Health sector performance in Ethiopia: a study in regional disparities

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Abstract:

The paper is an attempt to review the status of health parameters in the light of demographic attributes of population growth and mortality in Ethiopia. Health infrastructures, health personnel and health services to population ratios have been worked out and compared at regional levels. Twenty-six variables have been used to analyze national and regional situations. Results have been explained in terms of regional development levels, regional disparity, relative disparity and absolute disparity in the case of health services, infrastructures and health personnel to population ratios. In terms of health sector development; Addis Ababa, Amhara and Harari regions have high development (D.I= 0.283-0.74); Dire Dawa, Oromia and Tigray have moderately high development (D.I. = 0.165-0.220); Afar, SNNPR, and Somali regions have a moderately low level of development (D.I. from 0.125 to 0.155); while regions of Gambella and Beneshangul Gumuz reflect a low level of development (D.I. from 0.114 to 0.115) in relation to health facilities and infrastructures. The absolute disparity was extremely high in variables such as Basic Emergency Obstetric Care (BemOC) (1:534) and Comprehensive Emergency Obstetric Care (CemOC) (1:204) and availability of all other health professionals (1: 118.13).Similarly, the relative disparity was very high in cases of the functional health center to population ratio (230.71 %), all other health professionals (133.22%), BEmOC (120.36),CEmOC (116.52% and deaths due to malaria (114.85%). In terms of health sector performance Addis Ababa and Amhara regions present low regional disparities while Gambella and Beneshangul Gumuz regions reflect a very high regional disparity.

Keywords: *Health infrastructure, Health Services to population ratios, Regional Development, Regional Disparity, Relative Disparity, Absolute Disparity*

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Background

Most of the developing countries including Ethiopia are currently faced with a situation of widening disparity in the health sector (World Bank, 2020). This is due to the concentration of additional health services and infrastructures in and around those regions which are better placed in terms of health services. The burden of illness, injury, disability, or mortality experienced by one social group such as pastoralists relative to another social group such as agriculturalists is one of the causes for dissatisfaction among the people (Ahmed et. al., 2019). Similarly, people in a rural setup, who are dispersed in distribution, are placed at a disadvantage relative to people in urban setup who have clustered distribution (Hailemichael et.al., 2019). Some of these dichotomies are better expressed in regional setup. For example, pastoralists of Afar, Somali, and some parts of the Oromia region have similar situations in terms of burden of sickness, injury, disability and mortality (World Bank, 2019). As mentioned by Abebe (2020), poverty is more rampant in rural parts than in urban areas. In Ethiopia, 60 % of the population lives in highland parts of the country with various agro-ecological zones engaged in sedentary farming. The rest of the population which comprises 40% resides in low land parts of the country engaged in pastoral and agro-pastoral activities.

According to QU Dongyu, Director- General, FAO quoted by Mehari Beyene (2020), in many areas, the relationship between farmers and pastoral herders, which was once cooperative, has become confrontational as they compete over the same scarce resource. As such, there is an apparent need to re-orient policy attention in favor of disadvantaged social groups and lagging regions to incorporate health equity into national public health policies, thus, minimizing the gap between the groups; within and among the regions.

Statement of the problem

To review these backgrounds, an attempt has been made to analyze the level of regional development in the health sector in Ethiopia and to measure the regional disparity that exists. Disparities in health and health care not only affect the groups facing disparities, but also limit overall gains in quality of care and health for the broader population and result in increased costs and burden. Addressing health disparities is increasingly an important issue as the population becomes more diverse with expanding disease burden. It causes discontent among the groups of the people.

In the Ethiopian context, one can think of such a situation in case of the rural and urban communities. Urban communities have relatively greater access to health services compared to rural communities because of their scattered distribution (Abraha et al., 2019). Somewhat similar is the case of communities residing in lowland setup which is disadvantaged as compared to those residing in highland setup (World Bank, 2019). The provision of health services and infrastructure is relatively more in highland areas where a greater proportion of the Ethiopian population (about 60 %) resides, compared to lowland areas (Khan, 2014). Further, health infrastructure and services have a higher concentration in large towns and cities while small and medium-sized towns have a relatively very low level of health infrastructure and services (Unlocking the power of Ethiopian Cities, 2015).

Thus, there is marked variation within rural communities, when the comparison is made between pastoralist and agriculturists groups. Further, the rural-urban divide is very wide in the case of health infrastructure. It is somewhat narrowed down in the case of small urban to large urban set up. Thus, disadvantaged groups placed in different agro-ecological zones have different disease burden and demand region-specific provision of medical treatment and health services. It is in this context that, in this paper, absolute and relative disparity needs to be explained to focus on the indicator specific gap in health provision. Such input will help to set priority areas in the health sector so that disparities are minimized while the disparity and equity in the health sector are achieved.

Review of literature

Ethiopia has formulated a Comprehensive Health Policy in 1993 during Interim Government (World Bank, 2019). Further, the country has initiated Health Sector Development Programs (HSDP) under the Ministry of Health (MOH). Similarly, as a policy; strategic plans were also initiated in 2008. The progress was reviewed during HSDP-III which dealt with 2005-06 to 2009-10 (Federal Ministry of Health, 2010/11). The annual performance report was also published during 2011-12 (Federal Ministry of Health, 2012). The first documented report about the status of health in Ethiopia was published by Koblinsky et.al in 2010. The paper analyzed the constraints related to health care and its possible remedial measures. The results of the study explained that health care is so essential for ensuring a substantial reduction in child and maternal mortality besides a reduction in overall death rates in the country. Federal Ministry of Health (FMOH 2010 and 2014) has also brought out performance reports entitled 'Health Sector Development Program IV for 2010/11 – 2014/15. The study has critically analyzed that country has made substantial progress in making provision for basic health care. However, it has also remarked that there is still a wide gap in the fields of critical health care, particularly in rural areas.

Similarly, Ethiopia's Fifth National Health Accounts Report was brought out for 2010/11

(Bazie and Adimassie, 2017). National health account report presented the expenditures incurred in the field of developing health infrastructures and making adequate provisions for medicines, trained manpower to attend to the issues such as treatment for deficiencies of vitamins and minerals during sickness, pregnancy and immunization programs. However, the report could not identify the gap areas across different health sectors besides the magnitude of health sector requirements of different population groups and regions in the country. A Mid Term Review Report regarding HSDP IV was also brought out in 2013 (Hailemichael et al, 2019). These reports have summarized the investment expenditures and their outcomes at regional and national levels. CSA (2012) in association with the Institute of Maryland USA published the Demographic and Health Survey of Ethiopia (FAO, 2020).

In line with the above reports, Health and Health-Related Indicators were also published in 2012 (Federal Ministry of Health, 2015). According to *UNDP Ethiopia Country Report (2012)*, it has indicated that levels of achievements in different indicators at the country level have made considerable progress (World Bank, 2020). The report has further explained that although national child immunization coverage rates rose rapidly over the last five years, coverage rates are particularly low and need to be increased in Afar and Dire Dawa regional state while taking measures to sustain progress and prevent progress reversals in the rest of the regional states (World Bank, 2020). It is commendable to see regional states that initially had low immunization rates had rapidly increase immunization coverage during the last five years. Consequently, the disparities in measles and DPT3 immunization rates across regions have declined by 44 percent and 55 percent, respectively between 2006 and 2010 (*ibid*).

Besides review reports and assessments, some scholarly articles have been published to explain the performance of the health sector in Ethiopia. Important among them are the studies conducted by Banteyerga H, and Kidanu A. (2008), Birhan et.al (2010), Singh P. et al. (2010), Teckle Haimanot et al. (2013), Bilal, et al. (2014), Khan Et.al (2014), Bezie et.al (2017), Abegaz et al (2018) and Abraha, W. et.al (2019). Banteyerga & Kidanu (2008) attempted a rapid appraisal of the health extension program: Ethiopia Country Report. The study outlines the challenges that are faced by the program at the country level. In memory of 100 years of Ethiopian modern medicine and the New Ethiopian Millennium; Birhan (2010) published an article in *Ethiopian Medical Journal* on “A special issue on medical doctors’ profile in Ethiopia: production, attrition and retention. The article is a review article and explains slow yet steady progress in the health sector in Ethiopia. Similarly, the country case study of Ethiopia regarding human resources for health program was published by Singh P. (2010). It was part of a GHWA task force on scaling up education and training for the health work force by WHO (2016).

Later on, World Bank attempted an initiative on Yes African Can: Success Stories from a Dynamic Continent, Washington DC in 2011 (World Bank, 2020). It was an edited volume by Chauhan Pole P; Angwafo M. Bilal, N.K. et al contributed an article in this volume on “Health extension workers in Ethiopia: Improved access and coverage for rural poor”. The study has explained as to how health services have expanded to cover even remote areas and rural poor. Teklehaimanot, H & Teklehaimanot, A (2013) worked on human resource development for community- based health extension programs: the case of Ethiopia. Similar concerns were reflected in the studies conducted by Khan et al. in 2014 in a study undertaken by World Bank, Washington DC. The research aimed at improving basic services for the bottom forty

percent: Lessons from Ethiopia (Khan J et al., 2014). Later on, Bazie et al. (2017) worked on the “Modern health services utilization and associated factors in North East Ethiopia”. Somewhat different and a longitudinal study was conducted by Abegaz, et al. in 2018. The results of the study are important as scholars have compared the two trends of GDP and health care expenditures in Ethiopia. The study results have shown a positive association between the two variables. Further, it has also proved that there is a bidirectional relationship between the variables as health care expenditure leads to improve the status of community health which in turn contributes to improving the GDP.

A study conducted by Abraha et.al (2019) analyzed the availability and inequality in accessibility in health center- based primary healthcare in Ethiopia during 2015-2017 based on GHE (Government Health Expenditure) at health center level for each district. The purpose of the study was to assess availability and measure the magnitude and trend of inequalities in the accessibility of health center based PHC resources in Ethiopia during the period under study. The study area Tigray has 52 districts (18 Urban and 34 Rural); Afar has 34 districts (2 Urban and 32 rural, and Dire Dawa has one district consisting of nine health centers (HCs) catchment areas (6 in Urban and 3 in rural settings). The results of the study revealed clear contrasts of availability and inequalities in PHC (Primary Health Centers) resources across three regions (Afar, Dire Dawa and Tigray) in Ethiopia. The study has identified contributing factors to low densities and high inequalities of SHWs (Skilled Health Workers) that may help improve PHC services nationwide, along with the pathway towards UHC (Universal Health Coverage).

The foregoing literature review about studies conducted in the field of health services, facilities, and infrastructures in Ethiopia reveal that there are limited studies, both theoretical as well as empirical. Moreover, these studies may be because of certain limitations, remained confined to researches on specific themes of health and specific parts of the country. For example, a study undertaken by Abraha, Woldemichael et.al (2019) relates to the theme of accessibility and inequality in health services in northern (Tegray) and eastern (Afar and Dire Dawa) parts of Ethiopia. There is, thus, an apparent gap towards focusing researches on health services and infrastructures involving many health indicators for all regions of the country. This study is an attempt to fill this gap. The study is an exploratory exercise and does not claim to be comprehensive as it is based on the secondary data. However, it presents a synoptic view of the status of various health indicators across all regions of the country. As such, this study may serve as a base for making other empirical researches to conduct in-depth inquiry and substantiate the results in the future.

Research paradigm

According to WHO(2016) estimate, Ethiopia's total population was 102,403,000 persons (2016) and is growing rapidly. Gross national income per capita (PPP international $, 2013) was 1,350. Life expectancy at birth, as per 2016 estimates was 64 years for males and 67 years for females. United Nations (2012) predicts this rapid growth will continue, reaching nearly 120 million people by 2025. Ranking 92 out of 95 on the UNDP (2012) Human Poverty Index, Ethiopia is one of Africa’s poorest states, with 45 % of its 70 million people living below the poverty line. Three-quarters of the population lack access to clean water, and four persons out of five live without proper sanitation (Khan J et al., 2014). In addition, Ethiopia hosts some 133,000 refugees from neighboring countries. In the last two decades, major crises combining droughts, epidemics,

displacements and armed conflicts, have repeatedly affected the country.

Ethiopian land is severely eroded and deforested. Consequently, Ethiopian land is increasingly turning to desert, due to the country's high population growth, unsustainable land use, and lack of land ownership (Federal Ministry of Health, 2005). Certain projects have been initiated in the country to combating these devastating trends by meeting the country's complex challenges with integrated solutions. For example, EWNRA (Ethio Wetlands and Natural Resource Association), PHE (Population, Health and Environment in Ethiopia-2010), and PDE (Population, Development and Environment in Ethiopia-2005) are working effectively in this regard. According to a global report on food crises launched jointly by European Union, FAO and World Food Program (2020), there is a clear link between conflict and rising levels of acute food insecurity on the one hand and between livelihood interventions and peace processes on the other. FAO (2020) in its report cited that the nature of conflict in the Sahel where 12 million people experienced acute food insecurity last year, and this number could rise to 17 million during the upcoming lean season. In densely populated areas of the central and southern parts of the country, farmers' yield is declining from time to time due to land scarcity. During drought, which is frequent, their living is critically hit.

As per UN (2020) report cited by Abebe (2020) the areas that have been affected by recurrent drought, based on data brought from satellite image in Somali State, in places known as Adadele, Kebri Dehar and west Elimi, unrest and conflicts have increased significantly resulting in displacement and outmigration. It is further reported that about 13 million small holder farmers account for about 90 percent of agricultural GDP in Ethiopia. Nearly 55 percent of small holders' food producers are engaged in farming on one hectare of land or less. Humans as well as livestock face different kinds of risks like disease/ illness, accident, calving, windstorm, smoke, electrocution, flood and snake bite.

The main health concerns in Ethiopia include maternal mortality, malaria, tuberculosis and HIV/AIDS compounded by acute malnutrition and lack of access to clean water and sanitation. The limited number of health institutions, inefficient distribution of medical supplies, and the disparity between rural and urban areas, due to severe under-funding of the health sector, make access to health-care services very difficult. It is estimated that more than half of the population lives more than 10 km from the nearest health facility, usually in regions with poor transportation infrastructure.

According to Relief Society of Tigray (REST), family planning is very crucial to sustainable development. If the family has more children, they can't feed them properly; they can't send the children to school, because there is a food gap in the household. REST uses a watershed planning model jointly developed by the community, health workers, and government agencies.

According to Britannica Ethiopia/Health-and-Welfare; Ethiopia's health care system includes primary health centers, clinics, and hospitals. Only major cities have hospitals with full-time physicians, and most of the hospitals are in Addis Ababa. Access to modern health care is very limited, and in many rural areas, it is virtually nonexistent. The infant mortality rate is almost twice that of the world average (https://www.britannica.com/place/Ethiopia/Health-and-Welfare). Common health concerns are lower respiratory infections, diarrheal diseases, and HIV/AIDS. Ethiopia's HIV/AIDS adult prevalence is above the world average and slightly above that of neighboring countries, although it is lower than that of many other

African countries. In Ethiopia the prevalence is higher in urban areas and among young women and girls (Khan J et al., 2014).

Health facilities are mostly government-owned and are comparatively lower compared to its population size. Medical schools in the country continue to produce general practitioners and a few specialists, but the scale of output does not match the rising demand for health. Shortages of equipment and drugs are persistent problems in the country. Widespread use of traditional healing, including such specialized occupations as bone setting, midwifery, and minor surgery (including circumcision), continues to be important.

Abraha, W, et.al (2019) have conducted a cross-sectional population-based analysis of district-level data collected from 16th December 2017 until 24th May 2018. Afar, Dire-Dawa, and Tigray regions were purposefully included in the study to represent the four pastoralist/semi-pastoralist, three urban and four agrarian regions in Ethiopia, respectively. The analysis was based on primary data from 51 districts (17 urban or municipalities and 34 rural districts) in Tigray, nine operational districts (six urban and three rural) in Dire-Dawa and 34 districts (two urban or municipalities and 32 rural districts) in Afar region. One urban district in Tigray was excluded in the study. Authors in this study have used ratios, different inequality indices and Gini decomposition techniques to characterize the inequalities. The study first worked out the annual GHE per capita in Birr and the ratios of the HCs per 15,000 inhabitants of each district. Besides, district-level annual ratios of the SHWs were calculated per Health Center, and 10,000 inhabitants separately.

A large section of the Ethiopian population (more than 80 percent) resides in rural areas and is directly engaged in the systems of primary productions. Agricultural and pastoral activities are the dominant sources of earning for the rural population. Lowland set up in the rural population, where weather conditions are hot and dry, like that in Afar, Somali and parts of the Tegray region, pastoral activities dominate. Since pastoralists are moving with herds of animals from place to place, in search of grazing grounds and water points, accessing health facilities is a serious problem. These areas suffer from heat stroke and malnutrition. Consequently, mortality rates both among animals and humans are comparatively higher than the national average. As against this, the rural population living in hot and wet conditions like that in Beneshangul Gumuz, Gambella, and parts of SNNPR, the rural population is largely agro-pastoral and led a sedentary life. These areas also suffer from low access to health facilities due to highly scattered settlements and fields of operation. Prevalence of malaria, diarrhea, water- borne diseases, and high rate of IMR are common in such regions. Mortality in these regions is usually higher. Highland setups of rural areas are characterized by cold dry and cold wet conditions, due to higher altitude, which supports agriculture and horticulture. These areas have a higher density of population due to the higher carrying capacity of the land.

Depletion and degradation of land resources, on which three fourth of the Ethiopian population depend directly, continues due to deforestation and destruction in the land cover. Land degradation coupled with increasing frequency of extreme climate events, such as droughts and floods, has led to the pauperization of rural society (Federal Ministry of Health, 2005). Prevalence of poverty, high burden of sickness faced due to acute health problems; a large section of the rural population especially youths migrate towards cities in search of jobs for survival and sustenance (Abebe, 2020). Such a system of rural to urban migration has resulted in registering one of the highest rates of urbanization in Ethiopia. Urban centers are

growing without having basic infrastructure, housing and health facilities at par with growing population pressure in cities and towns (Abebe, 2020).

Thus, health services in rural areas are not only inadequate but do not meet the operational and functional requirements of the people living in remote areas (Abegaz & Mohammed, 2018). In terms of distribution, rural settlements are highly scattered and also lack connectivity to PHCs and availability of trained health workers[2]. Besides, the pastoral group of the population in rural set up is relatively more disadvantaged compared to their counterparts' agricultural population (Abegaz & Mohammed, 2018). Because of the clustering of business, industry, and construction activities in urban centers health infrastructure and services are relatively better served both in terms of quantity as well as quality. Studies have shown marked inequalities in the provision of health infrastructure within rural set up. Somewhat different but similar trends were noted in the case of small and medium towns where the provision of basic health infrastructure is there but they lack higher-order health services which are mostly concentrated in large towns and metro cities such as Addis Ababa, Dire Dawa and Harar (Koblinsky et al, 2010).

Therefore, innovative public-private partnerships and major stakeholders, the government, which plays a crucial role in poverty alleviation, should create an enabling environment by formulating legal framework and introducing proclamation helpful for accelerating the pace of development through supporting innovative technologies to access the health facilities in remote rural areas.

For a better appreciation of achievements in the health sector at regional and national levels, additional studies need to be carried out. Health, being an important indicator of social well-being and social development, needs to be accessible and available to all at affordable costs. Regional development of health infrastructure and services along with disparities needs to be studied for setting priorities of planning for future investments at federal and regional state levels. While planned efforts are needed to be made to ensure access to basic health services to all localities irrespective of their population size and geographic location. However, specialized and higher- order health services which are costly and hence cannot be provided to all the locations need to be planned at regional levels to satisfy the health requirements of regional people and to minimize the level of disparity within and between the regions.

Health disparities in the Ethiopian context could be conceptualized at three distinct levels (refer to figure 1). Considering the rural and urban settings of communities, there are relative health disparities that are caused largely due to the disadvantages of the profession followed in a specific area by the people. For example, pastoralists have to incur high mobility along with herds of livestock in search of pastures and water points; hence access to the health facility, which is mostly available in towns, remains difficult. As against this, agriculturists mostly working in the fields in the nearby settlement have relatively better access to a health facility.

Similar relative disparities exist between small and medium towns as compared to large towns and cities. Health facilities and infrastructures are relatively less equipped in small and medium towns compared to large towns and cities, which are the preferred locations for making provisions of health facilities.

Absolute disparities in health services and infrastructures related to the amount of gap that exists between the minimum and maximum scores recorded in a specific health facility. If this gap is wide, there is a need to reduce the absolute disparity by making more health

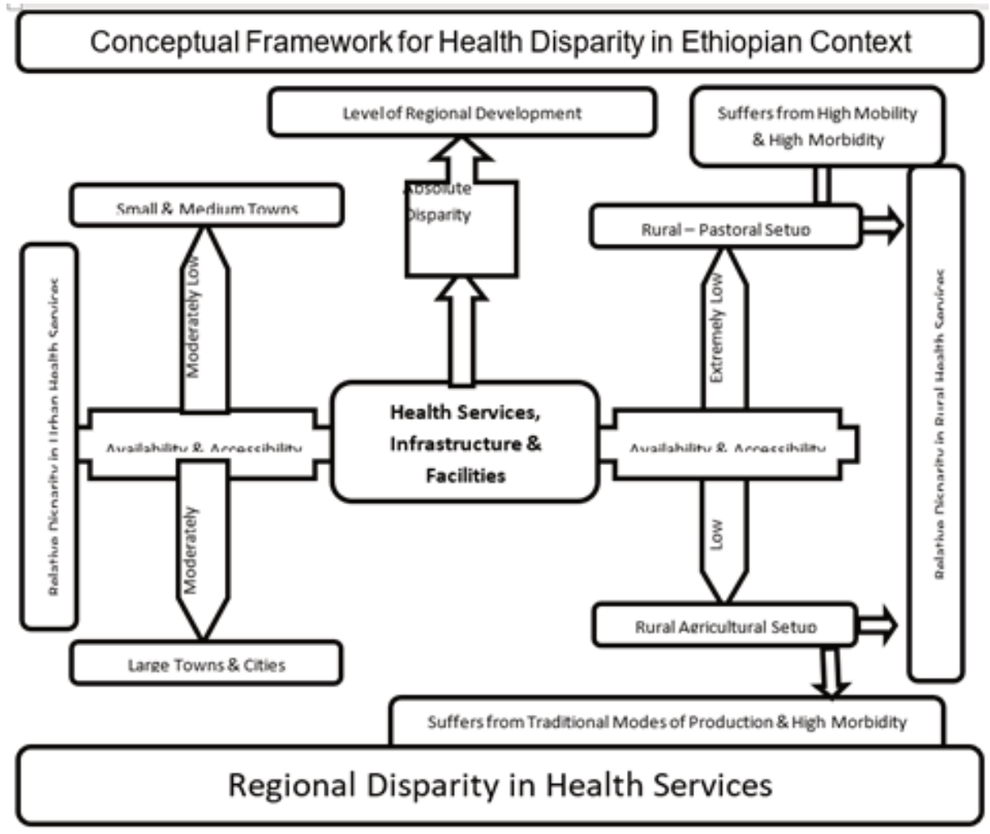

Figure1: Conceptual framework for disparities in health services and infrastructures.

provisions in favor of those at the low levels. Both relative as well as absolute disparities; viewed in terms of development at the regional levels; produce regional disparities. In the Ethiopian context, hot and dry lowland regions display marked regional disparity in health services compared to highlands which are comparatively wet and cold and support higher population density. As such, health facilities per unit of population in specific areas need to be matched to reduce the regional disparity; otherwise it may serve as a cause of discontent and unrest which remains detrimental to the federal structure of national development.

Methodology

Data base: The paper is based on the data from United Nation's Estimates (2019) for the current population of Ethiopia, life expectancy at birth and other vital statistics such as IMR, U5MR, MMR, CBR, CDR, etc. Information related to health infrastructures such as the number of hospitals, health centers and health posts besides health facilities and population ratios have been obtained from the Federal Democratic Republic of Ethiopia- Ministry of Health: *Health and Health -Related Indicators-Version 1, 2008 E.C.*

The methods used: The exercise has used five set of methods to derive the results related to the status of health indicators with regard to development, absolute disparity and relative disparity in case of health indicators. The derivation of each method is explained below.

1. **The Composite score of ranks (CSR):** Where: CSR is the 'Composite Score of Ranks' obtained by summing of the rank scores of all the variables involved in the exercise for each unit area under consideration. It is expressed as $Rx_1+Rx_2…..Rx_n$.
2. **The Normalized score of ranks (NSR):** Where NSR is the 'Normalized Score of Ranks'. It is worked out by dividing the CSR values of each unit of study by their average (mean value). It is expressed as NSR= where CSR is the sum of the composite score of ranks in the case of each unit of study and $\overline{X}$ is the average value of.
3. **Development index (D.I.)** = NSR RO

Where, D.I. is the 'Development Index'. It is worked out by dividing the NSR values of each study unit with its rank order (RO).

The methods used in this exercise related to the measures of variation. The absolute disparity has been worked out by measuring the gap between performing regions (highest- lowest scores) in case of all indicators into consideration. It is reflected in terms of times the gap between the minimum and maximum performing regions as a ratio. It is reflected as:

4. IAD = 1:

Where, IAD refers to the 'index of absolute disparity'. 1 is a measure of ratio denoting the score of minimum performing region (LSD) in a specific variable against which absolute disparity is worked out and compared. HSD refers to the highest score in a distribution, while LSD refers to the lowest score in a distribution.

5. IRD = x100 Where: IRD refers to the 'index of relative disparity' refers to the standard deviation; $\overline{X}$ refers to the average value in the distribution.

The coefficient of variation is used as a standardized measure to reflect the index of relative disparity. The coefficient of variation (C.V.) is the standard deviation of observation divided by the mean and expressed as a percentage. Higher the percentage, higher is the relative disparity.

6. RDI =DI*DR

Where, RDI is the regional disparity index. It has been worked out with the help of the development index (DI) multiplied with the respective development rank. RDI so obtained is divided into four classes of disparity as low, medium, high and very high.

Results and discussion

Health facilities in Ethiopia - levels of regional development:

This exercise has been worked out to understand the overall status of health parameters in different regions of Ethiopia. Regions have been ranked based on their performance in each parameter; the region performing at the top was assigned the first rank followed by second and so on. Ranks secured by specific region in all parameters have been added together to get a composite score of ranks (CSR). It was further divided by an average value to get the smaller value close to one termed as the normalized score of ranks (NSR). The development index for regions was determined based on the normalized score of ranks. To keep the order unchanged, values of normalized scores of ranks (NSR) were divided by specific rank orders. By following this procedure while D.I. value for the region at the top reflects the highest score at par with its NSR value being divided by one, regions in subsequent order reflect lesser scores successively. It was based on the logic that the region at the top should also reflect the highest index value.

Levels of health facilities were determined based on the grouping of the rank orders into four from the top as high, moderately high, moderately low and low levels. Regions with high levels of development (D.I. from 0.283 to 0.74) in health facilities are Addis Ababa, Amhara and Harari regions. Regions with moderately high (D.I. from 0.165 to 0.22) levels of health facilities are Dire Dawa, Oromia and Tigray. Similarly, regions with moderately low (D.I. from 0.125 to 0.155) levels of health facilities are Afar, SNNPR and Somali. Regions having low (D.I. from 0.114 to 0.115) levels of health facilities are Gambella and Beneshangul Gumuz (table 1).

Table 1: Levels of health facilities in Ethiopia: A regional profile 2015

Ser. no.	Regions	Composite score of ranks (CSR)	Normalized score of ranks (NSR)	Rank Order (R.O.)	Development index D.I.	Level of health facility
1	Tigray	154.5	0.99	6	0.165	Moderately high
2	Afar	169.5	1.086	7	0.155	Moderately low
3	Amhara	130	0.83	2	0.415	High
4	Oromia	149	0.95	5	0.190	Moderately high
5	Somali	175.5	1.125	9	0.125	Moderately low
6	Beneshangul Gumuz	198	1.26	11	0.114	Low
7	SNNPR	173.5	1.11	8	0.139	Moderately low
8	Gambella	179	1.147	10	0.115	Low
9	Harari	134	0.85	3	0.283	High
10	Addis Ababa	115.5	0.74	1	0.740	High
11	Dire Dawa	137.5	0.88	4	0.220	Moderately high
Mean ($\bar{x}$)score =156 Median (Med.) score =154.5						

Source: *Health and Health-Related Indicators-Version 1, 2008 E.C. (2015 G.C).The figures for each variable across regions were ranked and added to obtain the composite score of rank values.*

Status of absolute disparity in health indicators in Ethiopia

Attributes related to the growth of population: Before analyzing the health attributes of a country, it is essential to take stock of population parameters such as population growth rate, birth rate, death rate, etc. The population growth rate ranges between 1.7 percent, the lowest in the Amhara Region, to 4.1 percent the highest per annum in Gambella Region. The absolute disparity works out to be 1:2.4 times. In case of total fertility rate (TFR) which means the total number of children born or likely to be born to a woman in her lifetime if she were subject to the prevailing rate of age-specific fertility in the population. As such, Ethiopia recorded the lowest value of TFR as 1.5 in Addis Ababa to the highest value of 7.1 in Somali Region. The absolute disparity is worked out to be 1: 4.7 which explains the presence of a large disparity level in TFR. Crude birth rate (CBR) is a ratio of the number of live births in that population to the total size of the population, scaled to a denominator of 1000.The lowest value of CBR was recorded in Addis Ababa Region as 23.3 as against the highest value of

34.7 recorded in the Oromia Region. The absolute disparity in the case of CBR is 1: 1.49 (refer to table 1). RNI is a rate of natural increase in population. It is worked out in percentage terms by subtracting crude death rate from the values of the crude birth rate. RNI can indicate the stage of the demographic transition model (DTM) a country is in. Results of RNI indicate that the lowest value is recorded as 2.0 in Afar Region while the highest value as 2.6 in Oromia Region. The absolute disparity is worked out as 1:1.3. Thus, the absolute disparity from highest to lowest was recorded in the case of TFR followed

Table 2: Ethiopia: Absolute disparity related to the attributes of population growth of 2015

Score	The annual population growth rate (1)	TFR (2)	CBR (3)	RNI (4)
Highest recorded at	Gambella	Somali	Oromia	Oromia
Highest Value	4.1	7.1	34.7	2.6
Lowest recorded at	Amhara	Addis Ababa	Addis Ababa	Afar
Lowest Value	1.7	1.5	23.3	2.0
Rate (Highest value/ Lowest value)	*1: 2.4*	*1: 4.7*	*1: 1.49*	*1: 1.3*
Q-3	2.9	5.2	34.4	2.5
Median	2.6	4.6	32.2	2.4
Q-1	2.2	3.8	30	2.3

Source: *Health and Health- Related Indicators-Version 1, 2008 E.C. (2015 G.C). Figures for each variable were arranged in a descending order to obtain the highest and lowest scores besides determining Q-3; median and Q-1 scores were used to understand the location- specific values and absolute gap*

by APGR (annual population growth rate), CBR, and RNI in a sequential manner rated at the ratio of 1 as the point of reference (table 2).

The absolute disparity in death- related attributes: The absolute disparity in death-related attributes reveals that in case of crude death rate (CDR); which is the number of deaths occurring among the population of a given geographical area during a year per 1,000 mid-year total population of that area during the same year; the lowest value of 6.3 was recorded in Addis Ababa Region while the highest value of 11 in Beneshangul Gumuz Region. The absolute disparity is worked out to be 1: 1.7.

In case of infant mortality rate (IMR); which is the number of deaths per 1, 000 live births of children under one year of age; recorded the lowest value as 40 in Addis Ababa and the highest value as101 in Bene- Gumuz Region. The absolute disparity is worked out as 1: 2.5. Under 5 mortality rate reveals that the lowest value was recorded as 53 in Addis Ababa Region while the highest value was recorded as 169 in Beneshangul Gumuz. The absolute disparity is worked out as 1:3.18. The child mortality rate (CMR) refers to the death of children under the age of 14 and encompasses neonatal mortality, under 5 mortality, and mortality of children aged 5-14. Results reveal that the lowest value was recorded as 14 in Addis Ababa Region and the highest value as 76 in Beneshangul Gumuz Region. The absolute disparity is worked out as 1: 5.4. Deaths due to malaria are one of the major health problems in Ethiopia. Results reveal that the lowest value was recorded as 2 in Harari Region; whereas the highest value as 214 in the Oromia region. The absolute disparity is extremely high as 1: 107.

The overall analysis of absolute disparity related to death variables reveals that it increases substantially in a sequence from CDR to IMR, U5MR, CMR and deaths related to Malaria as 1.7, 2.5, 3.18, 5.4 and 107 respectively with reference to the lowest score considered as 1 for all the above variables (table-3).

Table 3: Ethiopia: Absolute disparities in

Score	CDR (5)	IMR (6)	U5MR (7)	CMR (8)	Deaths due to Malaria (9)
Highest recorded at	Ben-Gumuz	Ben-Gumuz	Ben-Gumuz	Ben-Gumuz	Oromia
Highest Value	11	101	169	76	214
Lowest recorded at	Addis Ababa	Addis Ababa	Addis Ababa	Addis Ababa	Harari
Lowest Value	6.3	40	53	14	2
Rate	*1:1.7*	*1:2.5*	*1:3.18*	*1:5.4*	*1:107*
Q.3	9.8	76	123	56	95
Median	9.2	71	112	41	20
Q.1	7.6	64	94	32	6

Source: *Health and Health- Related Indicators-Version 1, 2008 E.C. (2015 G.C).Computation of data by the researcher.*

Attributes related to life expectancy at birth: Life expectancy is an important measure of quality for people living in a country. In the case of Ethiopia, life expectancy for the male population ranges from a lowest value of 20.1 in Beneshangul Gumuz to a highest value of 60.3 years in Dire Dawa Region. The absolute disparity is worked out as 1: 3.0. However, in the case of life expectancy for the female population ranges between the lowest value of 51.1 years in Beneshangul Gumuz to the highest value of 64.1 years in Dire Dawa. The absolute disparity is 1:1.25. Thus, there is a wide gap in an absolute disparity between male and female population groups of Ethiopia. It is relatively much better in the case of the female population group compared to the male population group (table 4).

Attributes related to contraceptive acceptance, health care coverage, and services:

Acceptance of contraceptive is considered to be a positive parameter for balanced population growth and family welfare at the national level. In the case of Ethiopia, the lowest value of contraceptive acceptance was recorded as 5.7%

Table 4: Ethiopia: Absolute disparity in Life expectancy 2015

Score	Life expectancy-Male (10)	Life expectancy-Female (11)
Highest recorded at	Dire Dawa	Dire Dawa
Highest Value	60.3	64.1
Lowest recorded at	Bene-Gumuz	Bene-Gumuz
Lowest Value	20.1	51.1
Rate	*1:3.0*	*1:1.25*
Q.3	57.6	56.0
Median	54.1	55.4
Q.1	52	53.5

Source: *Health and Health- Related Indicators-Version 1, 2008 E.C. (2015 G.C).*

in Somali Region as against this the highest value was recorded as 97.2% in Amhara Region. As such, the absolute disparity in this case, worked out as 1: 17.05 which reflects the large variation. Similarly, deliveries by skilled attendants were recorded as lowest 18.7 in the Somali Region and highest as cent percent

(100%) in the regions of Addis Ababa and Harari. The absolute disparity in this case, worked out as 1:5.3 which reflects the gap to be about five times. Post natal care coverage is yet another important parameter of family welfare. Results reveal that the lowest value was recorded as12.8% in the case of the Gambella Region while the highest score was cent percent (100%) in three regions of Addis Ababa, Harari and Oromia. The absolute disparity was worked out as 1:7.8. As such, there is a marked disparity to the extent of about 8 times from the lowest. The health facility of basic emergency obstetric care, popularly known as, BEmOC is an important parameter of health care. Results reveal that with the lowest score of 1 in the Gambella Region and highest score of 534 in the Amhara Region; the absolute disparity is worked out as 1: 534 which reflects a huge gap in this parameter. In the case of health facility called as comprehensive emergency obstetric care, popularly known as CEmOC, is yet another parameter of health care which records the lowest value as 1 in the Gambella Region and highest value as 204 in the SNNPR.

Table 5: Ethiopia: Absolute disparity in contraceptive acceptance, health care coverage, and services 2015

Score	Contraceptive acceptance rate % (12)	Deliveries by skilled attendant % (13)	Postnatal care coverage% (14)	No of HF with BEmOC Services (15)	No of HF with CEmOC Services (16)
Highest recorded at	Amhara	Addis Ababa, Harari	Addis Ababa, Harari, Oromia	Amhara	SNNPR
Highest value	97.2	100	100	534	204
Lowest recorded at	Somali	Somali	Gambella	Gambella	Gambella
Lowest value	5.7	18.7	12.8	1	1
Ratio	*1:17.05*	*1:5.3*	*1:7.8*	*1:534*	*1:204*
Q.3	72.4	71.6	100	409	152
Median	49.9	60.1	74.4	29	18
Q.1	33.1	25.7	34.5	14	7

Source: *Health and Health -Related Indicators- Version 1, 2008 E.C. (2015 G.C).*

As such, absolute disparity worked out in this parameter is 1:204 which reflects a very large service gap of about 204 times. It is important to note that while the absolute disparity in case of deliveries by skilled attendants and post natal care ranges in less than ten times of variation; contraceptive acceptance crosses well over 10 times and those of BEmOC and CEmOC crosses much above 100 times at the national level (table-5).

Attributes related to OPD attendance, BOR and health facility to population ratios:

This section relates to a set of five parameters related to peoples' health. OPD attendance per capita is an important measure of comparison between the units of observation. The lowest value recorded in this case is 0.05 in Somali Region while the highest value is 1.27 in the Addis Ababa region. The absolute disparity, in this case, is 1: 25.4 which reflects a big gap that needs to be balanced through planning. The BOR (bed occupancy rate) is yet another significant parameter of health- related to human welfare. It records the lowest value as 0.02 in Somali Region as against the highest value of 0.42 in the case of Addis Ababa Region. The absolute disparity is 21 times that of the lowest record. Health center post to population ratio was recorded lowest at Dire Dawa as 5000 as against this the highest score was recorded at Addis Ababa as 218200 persons per health center post. It must be noted that the lower value indicates a relatively better health care.

The absolute disparity is worked out as 43.64 times in this case which needs to be lowered down in the larger interest of the society and its welfare. Hospital to population ratio is yet another important indicator of provisions made in favor of human welfare. Results reveal the lowest value of 33,143 was recorded in Harari Region while the highest value of 635,698 in the case of the Oromia Region. The absolute disparity is worked out as 1: 19.1 times. In the case of the health post, the lowest value was recorded as nil in Addis Ababa while the highest value as 13750 in the case of Dire Dawa city. Thus, absolute disparity works out to be infinite as the lowest value is nil. The overall assessment in this group of parameters reveals that health posts reflect the highest disparity as infinite followed by health center as 43.64 times. Per capita OPD attendance, reflects 25.4 times while the bed occupancy rate reflects absolute disparity as 21 times from the lowest recorded value (table 6).

Table 6: Ethiopia: Absolute disparity in public health facilities in Ethiopia 2015

Score	OPD attendance per capita (17)	Bed Occupancy Rate (18)	Public health facility to population ratio		
			Health center post (19)	Hospital (20)	Health (21)
Highest recorded at	Addis Ababa	Addis Ababa	Addis Ababa	Oromia	Dire Dawa
Highest Value	1.27	0.42	218,200	6,35,698	13,750
Lowest recorded at	Somali	Somali	Dire Dawa	Harari	Addis Ababa
Lowest Value	0.05	0.02	5,000	33,143	-
Ratio	*1:25.4*	*1:21*	*1:43.64*	*1:19.1*	-
Q.3	0.95	0.38	27,162	502,888	7,101
Median	0.66	0.37	25,174	409,002	5,135
Q.1	0.37	0.11	20,512	287,168	3,466

Source: *Health and Health- Related Indicators- Version 1, 2008 E.C. (2015 G.C).*

Attributes related to public health professionals and their density:

This group of indicators includes five variables such as non- medical, other health professionals besides density (per 10,000) of the health officer, midwifery, and all nurses. Results reveal that in the case of total specialists (non-medical), the lowest record was nil in Gambella Region and the highest record was 232 in SNNPR. As such, the absolute disparity is very large. In the case of all other health professionals, the lowest value recorded was 153 in Harari Region and the highest value as 18075 in Oromia Region. The absolute disparity was worked out as 1:118.1 times. In the case of health officer density per 10,000 of the population; the lowest value was recorded as 0.44 in Afar Region while the highest value as 2.41 in Harari Region. Absolute disparity, in this case, was worked out as 1: 5.4 times. In the case of midwifery density per 10,000 of the population; the Afar Region recorded the lowest value of 0.30 and Harari Region the highest value as 2.20. The absolute disparity in this case, was worked out as 1:7.3 times. All nurses' density 10,000 of the population was lowest 3.67 in Afar Region while the highest value was 17.59 in Harari Region.

Thus, the absolute disparity, in this case, was 1:4.7 (table 7).

Table 7: Ethiopia: Absolute disparity in public health professionals and their density in Ethiopia 2015

Score	Total specialists (non-medical) (22)	All other Health Professionals (23)	Health Officer Density per 10,000 (24)	Midwifery Density per 10,000 (25)	All nurses Density per 10,000 (26)
Highest recorded at	SNNPR	Oromia	Harari	Harari	Harari
Highest Value	232	18075	2.41	2.20	17.59
Lowest recorded at	Gambella	Harari	Afar	Afar	Afar
Lowest Value	-	153	0.44	0.30	3.67
Ratio	-	*1:118.1*	*1:5.4*	*1:7.3*	*1:4.7*
Q-3.	191	7938	1.80	1.36	8.57
Median	25	1364	1.11	1.20	7.51
Q-1.	4	637	0.73	0.76	4.27

Source: *Health and Health- Related Indicators-Version 1, 2008 E.C. (2015 G.C).*

Relative disparity in Ethiopia

The relative disparity has been worked out using the coefficient of variation (C.V.) for each variable. Further, based on the range of variation values, levels of relative disparity have been worked out and analyzed for all the 26 variables used in this exercise. The range of (C.V.) variation is 224.54 percent among the variables. As such, variables were grouped into 5 as very low, medium, high and very high having an interval of 25 percent each. A minimum variation of 6.17 percent was observed in the case of life expectancy for females to a maximum of 230.71 percent in the case of population ratio to the functional health center (table 8).

Results reveal that a very low level (0- 25 %) of relative disparity was observed in cases of life expectancy at birth both for male as well as female, RNI, CBR, CDR and annual population growth rate. It was also at a low level (25-50%) in cases of TFR, IMR, health officer density per 10,000; post natal care coverage; under 5MR, all nurses' density per 10,000; deliveries by skilled attendants; contraceptive acceptance rate and population ratio to a functional hospital. The medium level (50-75%) of relative disparity was observed in cases of five variables such as population ratio to a health post, bed occupancy rate, midwifery density per 10,000, CMR and OPD attendance per capita. A high level (75-100%) of relative disparity was observed in the case of total non-medical specialists. Very high level of (>100 %) relative regional disparity was observed in cases of deaths due to malaria, CEmOC, BEmOC, all other health professionals and population ratio to the functional health center.

Regional disparity in health indicators in Ethiopia:

Results reveal marked regional disparities in health indicators in Ethiopia (table-8). Addis Ababa City Administration region leads in most of the health indicators. Regional disparity index ranges between 0.74 (Addis Ababa) up to 1.254 (Beneshangul Gumuz Region). The low level of regional disparity was observed in the regions of Addis Ababa, Harari and Amhara. These regions are in the first quartile (0.740 up to 0.849) of the regional disparity index. The regions with moderate regional disparity index are Dire DawaOromia and Tigray. These regions are in the 2nd quartile and the regional disparity index ranges between 0.880 up to 0.990. Regions of Afar, SNNPR and Somali represent a high

Table 8: Levels of relative disparity related to health facilities in Ethiopia 2015

Level: Very low Disparity (<25%)			**Level: Medium Disparity (50-75%)**		
No.	**Variable**	**D.I. Value**	**No.**	**Variable**	**D.I. Value**
1	Life expectancy (female)	6.17	16	Health Post population ratio	52.31
2	RNI	6.75	17	Bed Occupancy Rate	58.77
3	CBR (Per 1000)	11.33	18	Midwifery Density per 10,000	62.35
4	CDR	14.53	19	CMR	64.45
5	Life expectancy (male)	19.77	20	OPD attendance per capita	71.17
6	Annual population growth rate	22.69	**Level: High Disparity (75-100%)**		
Level: Low Disparity (25-50%)			21	Total Specialists (Non-Medical)	92.74
7	TFR	28.80	**Level: Very high (>100%)**		
8	IMR	30.13	22	Deaths of Malaria	114.85
9	Health Officer Density per 10,000	30.75	23	Comprehensive Emergency Obstetric Care (CEmOC)	116.52
10	Postnatal care coverage	39.89			
11	U5 MR	39.92	24	Basic Emergency Obstetric Care (BEmOC)	120.36
12	All Nurses Density per 10,000	42.76	25	All Other Health Professionals	133.22
13	Deliveries by a skilled attendant	45.73	26	Functional Health Center population ratio	230.71
14	Contraceptive acceptance rate	47.01			
15	Functional Hospital population ratio	49.13			

Source: *FDRE, (MoH): Health and Health-Related Indicator, EFY 2007 (2015GC). Scores of relative disparity (IRD) for each indicator have been worked out by the author.*

regional disparity index. These regions are in the third quartile of the regional disparity index. Regions of Gambella and Beneshangul Gumuz in the 4th or upper quartile of regional disparity index. The RDI ranges between 1.150 up to 1.254. Thus, these regions are highly disadvantaged and reflect a very high regional disparity in health indicators. There is a very highsignificant negative correlation (r= - 0.98) between the development index and the disparity index of health indicators in the study area.

Table 9: Regional disparity in health indicators in Ethiopia

Dev't Ranks	Regions	Dev't Index	Index of disparity	Quartile	Level of regional disparity
1	Addis Ababa	0.740	0.740	Top	Low
2	Amhara	0.415	0.830		Low
3	Harari	0.283	0.849	3rd	Moderate
4	Dire Dawa	0.220	0.880		Moderate
5	Oromia	0.190	0.950		Moderate
6	Tigray	0.165	0.990	2nd	High
7	Afar	0.155	1.085		High
8	SNNPR	0.139	1.112		High
9	Somali	0.125	1.125	1st	Very High
10	Gambella	0.115	1.150		Very high
11	Beneshangul Gumuz	0.114	1.254	Bottom	Very high

Source: *Health and Health- Related Indicators- Version 1, 2008 E.C. (2015 G.C). Index of disparity and its levels have been worked by the researcher.*

Conclusion

The foregoing analysis leads to conclude the following:

1. Being one of the ancient civilizations Ethiopia has a long tradition of health workers and healers to address the ailments and sickness. However, modern medical care and health infrastructures were introduced to the country in the early decades of the 20th century. The country has achieved remarkable success in its health and health- related indicators during the past two decades. Distribution of health infrastructure and services has recorded success in all the regions and city administrations. However, health infrastructure and services are relatively more concentrated in city regions and regions with higher levels of development as compared to rural areas in general and depressed/less developed regions in particular.

2. Regions registering a high level of development (scores from 0.283 to 0.74) in health sector infrastructures, facilities and services are Addis Ababa, Amhara, and Harari; moderately high (scores from 0.165 to 0.22) are Dire Dawa, Oromia and Tigray; moderately low (scores from 0.125 to 0.155) are Afar, SNNPR and Somali regions while regions at the low level of development (scores from 0.114 to 0.115) are Gambella and Beneshangul Gumuz).

3. The absolute disparity presents wide variations in the case of health indicators. It varies from a minimum of 1: 1.25 in case of life expectancy at birth for females up to a maximum of 1: 534 in case of several hospital facilities with BEmOC. There are two variables with exceptionally high absolute disparity reflecting infinite ratio; four variables with very high absolute disparity ranging above 100 times up to 534 times; five variables with high absolute disparity ranging from 17.05 times up to 43.64 times; 11 variables with moderate absolute disparity ranging from 2.4 times up to 7.8 times and remaining four variables with low absolute disparity ranging from 1.25 times up to1.7 times.

4. The relative disparity in the case of health infrastructure and services ranges between a minimum of 6.17 % in the case of life expectancy at birth for females up to 230. 71 % in the case of the functional health center to population ratio. There are 6 variables reflecting very low level (<25 %); 9 variables with low level (25-50%); 5 variables with medium level (50-75%); one variable with high level (75-100 %) and remaining 5 variables with very high level (>100 %) of relative disparity.

5. Regions with high development scores in health indicators usually have a low regional disparity index. There is a significantly high negative correlation between the development level and level of regional disparity in health indicators. Both are inversely proportional. Addis Ababa and Harari regions with a high index of development reflect low level of regional disparity. On the contrary, regions of Gambella and Beneshangul Gumuz have very low levels of development and hence have a very high level of regional disparity index in health -related indicators.

6. It is important to note that country is making rapid progress in health and associated indicators. Further, there are significant improvements in reducing child mortality, improving extension works and deliveries by skilled nurses. Disparities need to be minimized to ensure normal health care to all the people across all regions irrespective of their levels of development and geographic setting.

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References

Abebe, W. (2020), "Reaching the low- income rural population through the provision of micro finance" *Ethiopian Herald, Sunday Edition,* 26th April 2020, page -22. Addis Ababa.

Abegaz, K.H. & Mohammed A.A. (2018), "Health care expenditure and GDP in Ethiopia from 1995 to 2014: A time –series analysis", *Agriculture and Food Security Vol.7, No.1.*

Abraha, W. Amirhossein, T. Aliakbari, S.A. & Olyemnesh, A. (2019), "Availability and inequality in the accessibility of health center- based primary health care in Ethiopia",PLoS ONE 14 (3): e 0213896. https://doi.org/10.1371.

Ahmed, M. Demissie, M. Worku, A. Abrha, A and Berhane, Y. (2019), "Socio-cultural factors favoring home delivery in Afar pastoral community, northeast Ethiopia: A Qualitative Study", *Reproductive Health,* Vol. 16, Article No.171.

Banteyerga, H. & Kidanu, (2008), *A. Rapid appraisal of health extension program: Ethiopia Country Report,* The L10 K Project of JSI.

Bazie, G.W., Adimassie M.T. (2017), "Modern Health Services Utilization and Associated Factors in North East Ethiopia", *Plos One, 12 (9) e 0185381*.

Bilal, NK et al. (2011), Health extension workers in Ethiopia: improved access and coverage for the rural poor. In: Chuhan-Pole P, Angwafo M, editors. *Yes, Africa can: success stories from a dynamic continent. Washington (DC)*: World Bank; 2011:433–44.

Birhan Y. (2010), Special issue on medical doctors' profile in Ethiopia: Production, attrition, and retention. In memory of '100 years of Ethiopian modern medicine and the New Ethiopian Millennium.' *Ethiopian Medical Journal Vol. 46.*

Central Statistical Agency and ICF International (2012), *Ethiopia demographic and health survey 2011.* Addis Ababa and Calverton, Maryland, USA.

FAO (2020), "FAO asks urgent response for food crises" *Ethiopian Herald, Sunday Edition,* 26th April, 2020, page -6. Addis Ababa.

Federal Ministry of Health (2005), Draft human resources for health strategic plan, Addis Ababa, Ethiopia: Health sector strategic

plan (HSDP-III) 2005/06–2009/10. Addis Ababa.

Federal Ministry of Health (2008), *Draft human resources for health strategic plan,* Addis Ababa, Ethiopia.

Federal Ministry of Health (2010), *Health Sector Development Program IV*: 2010/11 – 2014/15, Addis Ababa, Ethiopia

Federal Ministry of Health (2010/11), *Ethiopia's Fifth National Health Accounts,* Addis Ababa, Ethiopia.

Federal Ministry of Health (2012), *HSDP IV annual performance report* – 2011/2012. Addis Ababa, Ethiopia.

Federal Ministry of Health (2012), *Health, and health- related indicators*. Addis Ababa, Ethiopia..

Federal Ministry of Health (2012), *HSDP IV annual performance report* – 2011/2012. Addis Ababa, Ethiopia.

Federal Ministry of Health (2015) *Health and health- related indicators. Version 1*, 2008 E.C.; Addis Ababa, Ethiopia.

Hailemichael, Y. Hanlon, C. Tirfessa, K. Docrat, S. Alem, A. Medhiin, G. Fekadu, A. Lund C. and Hailemariam D. (2019), "Mental health problems and socioeconomic disadvantage: a controlled household study in rural Ethiopia" *International Journal for Equity in Health,* Vol.18, Article-121.

Khan J et al. (2014), "Improving basic services for the bottom forty percent: Lessons from Ethiopia" *World Bank Studies,* Washington DC.

Koblinsky M, Tain F, Gaym A, Karim A, Carnell M, Tesfaye S.(2010) "Responding to the maternal health care challenge: the Ethiopian health extension program". *Ethiopian Journal of Health Development*, Vol. 24; pp.105–9.

Singh P. (2010), "Country case study Ethiopia: Human resource for health program" *GHWA task force on scaling up education and training for the health workforce,* The Earth Institute, New York.

Teklehaimanot H D, Teklehaimanot, A (2013), Human resource development for a community-based health extension program: a case study from Ethiopia. *Human Resource for Health.* 2013; pp. 11–39.

Transitional Government of Ethiopia (1993), Health policy of the transitional government of Ethiopia. Addis Ababa.

UNDP Ethiopia (2012): Empowered Lives and Resilient Nations-Ethiopia Country Report-2, pages 5-8.

WHO (2016), Ethiopia Country Report.

World Bank (2019): Livelihoods Resilience in the l ow land areas of Ethiopia, PDF

World Bank (2020): Ethiopia has Made Major Strides in Poverty Reduction but Disparities, Inequality Remain, *Press Release,* April 16, 2020.

Websites

https://www.wilsoncenter.org/publication/issue-21-population-health-and-environment-Ethiopia

https://www.britannica.com/place/Ethiopia/Health-and-Welfare

https://www.britannica.com/place/Ethiopia/Education