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## Health extension workers' perceived health system context and health post preparedness to provide services: A cross-sectional study in four Ethiopian regions

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3 **Health extension workers' perceived health system context and health post**  
4 **preparedness to provide services: A cross-sectional study in four Ethiopian regions**  
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## ABSTRACT

**Context and objective** The health system context influences the implementation of evidence-based practices and quality of health care services. Ethiopia aims at reaching universal health coverage but faces low primary care utilization and substandard quality-of-care. We assessed the health extension workers' perceived context and the preparedness of health posts to provide services.

**Design** Cross-sectional study

**Setting** This study was part of evaluating a complex intervention in 52 districts of four regions of Ethiopia. Data were collected from December 2018 to February 2019. A total of 152 health posts serving selected enumeration areas in these districts were included.

**Outcome measures** We used the Context Assessment for Community Health (COACH) tool and the Service Availability and Readiness Assessment (SARA) tool.

**Results** Internal reliability of COACH was satisfactory. The dimensions *community engagement*, *work culture*, *commitment to work*, and *leadership* all scored high (mean 3.75-4.01 on a 1-5 scale), while *organizational resources*, *sources of knowledge*, and *informal payments* scored low (1.78-2.71). The general service readiness index was 59%. On average, 67% of the health posts had basic amenities to provide services, 81% had basic equipment, 42% had standard precautions for infection prevention, 47% had test capacity for malaria, and 58% had essential medicines.

**Conclusion** The health extension workers had a good relationship with the local community, used data for planning, were highly committed to their work with positive perceptions of their work culture, a relatively positive attitude regarding their leaders, and reported no corruption or informal payments. In contrast, they had insufficient sources of information and a severe lack of resources. The health post preparedness confirmed the low level of resources and preparedness for services. These findings suggest a significant potential contribution by health extension workers to Ethiopia's primary health care, provided that they receive improved support, including new information and essential resources.

**Key words:** Health system context, facility preparedness, health extension workers

### Strengths and limitations of this study

- This study was the first assessment of Ethiopian front-line primary healthcare workers' perceived health system context and the facility preparedness for services.
- Understanding the health system context increases the likelihood of successful implementation of evidence-based practices.
- The Context Assessment for Community Health (COACH) tool has been validated in a range of other low-income countries and was found to have satisfactory internal reliability when translated into three Ethiopian languages.
- Although precautions were taken to obtain valid responses from the interviewed health extension workers, we cannot exclude the risk of respondents' bias.
- The sample represented 52 districts in four Ethiopian regions that participated in a child health services study, and inferences cannot be drawn to the whole country.

## INTRODUCTION

The health system context is essential for new interventions and quality-of-care (1). Health care of poor quality contributes to the high mortality in low- and middle-income countries (2,3). These quality problems have multiple causes, for example, lack of resources and suboptimal interaction between health care providers and clients (4). Thus, there is a growing understanding that the health system context matters for efforts to improve health services quality (5,6). However, we lack consensus on the definition, operationalization, and methods to study context (1).

Therefore, we need systematic ways of assessing the context in which health workers are active (7).

The most frequently used tools and information systems provide structural information, for example, the Service Availability and Readiness Assessment (SARA) tool (8). Mapping the facility preparedness sets the scene, but such assessments are poorly associated with the quality of services provided (9). A meta-review showed that access to information, community engagement, leadership, regulations and standards, organizational capacity, models of care, communication, and work satisfaction are essential for implementing new interventions and quality-of-care (6,10). The Context Assessment for Community Health (COACH) tool was developed and validated in low- and middle-income countries and included many of the context dimensions mentioned above (11).

In Ethiopia, under-five children's primary level services are provided through the health extension program (12). Two female community health workers, known as health extension workers, provide preventative and curative services for a population of 5000. They offer static services from health posts as well as outreach services within the community. Five health posts, their referral health centre, and a primary district-level hospital comprise the primary health care unit (13). Despite the successful implementation of the health extension program, the program is currently facing challenges that

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3 remain to be addressed. These challenges are related to the utilization and quality of services offered  
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5 by the health extension workers and their working and living conditions (14).  
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8 The Ethiopian Ministry of Health aims to increase the primary health care services' access and quality  
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10 through reforms and new initiatives (15,16). One such effort was the Optimizing the Health Extension  
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12 Program intervention to increase the quality and utilization of under-five health services. As part of  
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14 the evaluation of that intervention, we have shown that health extension workers did not follow the  
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16 clinical guidelines for assessing and managing sick children with common illnesses (17). Their ability  
17  
18 to classify childhood illnesses was also low (18). Unfortunately, the intervention, which included  
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20 community engagement, training, supportive supervision, and performance reviews of health workers,  
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22 neither increased care-seeking for sick children (19) nor improved the classification of childhood  
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24 illnesses by these primary health care workers (Getachew T et al, submitted manuscript). The failure  
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26 of such an intervention could, at least partly, be attributed to the context of the health extension  
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28 workers. There is a need for accurate measurements that reflect the health system context in which  
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30 care is provided to patients and populations (20). Therefore, we aimed to assess the health extension  
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32 workers' perceived health system context and the health posts' service readiness in four Ethiopian  
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34 regions.  
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## 39 40 **METHODS**

### 41 42 **Study setting and design**

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44 This study was part of a large project, which assessed a complex intervention's effectiveness to  
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46 increase care-seeking for children under five years. This intervention had three components:  
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48 community engagement, capacity building, and ownership and accountability of child health services.  
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50 The assessment was done in 52 districts of four regions (Amhara, Tigray, Oromia, Southern Nations,  
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52 Nationalities, and Peoples) of Ethiopia with baseline and end-line surveys conducted before and after  
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3 the intervention. This paper used the endline data that was conducted from December 2018 to  
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5 February 2019. The protocol and results of the evaluation have been published (19,21).  
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## 8 **Subjects**

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10 A total of 200 enumeration areas were selected to represent the selected districts in the end-line survey.  
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12 Health posts serving these areas were included in the study, and their preparedness for services was  
13  
14 assessed. One health extension worker at each health post was interviewed, and their perceived context  
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16 was evaluated.  
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## 19 **Study tools**

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21 Two tools were used at facility and provider levels. The provider-level tool aimed to assess the health  
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23 extension workers' perceived context on the service delivery environment. This tool, labelled the  
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25 Context Assessment for Community Health (COACH), has 49 items that measure eight dimensions  
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27 of context (Table 1) (22). The tool was developed in Bangladesh, Vietnam, Uganda, South Africa,  
28  
29 and Nicaragua (11). It also includes demographic questions on age, gender, professional qualification,  
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31 health facility, and years working at the current facility. The tool items were measured on a five-point  
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33 Likert scale ranging from 'strongly disagree' to 'strongly agree'. Items in *source of information* were  
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35 measured for availability and frequency of use. The Brislin model (23) was used to translate the tool  
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37 into Amharic, Oromiffaa, and Tigrigna, including forward translation, review of the translated tool  
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39 backward translation, and comparison of the original and back-translated tools. Conrad and Blair's  
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41 taxonomy (24) was used to describe the problems that appeared in the translations. Accordingly, there  
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43 were six lexical problems with difficulties in the meanings of words, one logical problem, and one  
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45 inclusion or exclusion problem. All identified translation problems were possible to correct.  
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51 Table 1. Definitions of context assessment dimensions in the Context Assessment for Community  
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53 Health tool.  
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Dimensions	Number of items	Definition
<i>Resources</i>	11	The availability of resources (staff, space, time, communication and transport, drugs, equipment and supplies, finance) that allows a unit to adapt successfully to internal and external pressures.
<i>Community engagement</i>	5	The mutual communication, deliberation and activities that occur between community members and units.
<i>Monitoring services for action</i>	5	The process of using data to assess group/team performance.
<i>Sources of knowledge</i>	5	The structures that facilitate the ability to access and use knowledge.
<i>Commitment to work</i>	3	The relative strength of an individual's identification with and involvement in a particular work organization.
<i>Work culture</i>	6	The way that 'we do things' in our organizations and work units. This includes culture of learning and change, and culture of responsibility.
<i>Leadership</i>	6	The actions of formal leaders in an organization (unit).
<i>Informal payment</i>	8	Payments to individuals, which are made outside official payment channels including nepotism, and accountability.

The facility tool aimed at collecting information on the overall facility-level preparedness to provide child health services (Table 2), which was based on the World Health Organization Service Availability and Readiness Assessment reference manual (25). The tool was translated into three local languages (Amharic, Oromiffaa and Tigrigna), pretested and amended.

Table 2. Domains and their items used to construct the health post service availability and readiness.

Domain	Items
Basic amenities	Communication equipment
	Access to adequate sanitation facilities for clients
	Improved water source
	Power supply
Basic equipment	Infant scale
	Thermometer
	Functional stethoscope
	Mid-upper arm circumference tape measure
Standard precautions	Sharps container
	Chlorine bleach
	Bucket for decontamination solution
	Contaminated waste container

	Soap and towel or hand rub
	Alcohol-based hand rub
	Clean glove
Diagnosics	Malaria rapid diagnostic test
Essential medicines	Vitamin A
	Gentamycin
	Amoxicillin susp/tab
	Oral rehydration solution
	Zinc
	Coartem (Artemether Lumefantrine)
	Ready-to-use therapeutic food

## Measurements

We judged the COACH tool's internal consistency with Cronbach alpha (26) that expressed if items in the instrument's different dimensions measured the same thing. Descriptive statistics were used to assess the health extension workers' agreement to the items and dimensions. All items except for source of knowledge were measured on a scale of 1-5, where the scores for item 48 and 49 were reversed to measure in the same direction as other items. The overall agreement was a calculated value drawn by multiplying the number of items in the dimension by four, which was coded as agreement. An individual was considered to agree if her score was above the calculated value.

The general health service readiness score was a composite summary measure calculated by combining information from the five general service readiness domains: basic amenities, standard precautions for infection prevention, basic equipment, diagnostics, and essential medicines (25). For each domain, the average availability of tracer items was revealed as the domain score. Each dimension's mean score was computed to assess the average responses to the included items in the dimension. The analysis was performed using STATA 14.2 statistical package (Stata Corp LP, College Station, TX, USA).

## RESULTS

A total of 165 health posts were assessed, and 154 health extension workers were available for interview. After merging the two datasets, 152 health post and health extension worker data were available for analysis.

### Perceived context

Table 3 presents the average interitem correlation and the Cronbach Alpha coefficients for the eight context dimensions. Almost all dimensions exceeded the commonly accepted standard for satisfactory internal reliability (0.70) for new scales ( $\alpha$  range = 0.51 to 0.89). One dimension (*source of knowledge*,  $\alpha = 0.51$ ) did not meet this standard. The average inter-item correlation ranged from 0.17 to 0.59. The ideal range of average inter-item correlation is 0.15 to 0.50; less than 0.15 indicates that items are not well correlated and don't measure the same idea very well. More than 0.50 means that items are close, almost repetitive.

The mean scores of the COACH dimensions on a scale of 1-5 are presented in table 3. The dimensions *community engagement*, *work culture*, *commitment to work*, and *leadership* all scored high (mean 3.75-4.01 on the 1-5 scale), while *organizational resources*, *sources of knowledge*, and *informal payments* scored low (1.78-2.71). These findings indicate that the health extension workers neither perceived themselves as having sufficient resources to conduct their work nor to have access to new knowledge.

Table 3. Summary of perceived context of health extension workers and the internal consistency of the Context Assessment for Community Health tool. Survey in four Ethiopian regions, 2018. (N=152)

Dimensions	Number of items	Mean (SD)	Cronbach alpha	Average interitem correlation
<i>Resources</i>	11	2.60 (0.60)	0.7620	0.2255
<i>Community engagement</i>	5	4.01 (0.58)	0.8813	0.5975
<i>Monitoring services for action</i>	5	3.75 (0.70)	0.8678	0.5676
<i>Sources of knowledge</i>	5	2.71 (0.79)	0.5053	0.1696
<i>Commitment to work</i>	3	3.79 (0.79)	0.7976	0.5677
<i>Work culture</i>	6	3.89 (0.51)	0.7683	0.3559
<i>Leadership</i>	6	3.79 (0.60)	0.8771	0.5432

<i>Informal payment</i>	8	1.78 (0.56)	0.8427	0.4011
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Table 4 depicts the percentage of each item included in the eight context dimensions. Most of the health extension workers reported disagreement on the availability of financial resources. They also disagreed to having access to communication and transport.

Table 4. Percentage of items and dimensions of the Context Assessment for Community Health tool in four Ethiopian regions, 2018 (N=152).

<i>Resource</i>	Disagree	Neutral	Agree
1. My unit has enough workers with the right training and skills to do everything that needs to be done.	52	3	45
2. My unit has enough workers with the right training and skills to do their job in the best possible way.	52	2	46
3. My unit has enough space to provide healthcare services.	51	2	47
4. My unit has access to the transport and fuel that are needed to provide healthcare services.	88	0	13
5. My unit has access to the communication tools (e.g., telephone or radio) that are needed to provide healthcare services.	84	2	14
6. My unit has enough medicine to provide healthcare services.	48	2	50
7. My unit has enough functional equipment, such as a thermometer and blood pressure cuff, to provide healthcare services.	49	4	47
8. My unit has enough disposable medical equipment, such as syringes, gloves and needles, to provide healthcare services.	30	0	70
9. If the workload increases, my unit can get additional resources such as medicine and equipment.	45	2	53
10. My unit receives money according to an established financial plan.	84	2	14
11. My unit has money that we can decide how to use.	91	3	6
<i>Community engagement</i>			
12. In my unit we ask community members what they think about the healthcare services that we provide.	7	0	93
13. In my unit we listen to what community members think about the healthcare services we provide.	4	1	95
14. In my unit we have meetings with community members to discuss health matters.	5	1	93
15. In my unit we encourage community members to contribute to improving the health of the community.	3	1	96
16. In my unit we encourage other organizations to contribute to improving the health of the community.	11	0	89
<i>Monitoring services for action</i>			
17. I receive regular updates about my unit's performance based on information/data collected from our unit.	14	3	84
18. My unit discusses information/data from our unit in a regular, formal way, such as in regularly scheduled meetings.	11	7	82
19. My unit regularly uses unit information/data to make plans for improving its healthcare services.	13	4	84
20. My unit regularly monitors its work by comparing it with the unit's action plans.	13	5	83
21. My unit regularly compares its work with national or other guidelines.	16	2	82
<i>Commitment to work</i>			
27. I am proud to work in this unit.	21	3	76
28. I am satisfied to work in this unit.	16	5	80
29. I feel encouraged to do my very best at work.	7	3	89
<i>Work culture</i>			

30. My unit is willing to use new healthcare practices such as guidelines and recommendations.	4	1	95			
31. My unit helps me to improve and develop my skills.	28	2	70			
32. I am encouraged to seek new information on healthcare practices.	20	3	78			
33. My unit works for the good of the clients and puts their needs first.	6	1	93			
34. Members of the unit feel personally responsible for improving healthcare services.	6	0	94			
35. Members of the unit approach clients with respect.	2	2	96			
<i>Leadership</i>						
36. I trust the unit leader.	7	3	91			
37. The leader handles stressful situations calmly.	12	4	84			
38. The leader actively listens, acknowledges, and then responds to requests and concerns.	11	4	85			
39. The leader effectively resolves any conflicts that arise.	14	5	82			
40. The leader encourages the introduction of new ideas and practices.	13	4	83			
41. The leader makes things happen.	11	5	85			
<i>Informal payment</i>						
42. Clients must always give informal payment to health workers to access healthcare services.	97	1	3			
43. Clients are treated more quickly if they make informal payments to health workers.	98	0	2			
44. Medicines or equipment that should be available for free to clients have been sold in my unit.	97	1	3			
45. Health workers are sometimes absent from work earning money at other places.	97	1	2			
46. Health workers in my unit give healthcare services to friends and family first.	95	1	3			
47. Health workers in my unit give jobs or other benefits to friends and family first.	97	1	3			
48. Efforts are made to stop clients from providing informal payment to get appropriate healthcare services.	21	7	72			
49. Efforts are made to stop health workers from asking clients for informal payment.	21	8	71			
<i>Sources of knowledge</i>						
	Not available	Never, 0 times	Rarely 1-5 times	Occasionally 6-10 times	Frequently 11-15 times	Almost always 16 times or more
22. Clinical practice guidelines	15	4	18	16	16	32
23. Other printed material for work (e.g., textbooks, journals)	18	9	25	30	14	5
24. The Internet	68	25	5	1	0	1
25. Electronic decision support (e.g., mobile phone applications or other electronic devices to assist with care and decision-making)	56	30	3	5	5	2
26. In-service training/ workshops/courses	25	14	19	28	10	4

Figure 1 depicts the percentage of average scores for the context dimensions. Very few (2.6%) perceived their facility to have enough resources available to manage their work. Most respondents (83.6%) perceived that their facility had active communication with members of their communities. Sixty-six percent on average responded agreement for the *work culture* dimension, implying that they considered their *work culture* to support learning, change, and responsibility. A very high proportion

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3 of respondents (98.7%) regarded *informal payment* for health workers not to be acceptable in their  
4 facility.  
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9 Figure 1: Percent agreement to dimensions in the Context Assessment for Community Health tool.  
10 Health extension workers in four Ethiopian regions, 2018 (N=152).  
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13 There was no difference in context dimensions between intervention and comparison areas in the  
14 evaluation's end-line survey (all  $p > 0.05$ ). The exact percentage for each item is found Supplemented  
15 (table S1).  
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### 18 **General facility-level readiness**

19  
20 Figure 2 shows the general service readiness index and domain scores. The general service readiness  
21 index was 59%, implying that six in ten health posts were ready to provide child health services. On  
22 average, about two-thirds (67%) of health posts had basic amenities to provide services, 81% had  
23 basic equipment required, 42% had standard precautions for infection prevention, 47% had diagnostic  
24 test capacity for malaria RDT, and 58% had essential medicines. The basic equipment mean score  
25 was the highest across the five domains, and the diagnostic mean score index was the lowest.  
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29 Figure 2 also shows the percentage of health posts having all tracer items available to provide general  
30 child health services. Accordingly, only 1% of health posts had all essential medicines. Half of the  
31 health posts had all tracer items for basic equipment. Three in ten health posts had all items for basic  
32 amenities.  
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36 Figure 2: Percentage of health posts with tracer items available to provide general service in four  
37 regions of Ethiopia, 2018 (N=152)  
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## 45 **DISCUSSION**

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3 We have described the Ethiopian health extension workers' perceived context and the health posts'  
4 preparedness to provide child health services. The health extension workers perceived that they had a  
5 good relationship with the local community. They were active in using data for planning and  
6 performance, were highly committed to their work and had positive perceptions of their work culture.  
7 They also had a relatively positive experience of their leaders and reported no corruption or informal  
8 payments. In contrast, they reported having insufficient information sources and a severe lack of  
9 resources to perform their work. The latter was also reflected in the health post preparedness  
10 assessment, which overall was on a low level.  
11

12 So far, there is no consensus on defining or assessing the health system context (27). Several  
13 contextual factors are associated with quality improvement, like leadership, organizational culture,  
14 information system, and organizational structure. However, there are uncertainties regarding  
15 definitions and measurements (28). Qualitative studies have contributed to the understanding of the  
16 health system context and quality of care. In this study, we quantified the perceived context and  
17 compared it with health post preparedness. The COACH tool was developed in five countries. Later,  
18 it has been used in Mozambique (29), and now in four different Ethiopian regions and three languages.  
19 Except for the sources of knowledge dimension, all other COACH tool dimensions showed good  
20 internal reliability.  
21

22 The health extension workers lacked sources of new knowledge. Internet, e-health, or m-health  
23 applications were absent (29). Importantly, their responses indicated that they lacked in-service  
24 training, workshops, and courses. Insufficient sources of knowledge could lead to inappropriate  
25 diagnosis and mismanagement, such as the irrational use of antibiotics. An earlier study conducted in  
26 the same study area indicated that the health extension workers' clinical assessment, classification,  
27 and management of sick children did not follow the clinical guidelines (17). This low adherence could  
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3 lead to misdiagnoses and a lack of potentially life-saving treatments. Capacity building could be  
4 achieved through refresher training, followed by supportive supervision.  
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8 The health extension workers reportedly had good contact with the community they served. This  
9 engagement could help to enhance the health extension workers' accountability and dedication. A  
10 study conducted in southern Ethiopia indicated that with focused training, guidance, and regular  
11 supportive supervision, the health extension workers enhanced community participation (30). A  
12 qualitative study in southern Ethiopia revealed that health extension workers' relationships with the  
13 community could be constrained due to inadequate support systems, lack of trust, communication,  
14 dialogue, and differing expectations (31).  
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17 We also found that commitment to work was relatively good. A combination of financial and non-  
18 financial incentives is required to support motivation and satisfaction (32). Non-financial incentives,  
19 such as creating career opportunities, may increase the motivation and retention of health extension  
20 workers (33).  
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23 Informal payments were perceived to be very rare. Informal payments or various forms of corruption  
24 could have significant adverse effects on the health system, affecting patients and service providers  
25 (34). A study in Tanzania showed that informal payments existed and were negatively associated with  
26 job satisfaction and motivation (35).  
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29 The health posts in the study area seemed to have moderate service readiness, especially basic  
30 amenities and equipment. However, health posts did not have the essential medicines to provide child  
31 care. These facilities are the first contact for primary care, which provides basic health and medical  
32 care close to the community, especially in rural populations (14). These first-line services can  
33 potentially respond to a range of health challenges in low-income countries (36), but only if proper  
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3 attention is given to needs, such as essential medicines, in addition to infrastructure and basic  
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5 equipment. To meet such requirements is vital for a resilient health system (37).  
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8 We have earlier shown that health extension workers' ability to classify childhood illnesses was low  
9  
10 (18). The evaluation of the Optimizing the Health Extension Program intervention's effectiveness  
11  
12 showed no effect on the utilization of services for sick children (19). The lack of effect could partly  
13  
14 be attributed to delays, interruptions, and an overall short implementation period of a complex  
15  
16 intervention. Complex interventions that aim to change health services and care-seeking for sick  
17  
18 children may need an extended implementation period (38). Lack of effect could also be due to some  
19  
20 of these contextual factors necessary for improving quality.  
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23  
24 The context in which the services are provided is essential for implementing changes or new  
25  
26 programmes. However, contextual factors are generally not well understood. Before this study, no  
27  
28 assessments of different aspects of the health system context have been done in Ethiopia. A study  
29  
30 conducted in six European countries found that structure and process indicators explained more  
31  
32 variability in client satisfaction than contextual factors (39). A systematic review concluded that  
33  
34 contextual factors might influence the effectiveness of quality improvement interventions (40).  
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38 We report the first study in Ethiopia of primary healthcare workers' perceived health system context.  
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40 The Context Assessment for Community Health tool has been validated in a range of other low-  
41  
42 income countries (11) and was also found to have satisfactory internal reliability when translated into  
43  
44 three Ethiopian languages. Understanding context can identify factors that promote or hinder the  
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46 implementation of evidence-based practices, increasing the likelihood of successful implementation.  
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48 Although precautions were taken to obtain valid responses from the interviewed health extension  
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50 workers, the results could be susceptible to bias. The sample represented a large number of districts  
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3 in four Ethiopian regions that participated in a child health services study, but inferences cannot be  
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5 drawn to the whole country.  
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## 8 9 **CONCLUSION**

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11 The Ethiopian health extension workers' perceived context showed a severe lack of resources. They  
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13 perceived a good relationship with the local community, used data for planning but lacked access to  
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15 new knowledge. They were highly committed to work and had positive perceptions of their work  
16  
17 culture and a relatively positive attitude regarding their leaders. There was no corruption or informal  
18  
19 payments at their work sites. The internal consistency of the context assessment tool provided  
20  
21 evidence of its ability to measure its different dimensions. This feature will allow for tailoring  
22  
23 implementation strategies and assessing context as part of evaluations. The health extension workers'  
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25 perceptions of sources of information and available resources were in line with the results of the health  
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27 facility preparedness.  
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### **Data availability statement**

Data are available up on request. Request for data can be made to Della Berhanu ([della.berhanu@lshtm.ac.uk](mailto:della.berhanu@lshtm.ac.uk)). Data sharing policy has been developed. All requests will be reviewed by data sharing committee and if granted, data will be shared without any identifiers.

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### **Contributors**

TG, SMA, MY, LAP, and DB conceptualized the design of the study. TG analysed the data; TG, SMA, MY, AB, LAP, and DB provided review of the methodology and interpret the results; All authors contributed to the writing of this paper and all have read and approved the final manuscript.

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### **Conflict of interest**

None.

### **Patient and public involvement**

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

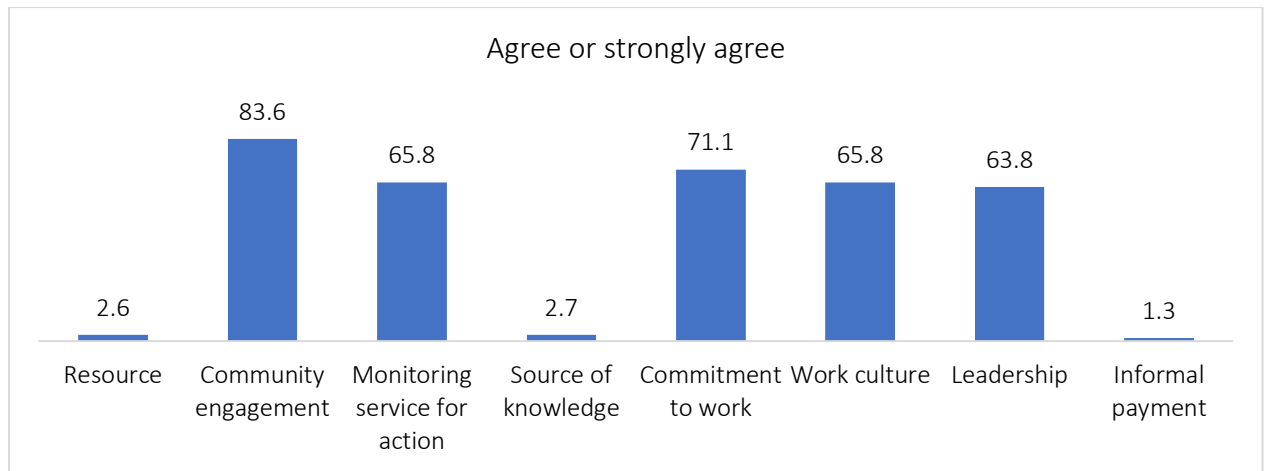
### **Ethical considerations**

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3 Ethical approvals were obtained from the University of Gondar (Ref O/V/P/RCS/05/371/2018), the  
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5 Ethiopian Public Health Institute (Ref 613/52), and the London School of Hygiene and Tropical  
6  
7 Medicine (Ref 16117). Information sheets were translated into the local languages Amharic,  
8  
9 Oromiffaa, and Tigrigna and read to obtain written informed consent.  
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### 12 **Figure legend**

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14  
15 Figure 1: Percent agreement to dimensions in the Context Assessment for Community Health tool.  
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17 Health extension workers in four Ethiopian regions, 2018 (N=152).

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19 Figure 2: Percentage of health posts with tracer items available to provide general service in four  
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21 regions of Ethiopia, 2018 (N=152)  
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19 Figure 1: Percentage of average score for items of the context assessment for community health  
20 workers tool in four regions of Ethiopia, 2018 (N=152).  
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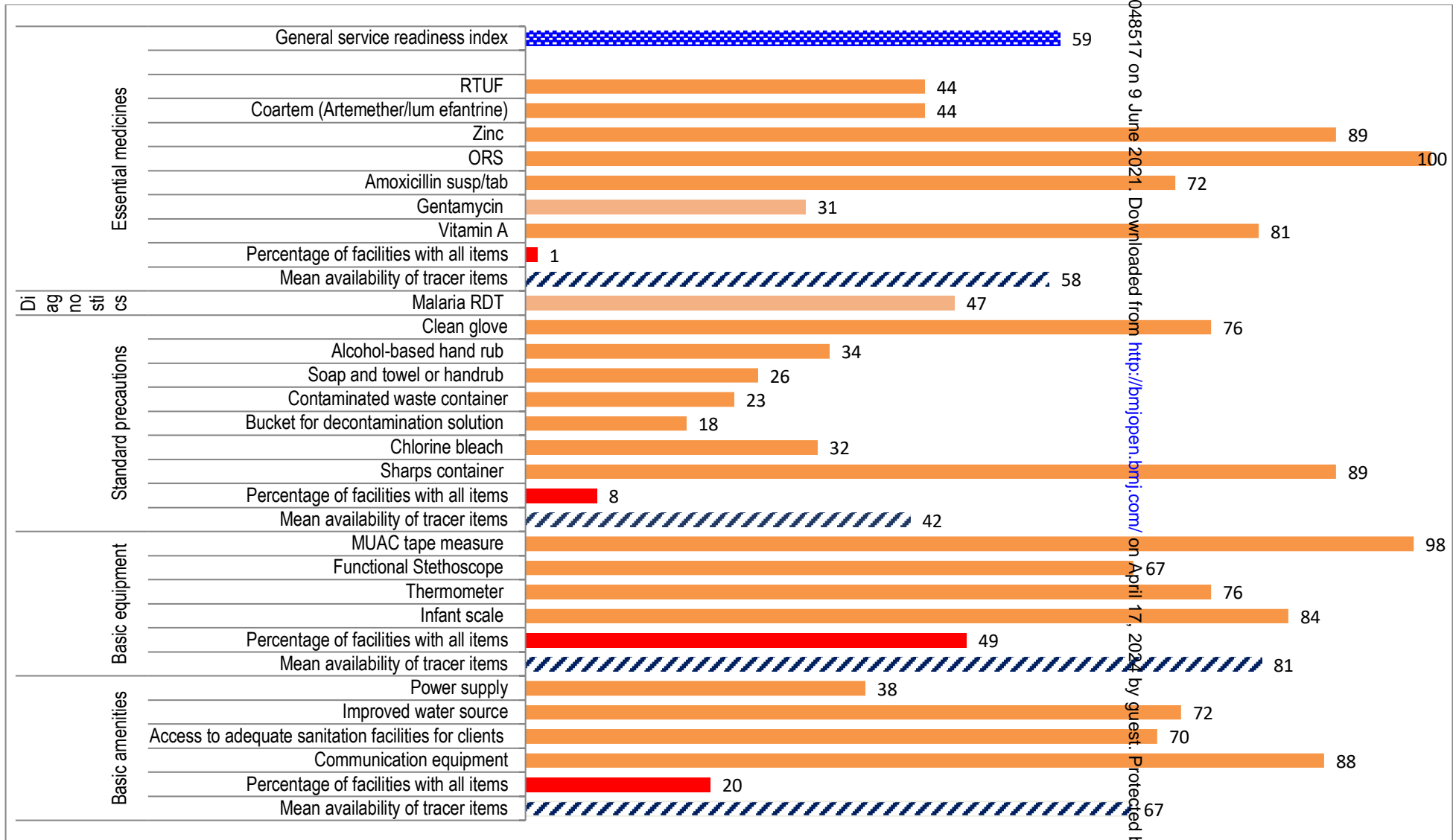









Figure 2: Percentage of health posts with tracer items available to provide general service in four regions of Ethiopia, 2018 (N=152)

Supplemental Table S1. Association between context dimensions and interventions and comparison areas in four regions of Ethiopia, 2018 (N=152).

Dimensions		Comparison (N=74)	Intervention (N=78)	Fisher's exact test
<i>Resource</i>	Agree	2.7	2.6	1
	Disagree	97.3	97.4	
<i>Community engagement</i>	Agree	78.4	88.5	0.125
	Disagree	21.6	11.5	
<i>Monitoring service for action</i>	Agree	58.1	73.1	0.061
	Disagree	41.9	26.9	
<i>Source of knowledge</i>	Agree	2.7	2.7	1
	Disagree	97.3	97.3	
<i>Commitment to work</i>	Agree	66.2	75.6	0.215
	Disagree	33.8	24.4	
<i>Work culture</i>	Agree	64.9	66.7	0.865
	Disagree	35.1	33.3	
<i>Leadership</i>	Agree	60.8	66.7	0.501
	Disagree	39.2	33.3	
<i>Informal payment</i>	Agree	1.4	1.3	1
	Disagree	98.7	98.7	

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Reported	Page number
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract		1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found		2
<b>Introduction</b>				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported		4-5
Objectives	3	State specific objectives, including any prespecified hypotheses		5
<b>Methods</b>				
Study design	4	Present key elements of study design early in the paper		5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection		5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants		6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable		6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group		8
Bias	9	Describe any efforts to address potential sources of bias		8
Study size	10	Explain how the study size was arrived at		6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why		6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses		8
<b>Results</b>				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed		9
		(b) Give reasons for non-participation at each stage		9
		(c) Consider use of a flow diagram		
Descriptive data	14*	(a) Give characteristics of study participants (eg		9

		demographic, clinical, social) and information on exposures and potential confounders		
		(b) Indicate number of participants with missing data for each variable of interest		
Outcome data	15*	Report numbers of outcome events or summary measures		9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included		10-12
		(b) Report category boundaries when continuous variables were categorized		
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		
<b>Discussion</b>				
Key results	18	Summarise key results with reference to study objectives		13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence		13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results		15
<b>Other information</b>				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based		22

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

# BMJ Open

## Health extension workers' perceived health system context and health post preparedness to provide services: A cross-sectional study in four Ethiopian regions

Journal:	<i>BMJ Open</i>
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Complete List of Authors:	Getachew, Theodros ; Ethiopian Public Health Institute; University of Gondar College of Medicine and Health Sciences, Institute of Public Health Abebe, Solomon; University of Gondar College of Medicine and Health Sciences, Institute of Public Health Yitayal, Mezgebu ; University of Gondar, Health Services Management and Health Economics Bergström, Anna; Uppsala Universitet Persson, Lars; London School of Hygiene & Tropical Medicine; Ethiopian Public Health Institute Berhanu, Della; London School of Hygiene & Tropical Medicine, Disease Control; Ethiopian Public Health Institute
<b>Primary Subject Heading</b>:	Health services research
Secondary Subject Heading:	Public health
Keywords:	Quality in health care < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Organisation of health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, International health services < HEALTH SERVICES ADMINISTRATION & MANAGEMENT

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3 1 **Health extension workers' perceived health system context and health post**  
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5 2 **preparedness to provide services: A cross-sectional study in four Ethiopian regions**  
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10 5 Theodros Getachew<sup>1,2</sup>, Solomon Mekonnen Abebe<sup>2</sup>, Mezgebu Yitayal<sup>2</sup>, Anna Bergström<sup>3</sup>,  
11 6 Lars Åke Persson<sup>1,4</sup>, Della Berhanu<sup>1,4</sup>  
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## 38 ABSTRACT

39 **Objective:** The health system context influences the implementation of evidence-based practices and  
40 quality of health care services. Ethiopia aims at reaching universal health coverage but faces low  
41 primary care utilisation and substandard quality-of-care. We assessed the health extension workers'  
42 perceived context and the preparedness of health posts to provide services.

43 **Setting:** This study was part of evaluating a complex intervention in 52 districts of four regions of  
44 Ethiopia. This paper used the endline data collected from December 2018 to February 2019.

45 **Participants:** A total of 152 health posts and health extension workers serving selected enumeration  
46 areas were included.

47 **Outcome measures:** We used the Context Assessment for Community Health (COACH) tool and the  
48 Service Availability and Readiness Assessment (SARA) tool.

49 **Results:** Internal reliability of COACH was satisfactory. The dimensions *community engagement*,  
50 *work culture*, *commitment to work*, and *leadership* all scored high (mean 3.75-4.01 on a 1-5 scale),  
51 while *organizational resources*, *sources of knowledge*, and *informal payments* scored low (1.78-2.71).  
52 The general service readiness index was 59%. On average, 67% of the health posts had basic amenities  
53 to provide services, 81% had basic equipment, 42% had standard precautions for infection prevention,  
54 47% had test capacity for malaria, and 58% had essential medicines.

55 **Conclusion:** The health extension workers had a good relationship with the local community, used  
56 data for planning, were highly committed to their work with positive perceptions of their work culture,  
57 a relatively positive attitude regarding their leaders, and reported no corruption or informal payments.  
58 In contrast, they had insufficient sources of information and a severe lack of resources. The health  
59 post preparedness confirmed the low level of resources and preparedness for services. These findings  
60 suggest a significant potential contribution by health extension workers to Ethiopia's primary health  
61 care, provided that they receive improved support, including new information and essential resources.

62  
63 **Key words:** Health system context, facility preparedness, health extension workers

64  
65

## 66 **Strengths and limitations of this study**

- 67 • This study was the first assessment of Ethiopian front-line primary healthcare workers’  
68 perceived health system context and the facility preparedness for services.
- 69 • Understanding the health system context increases the likelihood of successful implementation  
70 of evidence-based practices.
- 71 • The Context Assessment for Community Health (COACH) tool has been validated in a range  
72 of other low-income countries and was found to have satisfactory internal reliability when  
73 translated into three Ethiopian languages.
- 74 • Although precautions were taken to obtain valid responses from the interviewed health  
75 extension workers, we cannot exclude the risk of respondents’ bias.
- 76 • The sample represented 52 districts in four Ethiopian regions that participated in a child health  
77 services study, and inferences cannot be drawn to the whole country.

78

## 79 INTRODUCTION

80 The health system context is essential for new interventions and quality-of-care [1]. Health care of  
81 poor quality contributes to the high mortality in low- and middle-income countries [2, 3]. These  
82 quality problems have multiple causes, for example, lack of resources and suboptimal interaction  
83 between health care providers and clients [4]. Thus, there is a growing understanding that the health  
84 system context matters for efforts to improve health services quality [5, 6]. However, we lack  
85 consensus on the definition, operationalisation, and methods to study context [1].  
86 Therefore, we need systematic ways of assessing the context in which health workers are active [7].  
87 The most frequently used tools and information systems provide structural information, for example,  
88 the Service Availability and Readiness Assessment (SARA) tool [8]. Mapping the facility  
89 preparedness sets the scene, but such assessments are poorly associated with the quality of services  
90 provided [9]. A meta-review showed that access to information, community engagement, leadership,  
91 regulations and standards, organisational capacity, models of care, communication, and work  
92 satisfaction are essential for implementing new interventions and quality-of-care [6, 10]. The Context  
93 Assessment for Community Health (COACH) tool was developed and validated in low- and middle-  
94 income countries and included many of the context dimensions mentioned above [11].  
95 In Ethiopia, primary-level services for under-five children are provided through the health extension  
96 programme [12, 13]. This programme is a community-based strategy to expand access to basic health  
97 promotion, disease prevention, and selected curative health services [14]. The programme is operated  
98 by the health extension workers at the community level [15]. Two female community health workers,  
99 known as health extension workers, provide preventative and curative services for a population of  
100 5000. They offer static services from health posts as well as outreach services within the community  
101 [16]. The health extension workers are recruited from the community they serve and deployed to

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3 102 service after a 1-year formal pre-service training provided after completing 10th grade of formal  
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5 103 education [14]. Five health posts, their referral health centre, and a primary district-level hospital  
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7 104 comprise the primary health care unit [17]. Health posts are the most peripheral units, providing  
8  
9 105 mainly preventive care and selected curative services [18]. Despite the successful implementation of  
10  
11 106 the health extension program, the program is currently facing challenges that remain to be addressed.  
12  
13 107 These challenges are related to the utilisation and quality of services offered by the health extension  
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15 108 workers and their working and living conditions [19].

16  
17 109 The Ethiopian Ministry of Health aims to increase the primary health care services' access and quality  
18  
19 110 through reforms and new initiatives [20, 21]. One such effort was the Optimizing the Health Extension  
20  
21 111 Program intervention to increase the quality and utilisation of health services for under-five children.  
22  
23 112 As part of the evaluation of that intervention, we have shown that health extension workers did not  
24  
25 113 follow the clinical guidelines for assessing and managing sick children with common illnesses [22].  
26  
27 114 Their ability to classify childhood illnesses was also low [23]. Unfortunately, the intervention, which  
28  
29 115 included community engagement, training, supportive supervision, and performance reviews of health  
30  
31 116 workers, neither increased care-seeking for sick children [24] nor improved the classification of  
32  
33 117 childhood illnesses by these primary health care workers [25]. The failure of such an intervention  
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35 118 could, at least partly, be attributed to the context of the health extension workers. There is a need for  
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37 119 accurate measurements that reflect the health system context in which care is provided to patients and  
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39 120 populations [26]. Therefore, we aimed to assess the health extension workers' perceived health system  
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41 121 context and the health posts' service readiness in four Ethiopian regions.

## 42 122 **METHODS**

### 43 123 **Study setting and design**

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3 124 This study was part of a large project, which assessed a complex intervention's effectiveness to  
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5 125 increase care-seeking for children under five years. This intervention had three components:  
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7 126 community engagement, capacity building, and ownership and accountability of child health services.  
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10 127 The assessment was done in 52 districts of four regions (Amhara, Tigray, Oromia, Southern Nations,  
11  
12 128 Nationalities, and Peoples) of Ethiopia with baseline and end-line surveys conducted before and after  
13  
14 129 the intervention. This paper used the endline data that was conducted from December 2018 to  
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16  
17 130 February 2019. The protocol and results of the evaluation have been published [24, 27].  
18

### 19 131 **Subjects**

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21 132 A total of 200 enumeration areas were selected to represent the selected districts in the end-line survey.  
22  
23 133 Health posts serving these areas were included in the study, and their preparedness for services was  
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25  
26 134 assessed. One health extension worker at each health post was interviewed, and their perceived context  
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28 135 was evaluated. We considered datasets with information from health posts as well as their respective  
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31 136 health extension workers.  
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### 33 137 **Study tools**

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35 138 Two tools were used at facility and provider levels. The provider-level tool aimed to assess the health  
36  
37 139 extension workers' perceived context on the service delivery environment. The tool, labelled the  
38  
39 140 Context Assessment for Community Health (COACH), has 49 items that measure eight dimensions  
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42 141 of context (Table 1) [28]. The tool was developed in Bangladesh, Vietnam, Uganda, South Africa,  
43  
44 142 and Nicaragua [11]. It also includes demographic questions on age, gender, professional qualification,  
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46  
47 143 health facility, and years working at the current facility. The tool items were measured on a five-point  
48  
49 144 Likert scale ranging from 'strongly disagree' to 'strongly agree'. Items in *source of information* were  
50  
51 145 measured for availability and frequency of use. The Brislin model [29] was used to translate the tool  
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54 146 into Amharic, Oromiffaa, and Tigrigna, including forward translation, review of the translated tool,  
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147 backward translation, and comparison of the original and back-translated tools. The forward  
 148 translation was done by a professional translator. The review, backward translation, and comparisons  
 149 were done by a group of experts, including the study team. Conrad and Blair's taxonomy [30] was  
 150 used to describe the problems that appeared in the translations. Accordingly, there were six lexical  
 151 problems with difficulties in the meanings of words, one logical problem, and one inclusion or  
 152 exclusion problem. All identified translation problems were possible to correct.

153 Table 1. Definitions of context assessment dimensions in the Context Assessment for Community  
 154 Health tool.

Dimensions	Number of items	Definition
<i>Resources</i>	11	The availability of resources (staff, space, time, communication and transport, drugs, equipment and supplies, finance) that allows a unit to adapt successfully to internal and external pressures.
<i>Community engagement</i>	5	The mutual communication, deliberation and activities that occur between community members and units.
<i>Monitoring services for action</i>	5	The process of using data to assess group/team performance.
<i>Sources of knowledge</i>	5	The structures that facilitate the ability to access and use knowledge.
<i>Commitment to work</i>	3	The relative strength of an individual's identification with and involvement in a particular work organization.
<i>Work culture</i>	6	The way that 'we do things' in our organizations and work units. This includes culture of learning and change, and culture of responsibility.
<i>Leadership</i>	6	The actions of formal leaders in an organization (unit).
<i>Informal payment</i>	8	Payments to individuals, which are made outside official payment channels including nepotism, and accountability.

155  
 156 The facility tool aimed at collecting information on the overall facility-level preparedness to provide  
 157 child health services (Table 2), which was based on the World Health Organization Service  
 158 Availability and Readiness Assessment reference manual [31]. The tool was translated into three local  
 159 languages (Amharic, Oromiffaa and Tigrigna), pretested and amended.



160 Table 2. Domains and their items used to construct the health post service availability and readiness.

Domain	Items
Basic amenities	Communication equipment
	Access to adequate sanitation facilities for clients
	Improved water source
	Power supply
Basic equipment	Infant scale
	Thermometer
	Functional stethoscope
	Mid-upper arm circumference tape measure
Standard precautions	Sharps container
	Chlorine bleach
	Bucket for decontamination solution
	Contaminated waste container
	Soap and towel or hand rub
	Alcohol-based hand rub
Diagnostics	Clean glove
Essential medicines	Malaria rapid diagnostic test
	Vitamin A
	Gentamycin
	Amoxicillin susp/tab
	Oral rehydration solution
	Zinc
	Coartem (Artemether Lumefantrine)
Ready-to-use therapeutic food	

161 **Measurements**

162 We judged the COACH tool's internal consistency with Cronbach alpha [32] that expressed if items  
 163 in the instrument's different dimensions measured the same thing. Descriptive statistics were used to  
 164 assess the health extension workers' agreement to the items and dimensions. All items except for  
 165 source of knowledge were measured on a scale of 1-5, where the scores for item 48 and 49 were  
 166 reversed to measure in the same direction as other items. The overall agreement was a calculated value  
 167 drawn by multiplying the number of items in the dimension by four, which was coded as agreement.  
 168 An individual was considered to agree if her score was above the calculated value.

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3 169 The general health service readiness score was a composite summary measure calculated by  
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5 170 combining information from the five general service readiness domains: basic amenities, standard  
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7 171 precautions for infection prevention, basic equipment, diagnostics, and essential medicines [31]. For  
8  
9 172 each domain, the average availability of tracer items was revealed as the domain score. Each  
10  
11 173 dimension's mean score was computed to assess the average responses to the included items in the  
12  
13 174 dimension. The analysis was performed using STATA 14.2 statistical package (Stata Corp LP,  
14  
15 175 College Station, TX, USA).

### 19 176 **Patient and public involvement**

20  
21 177 Patients or the public were not involved in the design or conduct, or reporting or dissemination plans  
22  
23 178 of this research.

## 26 179 **RESULTS**

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29 180 Of the 200 enumeration areas, 20 were not included due to local unrest. The remaining 180  
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31 181 enumeration areas were served by 165 health posts. A total of 165 health posts were assessed, and 154  
32  
33 182 health extension workers were available for interview. Eleven health posts did not have data on their  
34  
35 183 respective health extension workers and two health extension workers were interviewed without their  
36  
37 184 respective health post data. After merging the two datasets, 152 health post and health extension  
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39 185 worker data were available for analysis.

### 43 186 **Perceived context**

44  
45 187 Table 3 presents the average interitem correlation and the Cronbach Alpha coefficients for the eight  
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47 188 context dimensions. Almost all dimensions exceeded the commonly accepted standard for satisfactory  
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49 189 internal reliability (0.70) for new scales ( $\alpha$  range = 0.51 to 0.89). One dimension (*source of knowledge*,  
50  
51 190  $\alpha = 0.51$ ) did not meet this standard. The average inter-item correlation ranged from 0.17 to 0.59. The  
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53 191 ideal range of average inter-item correlation is 0.15 to 0.50; less than 0.15 indicates that items are not  
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192 well correlated and don't measure the same idea very well. More than 0.50 means that items are close,  
193 almost repetitive.

194 The mean scores of the COACH dimensions on a scale of 1-5 are presented in table 3. The dimensions  
195 *community engagement, work culture, commitment to work, and leadership* all scored high (mean  
196 3.75-4.01 on the 1-5 scale), while *organizational resources, sources of knowledge, and informal*  
197 *payments* scored low (1.78-2.71). These findings indicate that the health extension workers neither  
198 perceived themselves as having sufficient resources to conduct their work nor to have access to new  
199 knowledge.

200 Table 3. Summary of perceived context of health extension workers and the internal consistency of  
201 the Context Assessment for Community Health tool. Survey in four Ethiopian regions, 2018. (N=152)

Dimensions	Number of items	Mean (SD)	Cronbach alpha	Average interitem correlation
<i>Resources</i>	11	2.60 (0.60)	0.7620	0.2255
<i>Community engagement</i>	5	4.01 (0.58)	0.8813	0.5975
<i>Monitoring services for action</i>	5	3.75 (0.70)	0.8678	0.5676
<i>Sources of knowledge</i>	5	2.71 (0.79)	0.5053	0.1696
<i>Commitment to work</i>	3	3.79 (0.79)	0.7976	0.5677
<i>Work culture</i>	6	3.89 (0.51)	0.7683	0.3559
<i>Leadership</i>	6	3.79 (0.60)	0.8771	0.5432
<i>Informal payment</i>	8	1.78 (0.56)	0.8427	0.4011

202 Table 4 and 5 depicts the percentage of each item included in the eight context dimensions. Most of  
203 the health extension workers reported disagreement on the availability of financial resources. They  
204 also disagreed to having access to communication and transport.

205 Table 4. Percentage of items and dimensions of the Context Assessment for Community Health tool  
206 in four Ethiopian regions, 2018 (N=152).

Resource	Disagree	Neutral	Agree
1. My unit has enough workers with the right training and skills to do everything that needs to be done.	52	3	45
2. My unit has enough workers with the right training and skills to do their job in the best possible way.	52	2	46
3. My unit has enough space to provide healthcare services.	51	2	47
4. My unit has access to the transport and fuel that are needed to provide healthcare services.	88	0	13

5. My unit has access to the communication tools (e.g., telephone or radio) that are needed to provide healthcare services.	84	2	14
6. My unit has enough medicine to provide healthcare services.	48	2	50
7. My unit has enough functional equipment, such as a thermometer and blood pressure cuff, to provide healthcare services.	49	4	47
8. My unit has enough disposable medical equipment, such as syringes, gloves and needles, to provide healthcare services.	30	0	70
9. If the workload increases, my unit can get additional resources such as medicine and equipment.	45	2	53
10. My unit receives money according to an established financial plan.	84	2	14
11. My unit has money that we can decide how to use.	91	3	6
<i>Community engagement</i>			
12. In my unit we ask community members what they think about the healthcare services that we provide.	7	0	93
13. In my unit we listen to what community members think about the healthcare services we provide.	4	1	95
14. In my unit we have meetings with community members to discuss health matters.	5	1	93
15. In my unit we encourage community members to contribute to improving the health of the community.	3	1	96
16. In my unit we encourage other organizations to contribute to improving the health of the community.	11	0	89
<i>Monitoring services for action</i>			
17. I receive regular updates about my unit's performance based on information/data collected from our unit.	14	3	84
18. My unit discusses information/data from our unit in a regular, formal way, such as in regularly scheduled meetings.	11	7	82
19. My unit regularly uses unit information/data to make plans for improving its healthcare services.	13	4	84
20. My unit regularly monitors its work by comparing it with the unit's action plans.	13	5	83
21. My unit regularly compares its work with national or other guidelines.	16	2	82
<i>Commitment to work</i>			
27. I am proud to work in this unit.	21	3	76
28. I am satisfied to work in this unit.	16	5	80
29. I feel encouraged to do my very best at work.	7	3	89
<i>Work culture</i>			
30. My unit is willing to use new healthcare practices such as guidelines and recommendations.	4	1	95
31. My unit helps me to improve and develop my skills.	28	2	70
32. I am encouraged to seek new information on healthcare practices.	20	3	78
33. My unit works for the good of the clients and puts their needs first.	6	1	93
34. Members of the unit feel personally responsible for improving healthcare services.	6	0	94
35. Members of the unit approach clients with respect.	2	2	96
<i>Leadership</i>			
36. I trust the unit leader.	7	3	91
37. The leader handles stressful situations calmly.	12	4	84
38. The leader actively listens, acknowledges, and then responds to requests and concerns.	11	4	85
39. The leader effectively resolves any conflicts that arise.	14	5	82
40. The leader encourages the introduction of new ideas and practices.	13	4	83
41. The leader makes things happen.	11	5	85
<i>Informal payment</i>			
42. Clients must always give informal payment to health workers to access healthcare services.	97	1	3

43. Clients are treated more quickly if they make informal payments to health workers.	98	0	2
44. Medicines or equipment that should be available for free to clients have been sold in my unit.	97	1	3
45. Health workers are sometimes absent from work earning money at other places.	97	1	2
46. Health workers in my unit give healthcare services to friends and family first.	95	1	3
47. Health workers in my unit give jobs or other benefits to friends and family first.	97	1	3
48. Efforts are made to stop clients from providing informal payment to get appropriate healthcare services.	21	7	72
49. Efforts are made to stop health workers from asking clients for informal payment.	21	8	71

Table 5. Percentage of items and dimensions in source of knowledge of the Context Assessment for Community Health tool in four Ethiopian regions, 2018 (N=152).

<i>Sources of knowledge</i>	Not available	Never, 0 times	Rarely, 1-5 times	Occasionally, 6-10 times	Frequently, 11-15 times	Almost always, 16 times or more
22. Clinical practice guidelines	15	4	18	16	16	32
23. Other printed material for work (e.g., textbooks, journals)	18	9	25	30	14	5
24. The Internet	68	25	5	1	0	1
25. Electronic decision support (e.g., mobile phone applications or other electronic devices to assist with care and decision-making)	56	30	3	5	5	2
26. In-service training/ workshops/courses	25	14	19	28	10	4

Figure 1 depicts the percentage of average scores for the context dimensions. Very few (2.6%) perceived their facility to have enough resources available to manage their work. Most respondents (83.6%) perceived that their facility had active communication with members of their communities. Sixty-six percent on average responded agreement for the *work culture* dimension, implying that they considered their *work culture* to support learning, change, and responsibility. A very high proportion of respondents (98.7%) regarded *informal payment* for health workers not to be acceptable in their facility.

Figure 1: Percent agreement to dimensions in the Context Assessment for Community Health tool. Health extension workers in four Ethiopian regions, 2018 (N=152).

222 There was no difference in context dimensions between intervention and comparison areas in the  
223 evaluation's end-line survey (all  $p > 0.05$ ). The exact percentage for each item is found Supplemented  
224 (table S1).

### 225 **General facility-level readiness**

226 Figure 2 shows the general service readiness index and domain scores. The general service readiness  
227 index was 59%, implying that six in ten health posts were ready to provide child health services. On  
228 average, about two-thirds (67%) of health posts had basic amenities to provide services, 81% had  
229 basic equipment required, 42% had standard precautions for infection prevention, 47% had diagnostic  
230 test capacity for malaria RDT, and 58% had essential medicines. The basic equipment mean score  
231 was the highest across the five domains, and the diagnostic mean score index was the lowest.

232 Figure 2 also shows the percentage of health posts having all tracer items available to provide general  
233 child health services. Accordingly, only 1% of health posts had all essential medicines. Half of the  
234 health posts had all tracer items for basic equipment. Three in ten health posts had all items for basic  
235 amenities.

236 Figure 2: Percentage of health posts with tracer items available to provide general service in four  
237 regions of Ethiopia, 2018 (N=152)

## 238 **DISCUSSION**

239 We have described the Ethiopian health extension workers' perceived context and the health posts'  
240 preparedness to provide child health services. The health extension workers perceived that they had a  
241 good relationship with the local community. They were active in using data for planning and  
242 performance, were highly committed to their work and had positive perceptions of their work culture.  
243 They also had a relatively positive experience of their leaders and reported no corruption or informal  
244 payments. In contrast, they reported having insufficient information sources and a severe lack of

245 resources to perform their work. The latter was also reflected in the health post preparedness  
246 assessment, which overall was on a low level.

247 So far, there is no consensus on defining or assessing the health system context [33]. Several  
248 contextual factors are associated with quality improvement, like leadership, organizational culture,  
249 information system, and organizational structure. However, there are uncertainties regarding  
250 definitions and measurements [34]. Qualitative studies have contributed to the understanding of the  
251 health system context and quality of care. In this study, we quantified the perceived context and  
252 compared it with health post preparedness. The COACH tool was developed in five countries. Later,  
253 it has been used in Mozambique [35], and now in four different Ethiopian regions and three languages.  
254 Except for the sources of knowledge dimension, all other COACH tool dimensions showed good  
255 internal reliability. Items included in *source of knowledge* might not measure the same construct. The  
256 original validation process of this tool also indicated a low internal reliability of this dimension [11].  
257 Some of the included items may not be relevant in certain contexts. We suggest this dimension with  
258 its five items for further evaluation.

259 The health extension workers lacked sources of new knowledge. Internet, e-health, or m-health  
260 applications were absent [35]. Importantly, their responses indicated that they lacked in-service  
261 training, workshops, and courses. Insufficient sources of knowledge could lead to inappropriate  
262 diagnosis and mismanagement, such as the irrational use of antibiotics. An earlier study conducted in  
263 the same study area indicated that the health extension workers' clinical assessment, classification,  
264 and management of sick children did not follow the clinical guidelines [22]. This low adherence could  
265 lead to misdiagnoses and a lack of potentially life-saving treatments. Capacity building could be  
266 achieved through refresher training, followed by supportive supervision.

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3 267 The health extension workers reportedly had good contact with the community they served. This  
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5 268 engagement could help to enhance the health extension workers' accountability and dedication. A  
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8 269 study conducted in southern Ethiopia indicated that with focused training, guidance, and regular  
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10 270 supportive supervision, the health extension workers enhanced in community participation [36]. A  
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12 271 qualitative study in southern Ethiopia revealed that health extension workers' relationships with the  
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14 272 community could be constrained due to inadequate support systems, trust, communication, and  
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16 273 dialogue, as well as differing expectations [37]. A study conducted in six regions of Ethiopia indicated  
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18 274 that there were challenges in work schedule and relationship with the community [38].

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20 275 We also found that commitment to work was relatively good. A combination of financial and non-  
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22 276 financial incentives is required to support motivation and satisfaction [39]. Non-financial incentives,  
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24 277 such as creating career opportunities, may increase the motivation and retention of health extension  
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26 278 workers [40]. Over the course of a week, the health extension workers spend their time at the health  
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28 279 post (51%), in the community (37%) and elsewhere, unable to get information, (12%) [15]. This is  
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31 280 an indication that they spend most of their time with the community that has a potential to enhance  
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33 281 the interpersonal communication.

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38 282 Informal payments were perceived to be very rare. Informal payments or various forms of corruption  
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40 283 could have significant adverse effects on the health system, affecting patients and service providers  
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42 284 [41]. A study in Tanzania showed that informal payments existed and were negatively associated with  
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44 285 job satisfaction and motivation [42].

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47 286 The health posts in the study area seemed to have moderate service readiness, especially basic  
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49 287 amenities and equipment. However, health posts did not have the essential medicines to provide child  
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51 288 care. These facilities are the first contact for primary care, which provides basic health and medical  
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53 289 care close to the community, especially in rural populations [19]. These first-line services can



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3 290 potentially respond to a range of health challenges in low-income countries [43], but only if proper  
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5 291 attention is given to needs, such as essential medicines, in addition to infrastructure and basic  
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8 292 equipment. To meet such requirements is vital for a resilient health system [44].  
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10 293 We have earlier shown that health extension workers' ability to classify childhood illnesses was low  
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12 294 [23]. The evaluation of the Optimizing the Health Extension Program intervention's effectiveness  
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14 295 showed no effect on the utilization of services for sick children [24]. The lack of effect could partly  
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16 296 be attributed to delays, interruptions, and an overall short implementation period of a complex  
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18 297 intervention. Complex interventions that aim to change health services and care-seeking for sick  
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20 298 children may need an extended implementation period [45]. Lack of effect could also be due to some  
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22 299 of these contextual factors necessary for improving quality.  
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26 300 The context in which the services are provided is essential for implementing changes or new  
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28 301 programmes. However, contextual factors are generally not well understood. Before this study, no  
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30 302 assessments of different aspects of the health system context have been done in Ethiopia. A study  
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32 303 conducted in six European countries found that structure and process indicators explained more  
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34 304 variability in client satisfaction than contextual factors [46]. A systematic review concluded that  
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36 305 contextual factors might influence the effectiveness of quality improvement interventions [47].  
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39  
40 306 We report the first study in Ethiopia of primary healthcare workers' perceived health system context.  
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42 307 The Context Assessment for Community Health tool has been validated in a range of other low-  
43  
44 308 income countries [11] and was also found to have satisfactory internal reliability when translated into  
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46 309 three Ethiopian languages. Understanding context can identify factors that promote or hinder the  
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48 310 implementation of evidence-based practices, increasing the likelihood of successful implementation.  
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50 311 Although precautions were taken to obtain valid responses from the interviewed health extension  
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52 312 workers, the results could be susceptible to bias. The sample represented a large number of districts  
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3 313 in four Ethiopian regions that participated in a child health services study, but inferences cannot be  
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5 314 drawn to the whole country.  
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8 315  
9 316 **CONCLUSION**

10  
11 317 The Ethiopian health extension workers' perceived context showed a severe lack of resources. They  
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13 318 perceived a good relationship with the local community, used data for planning but lacked access to  
14  
15 319 new knowledge. They were highly committed to work and had positive perceptions of their work  
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17 320 culture and a relatively positive attitude regarding their leaders. There was no corruption or informal  
18  
19 321 payments at their work sites. The internal consistency of the context assessment tool provided  
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21 322 evidence of its ability to measure its different dimensions. This feature will allow for tailoring  
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23 323 implementation strategies and assessing context as part of evaluations. The health extension workers'  
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25 324 perceptions of sources of information and available resources were in line with the results of the health  
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27 325 facility preparedness.  
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32 327 **Contributors**

33  
34 328 TG, SMA, MY, LAP, and DB conceptualized the design of the study. TG analysed the data; TG,  
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36 329 SMA, MY, AB, LAP, and DB provided review of the methodology and interpret the results; All  
37  
38 330 authors contributed to the writing of this paper and all have read and approved the final manuscript.  
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41 331 **Conflict of interest**

42  
43 332 None.  
44

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48  
49 335 in study design, data collection, management, analysis, or interpretation of results.  
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52 336  
53 337 **Data availability statement**

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3 338 Data are available up on request. Request for data can be made to Della Berhanu  
4  
5 339 ([della.berhanu@lshtm.ac.uk](mailto:della.berhanu@lshtm.ac.uk)). Data sharing policy has been developed. All requests will be reviewed  
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8 340 by data sharing committee and if granted, data will be shared without any identifiers.  
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For peer review only

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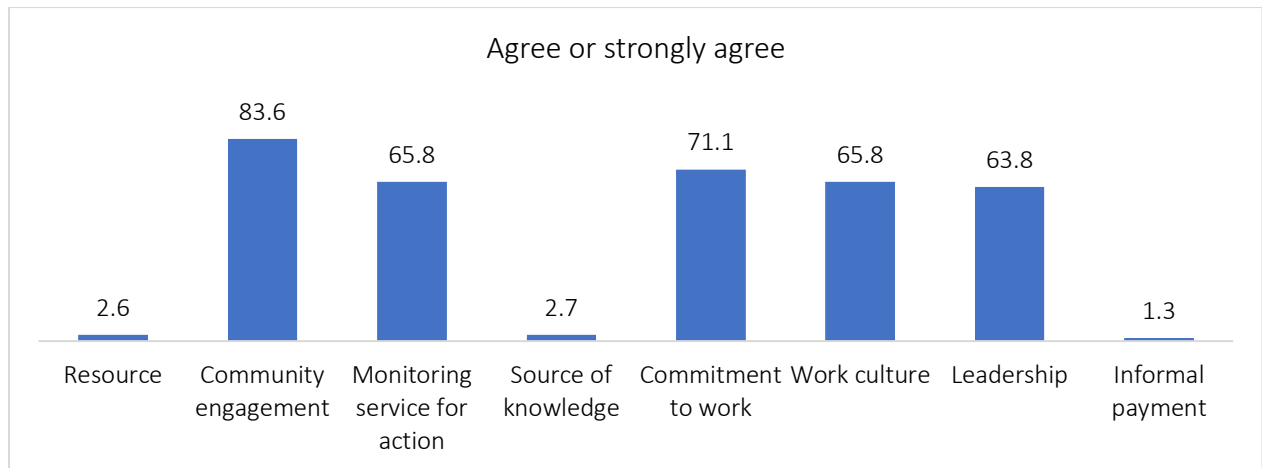
## 485 486 **Ethical considerations**

487 Ethical approvals were obtained from the University of Gondar (Ref O/V/P/RCS/05/371/2018), the  
488 Ethiopian Public Health Institute (Ref 613/52), and the London School of Hygiene and Tropical  
489 Medicine (Ref 16117). Information sheets were translated into the local languages Amharic,  
490 Oromiffaa, and Tigrigna and read to obtain written informed consent.

## 491 **Figure legend**

492 Figure 1: Percent agreement to dimensions in the Context Assessment for Community Health tool.  
493 Health extension workers in four Ethiopian regions, 2018 (N=152).

494 Figure 2: Percentage of health posts with tracer items available to provide general service in four  
495 regions of Ethiopia, 2018 (N=152)



19 Figure 1: Percentage of average score for items of the context assessment for community health  
20 workers tool in four regions of Ethiopia, 2018 (N=152).  
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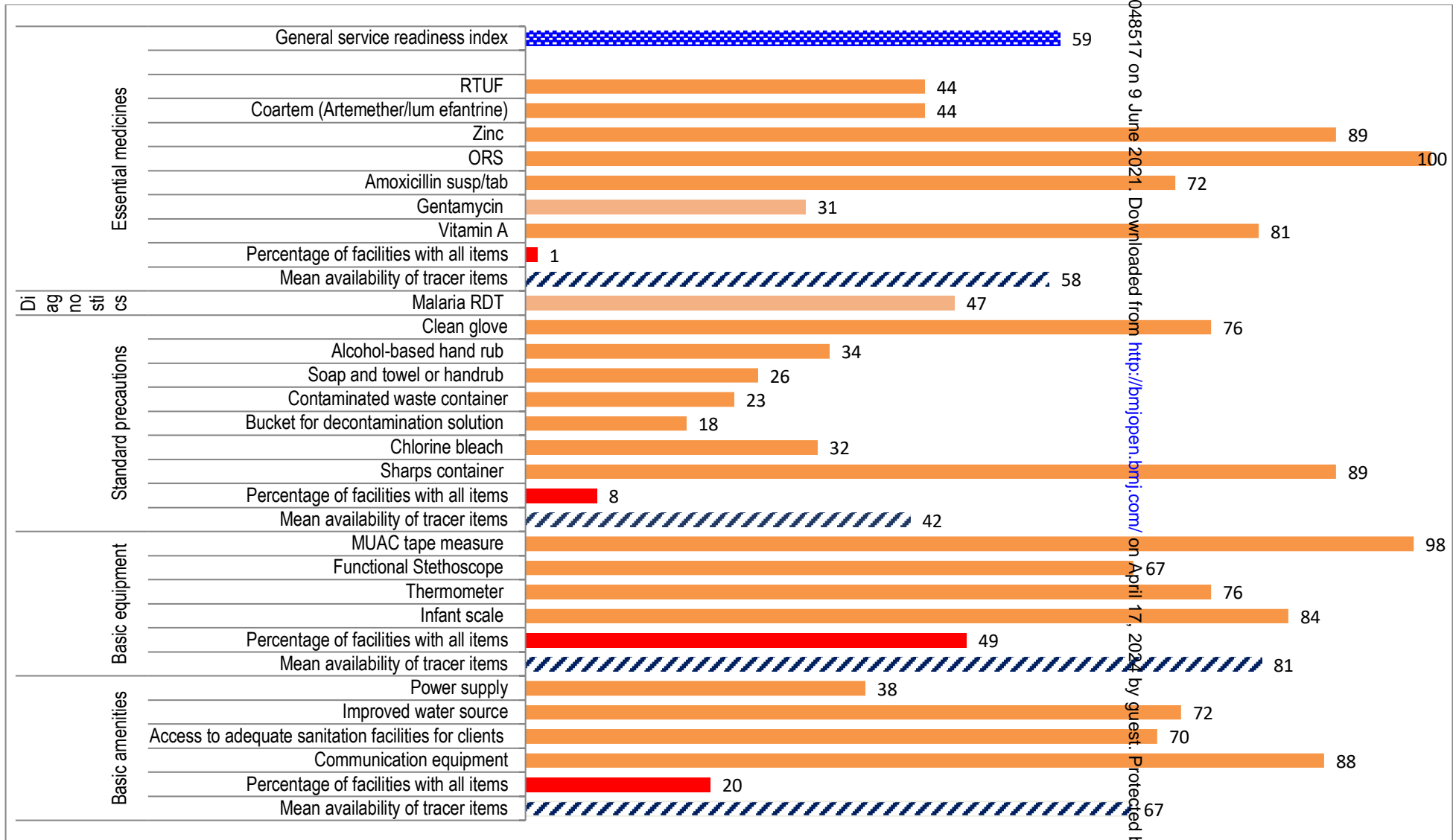


Figure 2: Percentage of health posts with tracer items available to provide general service in four regions of Ethiopia, 2018 (N=152)

Supplemental Table S1. Association between context dimensions and interventions and comparison areas in four regions of Ethiopia, 2018 (N=152).

Dimensions		Comparison (N=74)	Intervention (N=78)	Fisher's exact test
<i>Resource</i>	Agree	2.7	2.6	1
	Disagree	97.3	97.4	
<i>Community engagement</i>	Agree	78.4	88.5	0.125
	Disagree	21.6	11.5	
<i>Monitoring service for action</i>	Agree	58.1	73.1	0.061
	Disagree	41.9	26.9	
<i>Source of knowledge</i>	Agree	2.7	2.7	1
	Disagree	97.3	97.3	
<i>Commitment to work</i>	Agree	66.2	75.6	0.215
	Disagree	33.8	24.4	
<i>Work culture</i>	Agree	64.9	66.7	0.865
	Disagree	35.1	33.3	
<i>Leadership</i>	Agree	60.8	66.7	0.501
	Disagree	39.2	33.3	
<i>Informal payment</i>	Agree	1.4	1.3	1
	Disagree	98.7	98.7	

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Reported	Page number
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract		1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found		2
<b>Introduction</b>				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported		4-5
Objectives	3	State specific objectives, including any prespecified hypotheses		5
<b>Methods</b>				
Study design	4	Present key elements of study design early in the paper		5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection		5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants		6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable		6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group		8
Bias	9	Describe any efforts to address potential sources of bias		8
Study size	10	Explain how the study size was arrived at		6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why		6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding		8
		(b) Describe any methods used to examine subgroups and interactions		
		(c) Explain how missing data were addressed	Not Applicable	
		(d) If applicable, describe analytical methods taking account of sampling strategy	Not Applicable	
		(e) Describe any sensitivity analyses	Not Applicable	
<b>Results</b>				
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed		9
		(b) Give reasons for non-participation at each stage		
		(c) Consider use of a flow diagram	Not Applicable	
Descriptive data	14*	(a) Give characteristics of study participants (eg		9

		demographic, clinical, social) and information on exposures and potential confounders		
		(b) Indicate number of participants with missing data for each variable of interest	Not Applicable	
Outcome data	15*	Report numbers of outcome events or summary measures		9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included		10-12
		(b) Report category boundaries when continuous variables were categorized	Not Applicable	
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not Applicable	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not Applicable	
<b>Discussion</b>				
Key results	18	Summarise key results with reference to study objectives		13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence		13-14
Generalisability	21	Discuss the generalisability (external validity) of the study results		15
<b>Other information</b>				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based		22

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).