likelihood of taking their own lives, they are less likely to seek help and healthcare services. This is supported by the South African Society of Psychiatrists (SASOP) cited in a study [19] which indicated that among the 703,000 people dying every year in South Africa, the suicide rate for men is 12.6 per 100,000, which is significantly higher than that of women at 5.4 per 100,000. This suggests that men still require skills to enhance their problem-solving abilities, enabling them to cope with stressful situations and prevent the risk of suicide.

The results also indicated that men were aware that experiencing pain during urination is not normal. This suggests that men recognize pain when urinating as a potential health issue and understand the importance of seeking medical attention.Poor knowledge about the impact of excessive alcohol consumption on one's health was observed in this study. The findings align with those of Valdez et al. (2018) [20], who found that the cultural normalization of heavy drinking in men's social circles makes it difficult to view it as problematic behavior. This suggests that men do not perceive excessive alcohol consumption as a health risk. It also implies that, in social settings where men gather, they may share inaccurate information about the impact of alcohol on health. This raises concerns about the conversations men have in these spaces, as well as the interpretation of health-related messages on alcohol containers and bottles. This also raises concerns about whether alcohol consumers read the health messages on alcohol bottles and containers. When men face issues with alcohol abuse, they tend to seek advice from friends or close drinking buddies rather than consulting a healthcare professional. A peer's advice can significantly influence a man's health-seeking behavior [20]. This finding is consistent with the study by [21], which highlights that, for many men, excessive alcohol consumption is closely linked to perceptions of masculinity.

Healthcare workers were the main source of health information for men. This study's findings concur with the findings of Alduraywish et al. (2020) [22], who discovered that doctors were chosen as the first source of information by the majority of the participants, and they were completely trusted by most of the participants. This complements the health education that healthcare workers provide during treatment sessions and educational campaigns at health facilities and the effectiveness thereof. The internet emerged as the second main source of health information for men. The findings contrast with those of Alduraywish et al. (2020) [22], who found that Internet searches were not considered the primary or secondary source of health information. This discrepancy may be attributed to differences in the literacy levels between the men studied in their research and those in the current study. The findings of the current study suggest that men use the internet to self-diagnose when faced with a condition they do not understand, which may influence them not to visit health facilities to seek assistance. The internet is another platform that can be used to disseminate information about men's health, as most men prefer it for accessing health information. The men in this study perceived their health status to be in good condition. This suggests that perceptions of health status may play a role in men's health-seeking behavior, as they may not feel the need to seek health services when they believe their health is good. Overall, the results of this study indicated that men possess adequate knowledge about their health and perceive their health status to be in good condition. The findings of this study differ from those of Dovel et al. (2020) [23], where men's limited use of health services resulted in minimal exposure to health education. However, although men had adequate knowledge about issues that affect their health, such knowledge was not associated with the use of health services, and only two components of the health awareness tool influenced the use of health services. This suggests that although men possess knowledge about health issues that are likely to affect them, such knowledge does not influence their use of health services. The study findings of Fish et al. (2019) [24] indicated that men who delayed seeking treatment perceived their symptoms as non-troublesome and recurrent, seeking help only when the condition became severe. In another study by Tshuma et al. (2024) [25], lack of education was a barrier to seeking help at health facilities. In this study, given the fact that men had adequate knowledge of health awareness, however, this knowledge did not influence their use of health services. The factors identified by Fish et al. (2019) [24] could be among the reasons why men in this study had health awareness, yet it did not influence their decision to use health services. Furthermore, the study was limited by delays in obtaining permission from headmen to access communities and men, which resulted in respondents being given limited time to complete the questionnaires due to time constraints. Based on the findings, future research should focus on how men apply the general knowledge they possess to maintain their health in good condition. Moreover, future research should focus on men's understanding of their health and detailed views of their health status. The study used convenience sampling, which could limit the generalizability of the results. Future studies could employ random sampling techniques to enhance representativeness and reduce sampling bias. The study could have been improved by utilizing a mixed methods approach to explore the reasons influencing health awareness and knowledge gaps. Future research should employ mixed methods to allow a qualitative exploration of the factors affecting health awareness and knowledge gaps. The study could have been improved by utilizing a mixed methods approach to explore the reasons influencing health awareness and knowledge gaps. Future research should employ mixed methods to allow a qualitative exploration of the factors affecting health awareness and knowledge gaps.

# **CONCLUSION**

The findings of this study revealed that while men are knowledgeable about their health, they lack awareness of the harmful effects of excessive alcohol consumption. Most men obtained health information from healthcare workers and reported perceiving their health status to be in good condition six months prior to the study. Alternative methods of disseminating information about men's health should be explored to ensure that even those who do not visit health facilities or use social media platforms are informed about their health.

# **AUTHORS' CONTRIBUTION**

L.C., L.M., R.T.L: Study conception and design; L.C.:

Data collection; L.C., L.M., R.T.L: Analysis and interpretation of results; L.C.: Draft manuscript. All authors reviewed the results and approved the final version of the manuscript.

### LIST OF ABBREVIATIONS

- SPSS = Statistical Package for Social Sciences
- NCDs = Non Communicable Diseases

SASOP = South African Society of Psychiatrists

# ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted with the ethical approval granted by the University of Venda's Ethics Clearance Committee South Africa (Ethics Approval Number: FHS/21/PH/26/ 1215). The permission to conduct the study was obtained from the Chiefs and headmen of selected communities. Individual participants were given full information about the study, including its purpose and procedures, and gave voluntary informed consent.

# HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

### **CONSENT FOR PUBLICATION**

The permission to conduct the study was obtained from the Chiefs and headmen of selected communities. Individual participants were given full information about the study including its purpose and procedures and gave voluntary informed consent. Individual participants also gave written consent allowing the authors to publish the findings.

### **STANDARDS OF REPORTING**

STROBE guidelines were followed.

### AVAILABILITY OF DATA AND MATERIALS

The data sets used and/or analysed during this study are available from the corresponding author [L.C] upon reasonable request.

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# **CONFLICT OF INTEREST**

The authors declare no conflict of interest, financial or otherwise.

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