

# Disparities in the implementation of the Health Extension Program in Ethiopia: doing more and better towards universal health coverage

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## Research

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# Abstract

## Introduction

Large-scale implementation of the Health Extension Program (HEP) has enabled Ethiopia to make significant progress in health services coverage and health outcomes. However, evidence on equity and disparities in implementation of the HEP and its outputs is limited. The aim of this study was to examine disparities in the implementation of the HEP in Ethiopia.

## Methods

We used data from the 2019 National HEP assessment conducted between Oct 2018 and Sept 2019 in nine regions in the country. Data was collected from 62 districts, 343 Health posts, 179 Health centres, 584 Health Extension Workers (HEWs), 7,043 women from 7,122 Households. This study focused on selected input, service delivery, and service coverage indicators. We used rate differences, rate ratios and index of disparity to assess disparities in HEP implementation across regions.

## Results

We found wide interregional disparities in HEP implementation. Developing regional states (DRS) had significantly availability of qualified HEWs (Rate Ratio (RR) = 0.54), proportion of households visited by Health Extension workers (RR = 0.40, and proportion of mothers who received education on child nutrition (RR = 0.45) as compared national average. There are also significant disparities in HEP implementation among DRS in proportion of household visited by HEWs in the past 12 months (Index of disparity = 1.58) and proportion of adolescents who interacted with HEWs (Index of disparity = 1.43). Despite low overall coverage of health services in DRS, the contribution of the HEP for maternal health services is relatively high.

## Conclusion

There exist significant interregional disparities in HEP implementation in Ethiopia. The level of disparity among DRS is also remarkable. If the country is to achieve UHC, it is important that these disparities are addressed systematically and strategically. This calls for further attention in all regions, in general, and a tailored approach in DRS, in particular.

## Introduction

The Sustainable Development Goals (SDGs) through its pledge of “leave no one behind” in the 2030, affirmed the global commitment of nations to achieving the development needs of people by addressing avoidable disparities (1). Promoting health equity has been a global agenda widely promoted by national and global agencies, for several decades (2–4). Substantial progress has been made in improving overall health status of populations throughout the world. However, there are still significant health disparities within and between nations (5, 6).

In the health sector, equity has been broadly defined as the absence of avoidable, unfair, or remediable differences in health among subgroups of a population and/ or locations. Operationally, health equity is measured and monitored in terms of the extent of disparities in health status and health outcomes, including the occurrence of disease, disability, or death among populations in different socioeconomic, demographic, and geographic categories (7).

Disparities in health service coverage and health outcomes remain to be a challenge in Ethiopia despite some progress (8–11). The Ethiopian health sector takes into account socio-economic and geographic differences in health status and health service-related indicators as dimensions of equity that require mitigation actions. Geographic disparities, which overlap substantially with disparities across regions and livelihood categories, has been a primary focus of programs intending to promote health equity in the country (12). The difference between Economically Advanced Agrarian Regional States (EAARS: Tigray, Amhara, Oromia, SNNPR) and Developing Regional States (DRS: Afar, Somali, Benishangul Gumuz, Gambella) has been a major focus during the periods of the Health Sector Development Program (HSDP) and Health Sector Transformation Plan (HSTP) (13, 14).

The Health Extension Program (HEP), launched in 2003, is one of Ethiopia's major investments designed to improve the health of communities. The HEP is a community-based health program that was initially designed to deliver 16 packages of health services to agrarian communities (15, 16). Later, the program evolved in various ways, including adaptations for pastoralist and urban communities, making changes to existing packages, and including two additional packages and upgrading training of Health Extension Workers (HEWs). In 2019, the program involved more than 39,878 HEWs and 17,587 community health posts (HPs) (17). The program has been acknowledged as a flagship program and a major contributor to recent gains in health outcomes in the country. This program has made a significant contribution in improving access to and coverage of basic health services in Ethiopia (18).

Despite remarkable improvements in health service coverage, evidence from the 2019 Mini-EDHS,(11) and the 2018 Service Availability and Readiness Assessment (19, 20) indicated that there are substantial disparities between regions, urban and rural, and agrarian and pastoralist settings (21–23). Health indicators in DRSs are much lower than national averages. For instance, modern contraceptive use is 12.7% in Afar and 3.4% in Somali compared to over 30% in agrarian regions. Only 11.1% and 31.1% of pregnant women in Afar and Somali regions, respectively, have four or more antenatal care visits during their recent pregnancies as compared to 64% in Tigray region and 51% in Amhara region. Similarly, only 20% of children in

Afar and 18% of children in Somali region have received all basic vaccinations as compared to 83% in Addis Ababa, 73% in Tigray and 62% in Amhara (24).

Though disparities in health service coverage and health outcomes at population levels have been investigated, there is limited evidence on equity and disparities in the implementation of HEP and their impacts on access to and coverage of basic health services across regions in Ethiopia. Therefore, the aim of this study was to examine disparities in the implementation of HEP in Ethiopia. More specifically, the study examined disparities in availability of basic inputs of HEP, accessibility of selected HEP services to the target populations, and coverage of selected HEP services.

## Methods

### Study context:

In Ethiopia, the relatively economically better agrarian regions (EAARS) – Tigray, Amhara, Oromia and SNNPR – and the two city administrations – Addis Ababa, Dire Dawa and Hareri – have better economic status than the Developing Regional States (DRS) – Afar, Benishangul-Gumuz, Gambella and Somali regions. Since the adoption of the health policy of the transitional government of Ethiopia in 1993 (25), special attention has been given to health system strengthening in DRS in order to narrow the geographic disparities in terms of access to health services, uptake of essential services and health outcomes. This study focuses on EAARS and DRS.

### Study design

A mixed-methods study was used to achieve the objectives of the national HEP assessment. These included quantitative surveys, qualitative studies and synthesis of evidence. This paper used data from the quantitative part of the national HEP assessment.

### Data source

We used indicator data collected as part of the National HEP assessment in Ethiopia. Details of the methods used presented in this assessment are presented elsewhere (26). In brief, a national assessment of HEP was conducted from October 2018 to September 2019. All nine regional states and two city administrations were included. The assessment was guided by the Primary Health Care Performance Initiative (PHCPI) framework. Data was collected at all levels of the health system, including the Ministry of Health, Regional Health Bureaus (RHBs), District Health Offices, Health Centers (HCs), HPs, and communities.

Primary data were collected through a household survey, a survey of HEWs and a health facility assessment. Data were collected from household sampled from the general population, women and Women's Development Army (WDA) leaders' households, health posts, health centers, and district health offices that were randomly selected from all regions. The household survey involved women, men, and youth girls.

### Indicators of interest

For this analysis, we purposively selected eight input, six process (access to HEP services) and six output (coverage of HEP services) indicators. The selection of the indicators was based on relevance and attributability to HEP and its packages and availability of representative data at regional level. The input indicators assess availability of human resources and basic amenities and guidelines in health posts as well as adequacy of technical supervision by health centers. The process indicators selected for this analysis focus on exposure of household members, especially women and young girls, to HEP services and adoption of HEP-targeted behaviors by women in the general population. The service coverage indicators included in this study address the widely implemented HEP services such as maternal health services, infant and young child feeding, sanitation and hygiene and treatment of sick people. We did not include the other indicators (such as HIV and TB) because the improvements in these programs could not be adequately explained by the implementation of the HEP.

### Measurements

Data on input indicators were collected either by interview of HEWs or direct observation of Health Posts using a standardized checklist. The national HEP assessment collected data on access to and coverage of key HEP services through interview of women, men and young girls using a structured and pre-tested questionnaire. Indicator values, both at national and regional levels were computed as percentages of Health posts, household or study participants. Indicators for EAARS were computed by aggregating individual level data from four national regional states (Tigray, Amhara, Oromia and SNNPR). Similarly, indicator data for DRS were computed from aggregated data representing four DRS (Afar, Benishangul-Gumuz, Gambella and Somali regions).

### Data analysis

We used Stata 16.0 for analysis of HEP assessment data in computation of indicator data. This analysis of equity and disparities in the implementation of HEP had multiple stages. The first stage was direct comparison of HEP implementation indicator data among regions and between EAARS and DRS. We compared the HEP implementation indicator values across regions. In the second stage, we computed deviations of HEP implementation indicator values in DRS from national average and EAARS average and best performing regions. This was done to examine the disparities of indicators among DRS relative to national average and EAARS as well as best performing regions. In the third stage, we examined disparities within EAARS and DRS by comparing each region with EAARS and DRS averages. Finally, we considered aggregated HEP implementation indicators for DRS and examined its disparity from national and EAARS averages as well as best performing regions.

We used both absolute (rate difference) and relative (relative rate and index of disparity) measures of disparity. Rate difference, as the absolute disparity between two health status indicators, was calculated as the simple arithmetic difference two values of an indicator. The Rate Ratio was calculated by dividing rate 1 by rate 2 rather than subtracting. The Index of Disparity was calculated as the sum of the difference between several group rates and a reference rate, and the summed differences were expressed as a proportion of the reference rate (27).

## Results

### Study population

A total of 343 Health posts (235 from EAARS – Tigray, Amhara, Oromia and SNNR regions- and 108 from DRS – Afar, Somali, Benishangul-Gumuz, and Gambella regions), 179 Health Centers (139 from EAARS and 40 from DRS) and 584 HEWs (414 from EAARS and 170 from DRS) from nine regions and 62 districts (42 from EAARS and 20 from DRS) were involved in the national HEP assessment. A total of 7,122 households (4854 from EAARS and 2,268 from DRS), 7,122 women of child-bearing age (4,821 from EAARS and 2,222 from DRS), 4805 men (3407 from EAARS and 1,398 from DRS) and 1020 youth girls (746 from EAARS and 274 from DRS) were also interviewed. The distribution of the study population by regions is presented in Fig. 1

### Indicators of HEP implementation

Examination of indicator values by region showed a relatively higher availability of sanitation facilities and the tracer drug – oral rehydration therapy (ORS) in health posts. On the other hand, exposure of adolescents to HEP, delivery of IYCF services by HEWs and treatment of sick people at health posts were relatively lower. Benishangul-Gumuz region had higher values on most of HEP implementation indicators whereas Somali region had lower values on most of HEP implementation indicators. DRS have higher input indicators but low process and output indicators, except for coverage of maternal health services. Actually, DRS had higher coverage of maternal health services provided by HEWs. Health posts in DRS were more likely to receive adequate technical supervision by health centres. Details are shown in Table 1.

Table 1  
Indicators of HEP implementation (%) in Ethiopia stratified by administrative regions

	Tigray	Amhara	Oromia	SNNPR	Afar	Somali	Gambela	B/Gumuz	EAARS	DRS	National
<b>Inputs: HP/HEWs</b>											
Average population served per HEW (number)	2875	2834	3110	1966	1256	1268	424	935	2728	1361	2599
HPs with at least one level IV HEWs	80.9	69.0	64.9	58.0	20.7	33.0	66.5	52.3	65.3	33.5	62.4
HPs with improved water source	18.6	28.1	21.4	27.4	38.6	59.7	61.5	56.9	25.0	47.7	27.1
HPs with sanitation facilities	93.1	85.4	86.8	93.9	97.2	66.4	94.9	82.2	89.3	69.2	87.4
HPs having Cold box	62.4	39.8	39.0	36.2	42.8	40.0	55.0	40.8	45.8	31.4	41.8
HPs having Oral Rehydration Salt (ORS)	100.0	98.9	86.0	74.9	72.9	60.6	85.9	90.9	91.0	69.0	86.0
HPs with HEP guidelines: Family Health	78.2	78.8	59.1	65.2	22.5	54.9	30.6	48.4	65.2	53.7	64.6
HPs with adequate supervision from HC	59.5	63.3	47.1	37.0	69.8	91.4	57.7	57.4	48.4	80.7	51.4
<b>Process: Service delivery</b>											
HH members exposed to HEP service	74.5	68.6	53.7	71.0	71.2	24.6	70.6	92.9	62.7	44.0	61.8
HHS ever been visited by HEWs	67.2	64.9	52.8	49.4	31.8	5.5	51.6	90.6	56.6	22.3	55.1
HHS visited by HEWs in the last year	39.5	41.7	25.4	30.4	25.2	4.8	45.3	76.4	32.0	14.7	31.2
Women who interacted with HEWs	63.0	61.5	47.2	63.6	67.1	21.4	68.2	90.7	55.5	40.3	54.8
HHS with adopted HEP-targeted behavior	53.7	57.7	49.9	44.1	39.0	39.2	42.0	60.7	51.3	38.4	50.8
Adolescent who interacted with HEWs	37.5	27.3	12.3	26.7	44.7	8.5	58.0	50.8	22.1	16.7	21.9
<b>Output: Service coverage</b>											
Women received FP from HEWs/HP	40.4	51.6	54.9	66.7	49.3	0.0	43.9	54.6	56.5	67.7	56.7
Women who attended their ANC-IV at HPs	9.5	9.9	38.8	54.2	32.4	94.4	36.0	21.5	31.8	56.2	32.2
Women who received PNC from HEWs	73.6	36.2	40.8	39.9	7.2	50.0	39.5	89.9	43.1	46.1	43.2
HHS which were visited by HEWs for IYCF	43.6	39.1	22.5	32.9	16.7	3.6	37.3	41.5	29.6	13.1	28.8
Women educated on handwashing by HEWs	65.7	49.2	49.6	65.5	54.6	9.9	42.5	73.0	53.9	27.4	52.7
Sick people who sought Rx from HP/HEW	10.6	4.6	10.4	15.7	78.7	34.8	54.6	33.6	10.3	29.2	10.8
<i>HPs = Health Posts; HEWs = Health Extension Workers; HHS = Households; HEP = Health Extension Program; FP = Family Planning; PNC = Postnatal care; IYCF = infant and young child feeding; HC = Health Center; ANC = Antenatal care</i>											

## Interregional disparities

As shown in Fig. 2, disparities between best performing and least performing regions were highest for percentage of households ever visited by HEWs, percentage of women who attended four ANC visits at health posts and percentage of women who received PNC services from HEWs. Relatively lower disparities were observed in the adoption of HEP-targeted behaviour, availability of cold box in health posts, and availability of sanitation facilities in

health posts. Further examination of best and least performing regions showed that Benishangul-Gumuz and Somali regions had best and least performance, respectively, in process (access to health services) indicators.

## **Disparities in Developing regional states**

Table 2 shows deviations of HEP implementation indicators in DRS from national average, EAAS average and best performing region. Analysis of status of HEP implementation indicators in individual DRS as compared to national and EAARS averages showed a mixed pattern. While regions like Benishangul-Gumuz and Gambella have many HEP implementation indicators above the national and EAARS averages, Somali region had only a few HEP implementation indicators at or above the national and EAARS averages. However, DRS have significantly lower HEP implementation indicators as compared to best performing regions.

Table 2  
Disparities from national average and EAARS average and best performing region

	Deviation from national average				Deviation from EAARS average				Deviation from best performing region			
	Afar	Somali	Gambela	B/Gumuz	Afar	Somali	Gambela	B/Gumuz	Afar	Somali	Gambela	B/Gumuz
<b>Inputs: HP/HEWs</b>												
Average population served per HEW	-105	-1331	-2175	-1664	-1472	-1460	-2304	-1793	-1854	-1842	-2686	-2175
HPs with at least one level IV HEWs	-13	-29.4	4.1	-10.1	-44.6	-32.3	1.2	-13	-60.2	-47.9	-14.4	-28.6
HPs with improved water source	-9.1	32.6	34.4	29.8	13.6	34.7	36.5	31.9	-22.9	-1.8	0	-4.6
HPs with sanitation facilities	28	-21	7.5	-5.2	7.9	-22.9	5.6	-7.1	-2.8	-33.6	-5.1	-17.8
HPs having Cold box	11	-1.8	13.2	-1	-3.04	-5.8	9.2	-5	-19.6	-22.4	-7.4	-21.6
HPs having Oral Rehydration Salt (ORS)	3.9	-25.4	-0.1	4.9	-18.1	-30.4	-5.1	-0.1	-27.1	-39.4	-14.1	-9.1
HPs with HEP guidelines: Family Health	-31	-9.7	-34	-16.2	-42.7	-10.3	-34.6	-16.8	-56.3	-23.9	-48.2	-30.4
HPs with adequate supervision from HC	-11	40	6.3	6	21.4	43	9.3	9	-21.6	0	-33.7	-34
<b>Process: Service delivery</b>												
HH members exposed to HEP service	27	-37.2	8.8	31.1	8.5	-38.1	7.9	30.2	-21.7	-68.3	-22.3	0.0
HHs ever been visited by HEWs	9.5	-49.6	-3.5	35.5	-24.8	-51.1	-5	34	-58.8	-85.1	-39	0.0
HHs visited by HEWs in the last year	11	-26.4	14.1	45.2	-6.8	-27.2	13.3	44.4	-51.2	-71.6	-31.1	0.0
Women who interacted with HEWs	27	-33.4	13.4	35.9	11.6	-34.1	12.7	35.2	-23.6	-69.3	-22.5	0.0
HHs with adopted HEP-targeted behavior	0.6	-11.6	-8.8	9.9	-12.3	-12.1	-9.3	9.4	-21.7	-21.5	-18.7	0.0
Adolescent who interacted with HEWs	28	-13.4	36.1	28.9	22.6	-13.6	35.9	28.7	-13.3	-49.5	0.0	-7.2
<b>Output: Service coverage</b>												
Women received FP from HEWs/HP	-18	-56.7	-12.7	-2.08	-7.21	-56.52	-12.59	-1.95	-18.4	-67.7	-23.7	-13.1

	Deviation from national average				Deviation from EAARS average				Deviation from best performing region			
Women who attended their ANC-IV at HPs	-24	62.2	3.8	-10.7	0.6	62.6	4.2	-10.3	-62	0	-58.4	-72.9
Women who received PNC from HEWs	-39	6.8	-3.7	46.7	-35.9	6.9	-3.6	46.8	-82.7	-39.9	-50.4	0.0
HHs which were visited by HEWs for IYCF	3.6	-25.2	8.5	12.7	-12.9	-26	7.7	11.9	-26.9	-40	-6.3	-2.1
Women educated on handwashing by HEWs	27	-42.8	-10.2	20.3	0.7	-44	-11.4	19.1	-18.4	-63.1	-30.5	0.0
Sick people who sought Rx from HP/HEW	50	24	43.8	22.8	68.4	24.5	44.3	23.3	0	-43.9	-24.1	-45.1

## Disparities within EAARS and DRS

Table 3 shows disparities within EAARS and DRS. There were lower disparities within EAARS than within DRS. Within EAARS disparity was higher for output indicators whereas within DRS disparity was higher for process indicators. For input indicators of HEP implementation, the average index of disparity within DRS was almost six times higher than the average index of disparity within EAARS. The average index of disparity of process indicators within DRS was about 12 times higher than the average index of disparity within DRS than in EAARS. Similarly, the average index of disparity within DRS for output indicators of HEP implementation was nearly six times higher than the average index of disparity in EAARS.



Table 3  
Disparities within EAARS and DRS

	Deviation from EAARS average				Deviation from DRS average				ID within EAARS	ID within DRS
	Tigray	Amhara	Oromia	SNNPR	Afar	Somali	Gambela	B/Gumuz		
<b>Inputs: HP/HEWs</b>										
HPs with at least one level IV HEWs	15.6	3.7	-0.4	-7.3	-12.8	-0.5	33	18.8	0.04	0.29
HPs with improved water source	-6.4	3.1	-3.6	2.4	-9.1	12	13.8	9.2	0.05	0.14
HPs with sanitation facilities	3.8	-3.9	-2.5	4.6	28	-2.8	25.7	13	0.01	0.23
HPs having Cold box	16.6	-6	-6.8	-9.6	11.36	8.6	23.6	9.4	0.03	0.42
HPs having Oral Rehydration Salt (ORS)	9	7.9	-5	-16.1	3.9	-8.4	16.9	21.9	0.01	0.12
HPs with HEP guidelines: Family Health	13	13.6	-6.1	0	-31.2	1.2	-23.1	-5.3	0.08	0.27
HPs with adequate supervision from HC	11.1	14.9	-1.3	-11.4	-10.9	10.7	-23	-23.3	0.07	0.14
<b>Process: Service delivery</b>										
HH members exposed to HEP service	11.8	5.9	-9	8.3	27.2	-19.4	26.6	48.9	0.07	0.47
HHs ever been visited by HEWs	10.6	8.3	-3.8	-7.2	9.5	-16.8	29.3	68.3	0.03	1.01
HHs visited by HEWs in the last year	7.5	9.7	-6.6	-1.6	10.5	-9.9	30.6	61.7	0.07	1.58
Women who interacted with HEWs	7.5	6	-8.3	8.1	26.8	-18.9	27.9	50.4	0.06	0.53
HHs with adopted HEP-targeted behavior	2.4	6.4	-1.4	-7.2	0.6	0.8	3.6	22.3	0.00	0.18
Adolescent who interacted with HEWs	15.4	5.2	-9.8	4.6	28	-8.2	41.3	34.1	0.17	1.43
<b>Output: Service coverage</b>										
Women received FP from HEWs/HP	-16.16	-4.89	-1.59	10.21	-18.36	-67.67	-23.74	-13.1	0.05	0.45
Women who attended their ANC-IV at HPs	-22.3	-21.9	7	22.4	-23.8	38.2	-20.2	-34.7	0.12	0.18
Women who received PNC from HEWs	30.5	-6.9	-2.3	-3.2	-38.9	3.9	-6.6	43.8	0.10	0.01
HHs which were visited by HEWs for IYCF	14	9.5	-7.1	3.3	3.6	-9.5	24.2	28.4	0.17	0.89
Women educated on handwashing by HEWs	11.8	-4.7	-4.3	11.6	27.2	-17.5	15.1	45.6	0.07	0.64
Sick people who sought Rx from HP/HEW	0.3	-5.7	0.1	5.4	49.5	5.6	25.4	4.4	0.00	0.73

ID = Index of Disparity

## Aggregated DRS

When the four DRS are taken together, DRS had significantly lower HEP implementation in all indicators included in this study. Input indicators, process and output indicators were on average 27, 49, and 35 percentage points lower than best performing regions, respectively. Further assessment using average index of disparity from best performing region, however, showed that disparities in DRS were higher for output indicators followed by process indicators and input indicators. Relative rates of HEP implementation indicators in DRS to EAARS for percentage of HPs with improved water source, adequacy of supervision by Health centre, percentage of women received family planning, ANC and PNC services from HEWs and percentage of sick people who sought treatment from HPs were above 1. Details of disparity measures for DRS are shown in Table 4.

Table 4  
Disparity in DRS (aggregate) as compared to EAARS, national and best performing region

	Rate difference			Index of disparity			RR: DRS/EAARS
	From national	From EAARS	From best	From national	From EAARS	From best	
<b>Inputs: HP/HEWs</b>							
HPs with at least one level IV HEWs	-28.9	-31.8	-47.4	0.19	0.34	0.47	0.51
HPs with improved water source	20.6	22.7	-13.8	0.81	1.17	0.12	1.91
HPs with sanitation facilities	-18.2	-20.1	-30.8	0.03	0.05	0.15	0.77
HPs having Cold box	-10.4	-14.4	-31	0.13	0.03	0.28	0.69
HPs having Oral Rehydration Salt (ORS)	-17	-22	-31	0.05	0.15	0.22	0.76
HPs with HEP guidelines: Family Health	-10.9	-11.5	-25.1	0.35	0.40	0.50	0.82
HPs with adequate supervision from HC	29.3	32.3	-10.7	0.20	0.43	0.24	1.67
<b>Process: Service delivery</b>							
HH members exposed to HEP service	-17.8	-18.7	-48.9	0.12	0.03	0.30	0.70
HHs ever been visited by HEWs	-32.8	-34.3	-68.3	0.04	0.21	0.50	0.39
HHs visited by HEWs in the last year	-16.5	-17.3	-61.7	0.35	0.19	0.50	0.46
Women who interacted with HEWs	-14.5	-15.2	-50.4	0.19	0.11	0.32	0.73
HHs with adopted HEP-targeted behavior	-12.4	-12.9	-22.3	0.05	0.12	0.25	0.75
Adolescent who interacted with HEWs	-5.2	-5.4	-41.3	0.91	0.83	0.30	0.76
<b>Output: Service coverage</b>							
Women received FP from HEWs/HP	11	11.15	0.00	0.40	0.35	0.45	1.20
Women who attended their ANC-IV at HPs	24	24.4	-38.2	0.24	0.45	0.51	1.77
Women who received PNC from HEWs	2.9	3	-43.8	0.06	0.08	0.48	1.07
HHs which were visited by HEWs for IYCF	-15.7	-16.5	-30.5	0.00	0.16	0.43	0.44
Women educated on handwashing by HEWs	-25.3	-26.5	-45.6	0.03	0.17	0.38	0.51
Sick people who sought Rx from HP/HEW	18.4	18.9	-49.5	3.24	3.90	0.36	2.83

## Discussion

Our findings indicated that there is a significant disparity in the implementation of HEP between DRS and EAARS. Disparities in inputs between DRS and national average seems to be affecting disparities in process and output indicators. For instance, there is a significant disparity in proportion of health posts with level IV HEWs in DRS as compared to national average. Consequently, process indicators such as number of households visited by HEWs and proportion of women educated on infant and young child feeding and handwashing practices by HEWs were very low in these regions.

Even within DRS, there are considerable disparities in implementation of HEP. Benishangul-Gumuz region, considered as one of the DRS, had relatively higher indicators while Somali region had a relatively lower performance in most of the HEP indicators included in this study. While DRS had low performance in many aspects of HEP implementation, there are some key areas where DRS were performing better. These include availability of sanitation in health posts, adequacy of supervision, proportion of maternal health service received at health posts and treatment of sick people at health posts.

DRS in Ethiopia had lower overall health system performance in many of the HEP implementation indicators. This is also true for other health and health-related indicators. These regions have "hard-to-reach" populations for health service delivery (28). Access to health services in these regions is also challenging due to distance and lifestyle of the population that involves mobility. Lack of awareness about benefits of HEP (29) also adds into the severity of the problem. Besides, Health extension program was introduced in DRS five to six years later in 2010 (30). There were also some differences in the recruitment and training of HEWs in DRS. These factors, along with differences in leadership and governance and support from development partners could have contributed to the disparities between DRS and EAARS, and even within DRS, in terms of HEP implementation indicators.

As there is still a significant disparity in HEP between DRS and EAARS in most of HEP implementation indicators, there is a need to strengthen the current efforts that are targeted to ensure equitable implementation of HEP in DRS. The current policy direction of ensuring equity needs to continue as a priority. The findings of this study also imply that these efforts need to be tailored to the specific developing regional states. Moreover, further studies that consider a longitudinal approach are needed to explore and monitor trends in the implementation and outcomes of HEP in DRS.

Although, DRS had accomplished low in overall access to and coverage of health services, they were performing better in a few indicators, such as proportion of health posts with improved water source, proportion of health posts with adequate proportion and proportion of mothers who received family planning services from HEWs. In addition, the percentage share of HEP in access to and coverage of health services is relatively larger in DRS than in EAARS. These differences may be due to better access of the population in EAARS to other health service delivery options, including health centres, hospitals and private health facilities.

Implementation of HEP among DRS also varies significantly. Somali and Afar regions had lower levels of input indicators as compared to Benishangul-Gumuz and Gambella regions. In line with this, Benishangul-Gumuz and Gambella regions had better status of process and output indicators of HEP implementation. With regard to HEP implementation, Benishangul-Gumuz is more similar to EAARS than DRS as it had better status of implementation as compared to the other DRS. This implies that a “one-size-fits-all” approach wouldn’t be appropriate for the implementation of HEP in DRS. Benishangul-Gumuz region which had higher values of HEP implementation indicators would need a different approach as compared to other DRS regions. Somali region, with very low FP coverage but relatively better proportion of ANC delivered by HEP would need a different approach in optimization of HEP implementation. Overall, there needs to be a contextualized approach that considers differences between regions and differences between indicators.

There are some limitations associated with this study. Firstly, the HEP assessment was a cross-sectional study and reflects the state of the indicators only at the time of the assessment. It didn’t capture the variation in the pattern of the indicators across time. Secondly, most of the information collected from household members was self-reported and the possibility of social desirability bias cannot be ruled out. Thirdly, we have focused on selected indicators of implementation of HEP in Ethiopia and these may not reflect the implementation HEP in its entirety. The performance indicators (process and output indicators) may not be fully attributed to HEP. Finally, the focus of this study was at regional levels and this may not reflect sub-regional differences in HEP implementation. Although these limitations do not really affect the conclusions of this study, it is important to consider them in the interpretation of these findings of this study and the design of in future studies.

## **Conclusion**

There exist significant interregional disparities in HEP implementation in Ethiopia. There is also significant disparity in the implementation of HEP between DRS and EAARS. The level of disparity among DRS is also remarkable. If the country is to achieve UHC, it is important that these disparities are addressed systematically and strategically. Moreover, tailored attention should be given to DRS. Further studies are needed to monitor the patterns and progress in the reduction of disparities between EAARS and DRS.

## **Declarations**

### **Ethics approval and consent to participate**

Ethical clearance to conduct the national HEP assessment was obtained from Ethiopian Public Health Institute. Informed consent to participate in the study was obtained from all the participants.

### **Consent for publication**

Not applicable

### **Availability of data and materials**

Data used for this study are available from Ministry of Health, Ethiopia, subject to approval by Ministry of Health.

### **Competing interests**

The authors declare that they have no competing interests

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### **Authors' contributions**

TNH, YKA and AMT conceptualized the study and prepared the proposal. TNH and MAW conducted data analysis. TNH, YKA and MAW wrote the manuscript. All other authors provided substantial inputs into the manuscript. All authors approved the manuscript for submission.

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## Figures

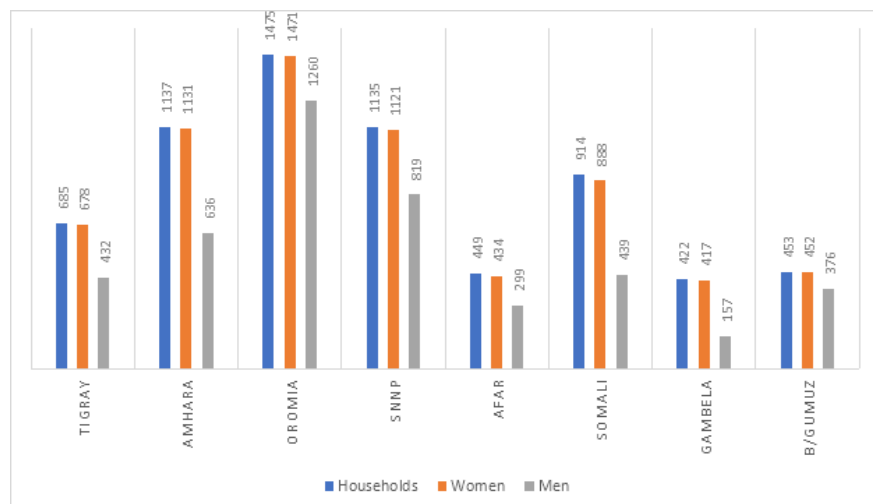


Figure 1

Study population by region

HEP Implementation Indicators	Rate difference (best vs least performing regions)
<b>Input: HP/HEW s</b>	
HPs with at least one level IV HEWs	60.2
HPs with improved water source	42.9
HPs with sanitation facilities	30.8
HPs having Cold box	26.2
HPs having Oral Rehydration Salt (ORS)	39.4
HPs with HEP guidelines: Family Health	56.3
HPs with adequate supervision from HC	54.4
<b>Process: Service delivery</b>	
HH members exposed to HEP service	68.3
HHS ever been visited by HEWs	85.1
HHS visited by HEWs in the last year	71.6
Women who interacted with HEWs	69.3
HHS with adopted HEP-targeted behavior	21.7
%of adolescent who interacted with HEWs	49.5
<b>Output: Service coverage</b>	
Women received FP from HEWs/HP	66.73
Women who attended their ANC-IV at HPs	84.9
Women who received PNC from HEWs	82.7
HHS which were visited by HEWs for IYCF	40
Women educated on handwashing by HEWs	63.1
Sick people who sought Rx from HP/HEW	74.1

Figure 2

Disparities between best and least performing regions