

Inequalities of Access to Skilled Birth Attendants among Ethiopian Women

Nasser B. Ebrahim

Department of Public Health, Keimyung University, 1095 Dalgubeol-Daero, Dalseo-Gu, Daegu 42601, South Korea

Received December 14, 2022; Revised March 6, 2023; Accepted March 21, 2023

Cite This Paper in the Following Citation Styles

(a): [1] Nasser B. Ebrahim, "Inequalities of Access to Skilled Birth Attendants among Ethiopian Women," *Universal Journal of Public Health*, Vol. 11, No. 2, pp. 224 - 231, 2023. DOI: 10.13189/ujph.2023.110204.

(b): Nasser B. Ebrahim (2023). *Inequalities of Access to Skilled Birth Attendants among Ethiopian Women*. *Universal Journal of Public Health*, 11(2), 224 - 231. DOI: 10.13189/ujph.2023.110204.

Copyright©2023 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract This study aims to examine the inequalities in coverage of skilled birth attendants among Ethiopian women. Access to skilled birth attendants, a key indicator for reducing maternal mortality, is a closely monitored parameter. Data from the World Health Organization's Health Equity Monitor database (HEAT) were analyzed and disaggregated by residence type, economic status, education, and subnational regions. Inequality summary measurements and the magnitude of skilled birth attendants for subgroups were calculated. The data were based on Ethiopia's Demographic and Health Surveys (EDHS) of 2000 (n=14072), 2005 (n=14500), 2011 (n=17817) and 2016 (n=16650). The results showed that the inequality gap between rural and urban residents has significantly increased, and access to skilled birth attendants improved with higher economic status and educational levels. Although the disparities among regions were small, they persisted. To achieve equitable progress towards universal coverage of births attended by skilled health personnel, targeted efforts and resources should be directed towards underserved poor and rural women, particularly those living in regional states. Health inequalities cannot only harm disadvantaged subpopulations, but also hinder a country's progress towards equitable health outcomes. The contribution of these findings is that it provided a comprehensive analysis of inequities in relations to accessing skilled birth attendants by Ethiopian women and identified highly disadvantaged groups. The results have highly relevant practical implications to reducing the gap in accessing skilled birth attendants that may ultimately contribute towards universal and equitable access to skilled birth attendants among Ethiopian women. Achieving equity in accessing skilled birth attendants will ultimately

reduce maternal mortality rates, improve quality of life for women, and may lead to greater productivity and contribution of women to the society.

Keywords Skilled Birth Attendants, Inequalities, Women, Ethiopia, Africa

1. Introduction

Maternal mortality is a major public health problem, specifically, affecting women in resource-poor countries. Globally, 295,000 maternal deaths were recorded in 2017 [1, 2]. Each year, more than 8 million women experience severe and lifelong health consequences arising from complications related to pregnancies and childbirth. While every pregnant woman has a 15% chance of having complications during childbirth, very few maternal deaths occur in the developed world [3]. Although worldwide, maternal mortality ratio, the number of maternal deaths per 100,000 livebirths (MMR), has declined significantly, still large number of women are dying while giving birth, particularly, in low and middle income countries where 94% of all maternal mortality occurs [1]. Sub-Saharan Africa despite having experienced significant reduction in MMR, is severely affected, accounting for 68% of global maternal deaths [2]. The maternal mortality rate of 421 deaths per 100,000 livebirths in Ethiopia which translates to thousands of preventable maternal deaths each year is high. The majority of births in Ethiopia (53%) occur at home and only 50% of the deliveries are assisted by skilled birth attendants [4]. One of the sustainable

development goals is to reduce MMR to less than 70 deaths per 100,000 livebirths worldwide by 2030 [5].

The main causes of maternal deaths (75%) are due to complications arising before labor, during and after delivery [1]. Globally, more than 50% of maternal deaths are caused by hemorrhage, hypertensive disorders, and sepsis [6]. The current low rates of MMR in the developed countries were achieved through women's access to antibiotics, cesarean section, and blood transfusions [7]. Thus, access to skilled health personnel during childbirth is critical for survival and wellbeing of mothers and newborns. Inability to access maternal care services during this critical moment could lead to significant maternal mortalities and morbidities [8]. Although a causal link between access to skilled birth attendants in developing countries and reduced maternal mortality was not conclusively established, the proportion of births assisted by skilled birth attendants is being used as a measure and indicator to reduce maternal mortality and thus its universal coverage is envisioned and monitored [9, 10].

One of the goals of 2015-16 Health Sector Transformation Plan (HSTP) of Ethiopia was to reduce maternal mortality ratio to 199 per 1000,000 livebirths by 2020 [4]. Improving delivery at health facilities, access to skilled birth attendants, reducing infection acquired during labor and delivery through improved hygiene, and timely postnatal care are key components [4]. Strategies to ending preventable maternal mortality include reducing inequities between countries and within countries [10]. As highlighted by the World Health Organization (WHO), "Special target for all countries in addition to reducing their national average MMR is to reduce the extremes of between-country inequity in global maternal survival by focusing on equity and eliminating disparities in maternal mortality among subpopulations regardless of their baseline MMR." [10]. In Ethiopia, the proportions of births assisted by skilled health personnel have increased from 6% in 2000 and 2005 to 50% in 2019 [4]. Nonetheless, inequities in accessing skilled birth attendants still exist. Given the prevalence of significant inequalities in accessing skilled birth attendants defined as deliveries assisted by doctors, nurses, midwives, and health extension workers in Ethiopia [4, 11-14], it is important to identify severely affected or disadvantaged groups of women, as it could help inform equity-directed policies and programs, and reduce inequality gaps [15]. Previous studies highlighting inequalities in skilled birth attendants were limited in scope as all inequality dimensions were not examined [16-18]. Thus, the purpose of this study is to provide a diagnosis of inequalities of access to skilled birth attendants assessed by the percentages of births attended by skilled health personnel in the five years preceding the surveys from four inequality dimensions: residence type, economic status (wealth quantile), mother's education, and subnational (regional) differences. The goal is to provide a diagnosis of these inequalities.

2. Methods

WHO's Health Equity Monitor database (HEAT, 2021) [15] was used. The data on skilled birth attendants was disaggregated by (residence type, economic status as measured by wealth index, education, and subnational regions). The data were based on Ethiopia's Demographic and Health Surveys (EDHS) of 2000 (n=14072), 2005 (n=14500), 2011 (n=17817) and 2016 (n=16650) for which data collections were reviewed and approved by the Federal Democratic Republic of Ethiopia Ministry of Science and Technology and the Institutional Review Board of ICF International [11-14]. WHO's Health Equity Assessment Toolkit (HEAT) [15] software was used. "The Health Equity Assessment Toolkit (HEAT), was developed between 2014 and 2016. The software, which contains the World Health Organization's Health Equity Monitor database, allows the assessment of inequalities within a country using over 30 reproductive, maternal, newborn and child health indicators and five dimensions of inequality" [15]. Estimates of percentages of births attended by skilled health personnel in the five years preceding the surveys along with inequality summary measurement that reflect within-country differences in relation to population subgroups were assessed [16].

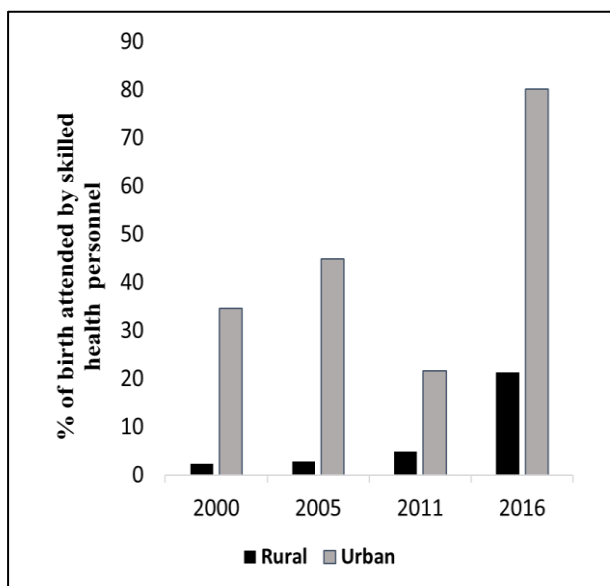
The inequality dimension, residence type, is a binary meaning and inequalities are compared between two groups with specific reference group (in this case urban residents) using the difference (D), an absolute inequality summary measurement that shows differences in accessing skilled birth attendants. D was calculated from percentage of the number of birth attended by skill health personnel in urban areas minus percentages in rural areas. If no inequality existed, D would be zero. Positive D means concentration of inequality in the disadvantage group (rural residents) and negative values indicate concentration of inequality in the advantaged group, urban residents [16].

When dimensions of inequalities are compared in more than two groups, they are either ordered or non-ordered (HEAT, 2021) [16]. Economic status, measured by wealth index (constructed from ownership of various assets) and women's educational level can be ordered from most disadvantaged to most advantaged subgroups (e. g., ordered from no education to primary, secondary and higher education and wealth index can be ordered from poorest quantile 1 to the richest quantile 5). For these dimensions of inequalities, relative concentration index (RCI), a measure of health gradient among subgroups in a population that reflect the degree to which access to skilled birth attendants is concentrated in subgroups was estimated [16]. Zero RCI means there is no inequality. Positive numbers show a concentration of health indicators among the advantaged groups. Negative values indicate concentration of the health indicator in the disadvantaged group. Higher RCI means larger inequalities (HEAT, 2021) [16]. For non-ordered inequality dimension arising from subnational (regional) differences, estimates of coefficient

of variation (COV) were generated. Zero COV means no inequality and large COV reflects larger inequalities [16]. 95% confidence interval levels were used to determine the statistical significant differences.

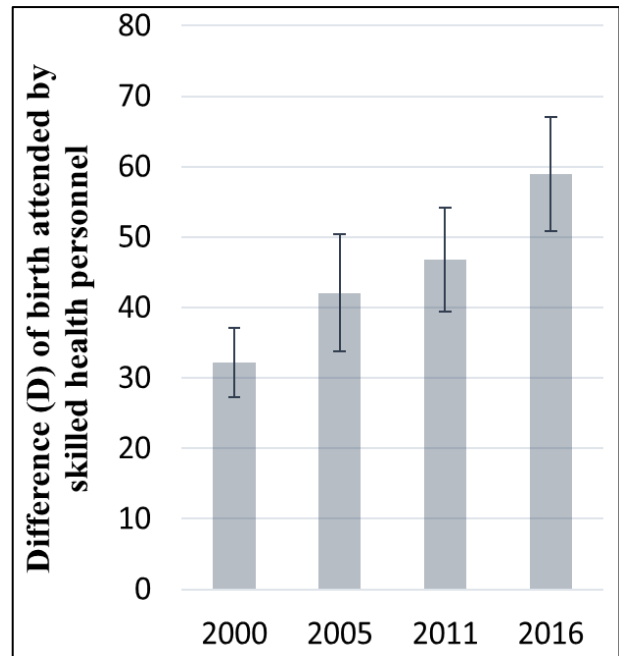
3. Results

Among rural residents, the proportion of births attended by skilled health personnel had increased from a meagre 2.3% in 2000 to 21.2% in 2016. However, in urban areas, it had increased from 34.5% in 2000 to 80.1% in 2016, four times higher than the births attended by skilled health personnel in rural areas (Fig. 1a). The inequality gap between rural and urban areas in accessing skilled birth attendants had also increased from 2000 to 2016 (Fig. 1b).



DHS: Demographic and Health Survey.

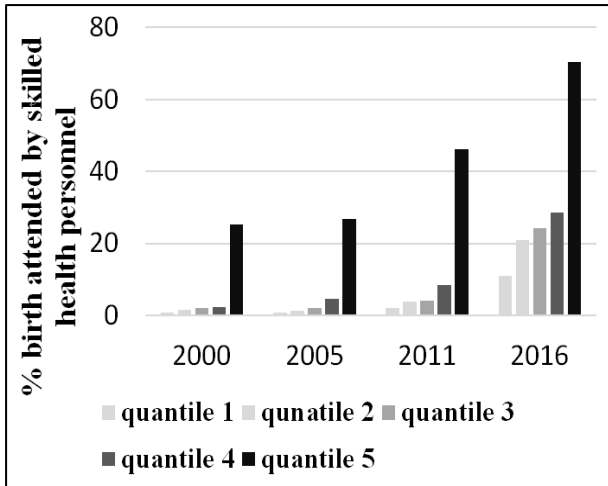
Figure 1a. Proportion of births attended by skilled health personnel by residence type DHS (2000, 2005, 2011, 2016)



DHS: Demographic and Health Survey.

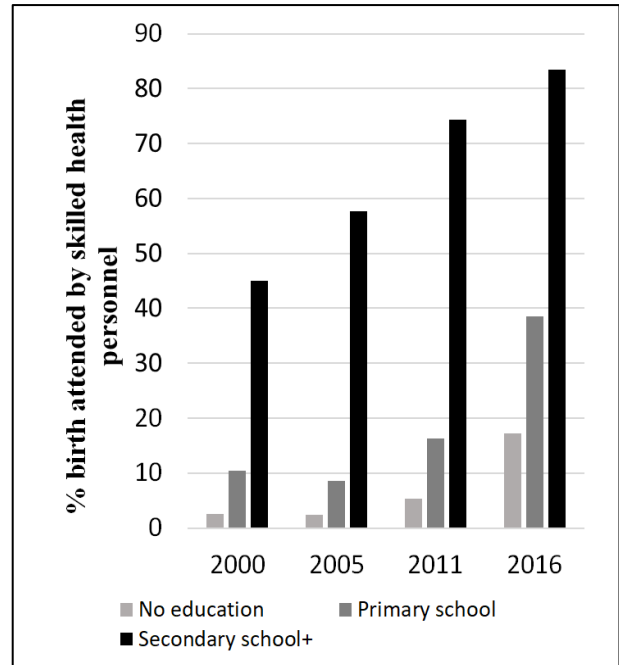
Figure 1b. Inequality of birth attended by skilled health personnel related to residence type difference (D) 95% CI, DHS (2000, 2005, 2011, 2016)

From 2000 to 2011, except for the richest (quantile 5), access to skilled birth attendants was very low for most women. However, in 2016, an increase in births attended by skilled health personnel was observed across spectrum of the wealth index, nonetheless, significant gap remained. The proportion of births attended by skilled birth attendants was 25% among the poorest women (quantile 1) and 75% among the wealthiest women (quantile 5) (Fig. 2a) in 2016. In the economic status dimension, although inequality still exists, in general, the gap has been narrowed as evidenced by reduction in the relative concentration index (RCI) from 2011-2016 (Fig. 2b).



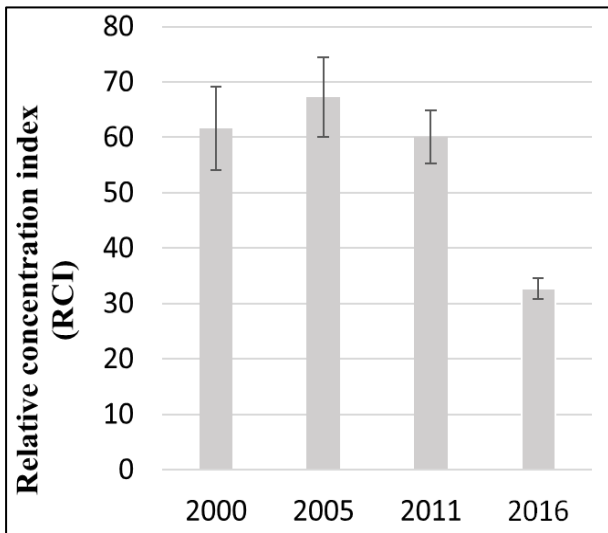
DHS: Demographic and Health Survey

Figure 2a. Percent birth attended by skilled health personnel and wealth index in quintiles DHS (2000, 2005, 2011, 2016)



DHS: Demographic and Health Survey

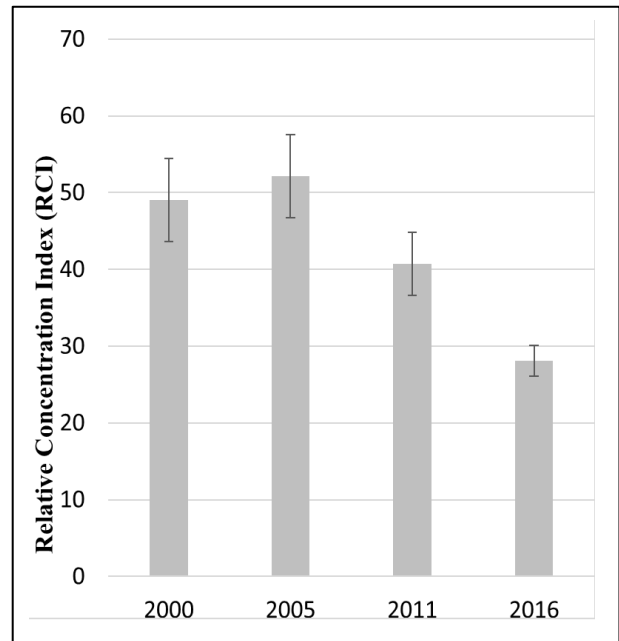
Figure 3a. Percent of birth attended by skilled health personnel in relation to mother's education, DHS (2000, 2005, 2011, 2016)



DHS: Demographic and Health Survey

Figure 2b. Inequalities of birth attended by skilled health personnel related to wealth index, Relative Concentration Index (RCI) and 95% Confidence Interval, DHS (2000, 2005, 2011, 2016)

With regard to women's education, access to skilled birth attendants was lowest for women with no formal education and highest for women with highest education. Nevertheless, access to skilled birth attendants has increased for women of all educational levels, specifically, from 2011-2016. Women with secondary and above education had, however, had the greatest access to skilled birth attendants (Fig. 3a).

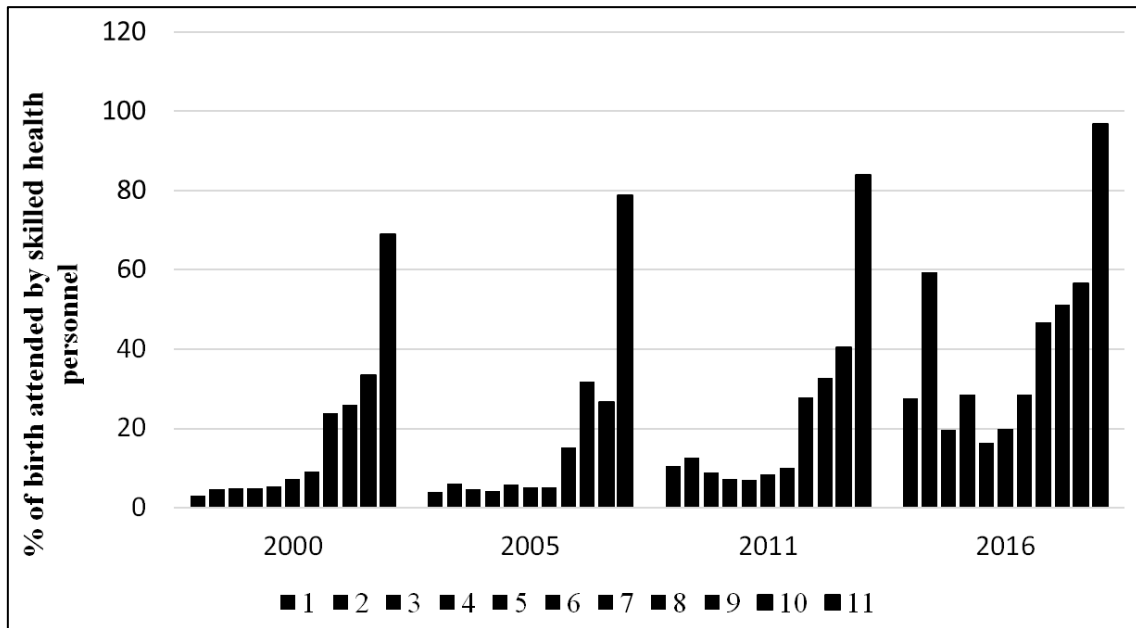


DHS: Demographic and Health Survey

Figure 3b. Inequalities of birth attended by skilled health personnel related to mother's education, Relative Concentration Index (RCI) and 95% Confidence Interval, DHS (2000, 2005, 2011, 2016)

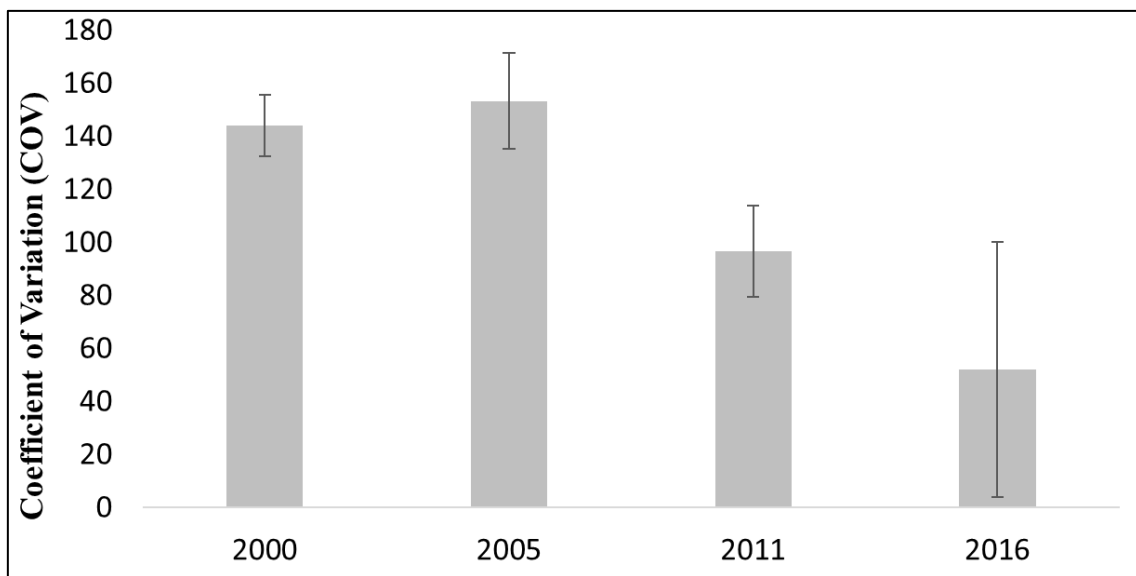
Inequality as assessed by RCI showed that there are still significant inequalities among women of different educational backgrounds although the gap has narrowed since 2011 (Fig. 3b). From 2000-2011, the proportions of births attended by skilled health personnel were consistently lower for Amhara, Tigray, Oromiya, Southern Nations, Nationalities, and People’s (SNNP), Afar, Somali, and Benshangul-Gumuz, regions. However, in 2016, all the regions including the two cities (Addis Ababa and Dire

Dawa) had shown improvements. Births assisted by skilled health personnel was highest in Addis Ababa, the capital, with near universal access (96%), followed by Tigray (59.3%), Dire Dawa (56.7%), Harari (51.2%), and Gambella (46.9%) (Fig. 4a). The coefficient of variation (COV) as an index to assess inequalities among regions had shown the presence of inequalities related to subnational (regional) differences although the magnitude has declined after 2005 (Fig. 4b).



From left to right: 1=Amhara region; 2=Tigray region; 3=Oromiya region; 4=SNNP; 5= Somali region; 6=Benshengul-Gumuz region; 7= Gambella region; 8= Harari region; 10= Dire Dawa City, 11= Addis Ababa City
DHS: Demographic and Health Survey.

Figure 4a. Percent birth attended by skilled health personnel relations to the administrative regions, DHS (2000, 2005, 2011, 2016)



DHS: Demographic and Health Survey.

Figure 4b. Inequalities of birth attended by skilled health personnel in relations to administrative regions, Coefficient of Variation (COV) and 95% Confidence Interval, DHS (2000, 2005, 2011, 2016)

4. Discussion

The WHO has set a target to reduce the global MMR average to less than 70/100 000 live births by 2030 [5, 10]. As well, it has emphasized that countries should also focus not only on reducing national averages, but also decreasing inequities in maternal mortalities among subpopulations [10]. WHO defines social groups based on variables such as place of residence, economic status, education, gender, age, geographic locations (subnational regions) [16, 20]. In order to understand and reduce maternal mortalities among these social groups, the number of births assisted by skilled birth attendants is monitored [9, 10] because consistent and wide health inequities that disproportionately affect certain subpopulations not only undermine countries progress, but may also threaten the very wellbeing of the communities as a whole [19].

In Ethiopia, the inequality gap in the number of births attended by skilled health personnel has widened significantly between rural and urban residents (Figure 1b). In 2016, the number of births attended by skilled health personnel was 4 times lower among rural residents. Although, overall the number of births assisted by skilled health personnel had increased from 11% in 2011 to 50% in 2019, in rural areas, only 42% of births were assisted by skilled health personnel [4]. Further, a clear difference emerges on closer inspection of who is providing assistance during childbirth, in rural vs. urban areas. In 2019, in rural areas, only 4.1% of births were attended by doctors, 32% by nurses/midwives, and 34.8% by traditional birth attendants. In contrast, in urban areas, 21.6%, 47%, and 19.4% of births were attended by doctors, nurses/midwives, and traditional birth attendants, respectively [4]. The increased inequalities between rural and urban settings indicate that women in urban areas particularly benefited from improved access. This phenomenon could be explained by what is known as reverse equity hypothesis which posits that urban rich women initially reap the benefits of interventions while poor rural women are the last to gain benefits [21-23]. Given the majority of women live in rural areas of Ethiopia, decreasing the gap in births attended by skilled health personnel could ultimately help the goal of achieving universal access to all groups. Reasons for lower utilization or access to skilled birth attendants include inaccessibility/availability of health facilities, unfamiliarity of giving birth at health facilities, inadequate antenatal care, suboptimal knowledge about birthing in health facilities, and poor quality of services [24]. Interventions to reduce inequities should focus on scaling up maternal services to underserved rural women [25]. Furthermore, a linear gradient of the number of birth attended by skilled health personnel was also observed as economic status of women improved specially in 2016. Poorest women being the most disadvantaged group. Inequalities related to economic status declined significantly over the years, although substantial inequality

remained. Similarly, inequalities related to differences in educational level followed the same trend. Moreover, women in regional states such as Somali, Afar, Benshangul-gumuz, SNNP, Amhara, and Oromiya regions had the lowest usage of skilled birth attendants. The gap between regional states, however, shrunken significantly from levels in 2005. Most of these regional states are also relatively underdeveloped with poor infrastructure (Somali, Afar, Benshangul-gumuz, SNNP).

According to the WHO “Skilled health personnel, as referenced by SDG indicator 3.1.2, are competent maternal and newborn health (MNH) professionals educated, trained and regulated to national and international standards. They are competent to: (i) provide and promote evidence-based, human-rights based, quality, socio-culturally sensitive and dignified care to women and newborns; ii) facilitate physiological processes during labor and delivery to ensure a clean and positive childbirth experience; and (iii) identify and manage or refer women and/or newborns with complications.” These professionals include midwives, nurses, obstetricians, pediatricians and anesthetists who can provide emergency maternal health and newborn care [26]. In Ethiopia, skilled health personnel include doctors, nurses/midwives, health officers and health extension workers [4] with varied capacities in training and managing emergencies during childbirth. Additionally, more than one-third of births in rural and nearly one-fifth in urban areas are attended by traditional birth attendants [4] even though their role in reducing maternal mortalities is limited [27] as most maternal deaths in Ethiopia are caused by obstructed labor, hemorrhage, eclampsia and sepsis [28]. Although increased coverage of skilled birth attendants in and of itself is not the ultimate goal, nevertheless, could be instrumental in reducing maternal mortalities. However, it requires a panoply of interventions including improved access and universal coverage of quality and comprehensive reproductive and maternal health services, reducing the main causes of maternal mortalities and morbidities, and strengthening the health care system as well [29]. Specifically, addressing delays in deciding to seek help, getting to a health facility, and obtaining quality care and treatment at medical facilities could help reduce maternal mortalities and morbidities in resource-poor countries like Ethiopia [30].

5. Conclusions

There were significant inequities in skilled birth attendants’ coverage among subgroups of Ethiopian women. Poor and rural resident women with no formal education and largely living in regional states were the disadvantaged groups. Inequality gaps have increased between rural and urban residents. However, gaps related to economic status, educational level, and regions have narrowed. Equitable progress towards universal coverage of births attended by skilled health personnel may be

achieved by directing efforts and resources to underserved poor and rural women.

Acknowledgements

I would like to thank WHO for providing access to the Health Equity Assessment Toolkit (HEAT).

REFERENCES

- [1] WHO. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. World Health Organization. 2019. <https://apps.who.int/iris/handle/10665/327595>. License: CC BY-NC-SA 3.0 IGO. (Retrieved June 27, 2022).
- [2] WHO, UNICEF, UNFPA, World Bank Group and UNPD (MMEIG). Maternal Mortality. 2019. <https://data.unicef.org/topic/maternal-health/maternal-mortality/>. (Retrieved May 5, 2022).
- [3] Nutrition Landscape Information System (NLiS) Nutrition and nutrition-related health and development data. <https://www.who.int/data/nutrition/nlis/info/births-attended-by-skilled-health-personnel>. (Retrieved May 25, 2022).
- [4] Ethiopian Public Health Institute (EPHI) [Ethiopia] and ICF. *Ethiopia Mini Demographic and Health Survey 2019: 2021. Final Report*. Rockville, Maryland, USA: EPHI and ICF. Ethiopia Mini Demographic and Health Survey 2019 - Key Indicators [PR120] (unicef.org) (Retrieved December 15, 2022).
- [5] WHO. The Global Health Observatory. Explore a world of health data. <https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/maternal-mortality>. (Retrieved June 12, 2022).
- [6] Say, L., Chou D., Gemmill, A., Tunçalp, Ö., Moller A. B., Daniels, J., Gülmezoglu, A. M., Temmerman, M., Alkema, L. Global causes of maternal death: a WHO systematic analysis. *The Lancet Global Health*, vol. 2, no. 6, pp. e323-337, 2014. DOI: 10.1016/S2214-109X(14)70227-X.
- [7] WHO. The Global Health Observatory. Explore a world of health data. <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/25>. (Retrieved June 15, 2022).
- [8] Donnay, F. Maternal survival in developing countries: What has been done, what can be achieved in the next decade. *International Journal of Gynecology & Obstetrics*, vol. 70, no. 1, pp. 89-97, 2000. DOI: 10.1016/s0020-7292(00)00236-8.
- [9] Harvey, S. A., Blandón, Y. C., McCaw-Binns A., Sandino, I., Urbina, L., Rodríguez, C., Gómez, I., Ayabaca, P., Djibrina, S. Are skilled birth attendants really skilled? A measurement method, some disturbing results and a potential way forward. *Bulletin of the World Health Organization*, vol., 85, pp.783-790, 2007. DOI: 10.2471/blt.06.038455.
- [10] WHO. Strategies towards ending preventable maternal mortality (EPMM). 2015. https://apps.who.int/iris/bitstream/handle/10665/153540/WHO_RHR_15.03_eng.pdf. (Retrieved June 22, 2022).
- [11] Central Statistical Authority [Ethiopia] and ORC Macro. 2001. Ethiopia Demographic and Health Survey 2000. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Authority and ORC Macro. 2001. <https://dhsprogram.com/pubs/pdf/FR118/FR118.pdf>. (Retrieved June 19, 2022).
- [12] Central Statistical Agency [Ethiopia] and ORC Macro. Ethiopia Demographic and Health Survey 2005. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro. 2006. <https://dhsprogram.com/pubs/pdf/FR118/FR118.pdf>. (Retrieved June 20, 2022).
- [13] Central Statistical Agency [Ethiopia] and ICF International. Ethiopia Demographic and Health Survey 2011. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ICF International. 2012. <https://dhsprogram.com/pubs/pdf/fr255/fr255.pdf>. (Retrieved September 20, 2022).
- [14] Central Statistical Agency (CSA) [Ethiopia] and ICF. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2017. <https://dhsprogram.com/pubs/pdf/FR328/FR328.pdf>. (Retrieved October 19, 2022).
- [15] Hosseinpoor A. R., Nambiar D, Schlottheuber A, Reidpath D, Ross Z. Health Equity Assessment Toolkit (HEAT): software for exploring and comparing health inequalities in countries. *BMC Medical Research Methodology*. 2016, vol. 16, no. 1, pp.141.
- [16] WHO (2021). Health Equity Assessment Toolkit (HEAT): Software for exploring and comparing health inequalities in countries. Built-in database edition. Version 4.0. Geneva, World Health Organization, 2021.
- [17] Tesfaye, B., Mathewos, T., Kebede, M. Skilled delivery inequality in Ethiopia: to what extent are the poorest and uneducated mothers benefiting? Tesfaye, B., Mathewos, T. and Kebede, M., 2017. Skilled delivery inequality in Ethiopia: to what extent are the poorest and uneducated mothers benefiting?. *International Journal for Equity in Health*, vol., 16, no. 1, pp. 1-8, 2017. DOI: 10.1186/s12939-017-0579-x.
- [18] Fekadu, M., Regassa, N. Skilled delivery care service utilization in Ethiopia: analysis of rural-urban differentials based on national demographic and health survey (DHS) data. *African Health Sciences*, vol. 14, no. 4, pp. 974-984, 2014. DOI: 10.4314/ahs.v14i4.29.
- [19] Shiferaw, B. B., Modiba, L. M. Why do women not use skilled birth attendance service? An explorative qualitative study in north West Ethiopia. *BMC Pregnancy and Childbirth*. BMC Pregnancy and Childbirth, vol. 20, no. 1, pp. 1-14. 2020. DOI: 10.1186/s12884-020-03312-0.
- [20] World Health Organization. Handbook on health inequality monitoring with a special focus on low-and middle-income countries. Geneva: World Health Organization. 2013. <https://www.who.int/docs/default-source/gho-documents/health-equity/handbook-on-health-inequality-monitoring/handbook-on-health-inequality-monitoring.pdf>. (Retrieved November 21, 2022).

- [21] Channon, A., Neal, S., Matthews, Z., Falkingham, J. Maternal health inequalities over time: is there a common pathway? Background paper for “addressing inequalities the heart of the post-2015 development agenda and the future we want for all global thematic consultation.” <https://goo.gl/NqD62i>. (Retrieved May 2, 2022).
- [22] Victora, C. G., Joseph, G., Silva, I. C., Maia, F. S., Vaughan, J. P., Barros, F. C., Barros, A. J. The inverse equity hypothesis: analyses of institutional deliveries in 286 national surveys. *American journal of public health*, vol. 108, no. 4, pp. 464-471, 2018. DOI: 10.2105/AJPH.2017.304277.
- [23] Victora, C. G., Vaughan J. P., Barros, F. C., Silva, A. C., Tomasi, E. Explaining trends in inequities: evidence from Brazilian child health studies. *The Lancet*, vol. 356, pp. 1094-1098, 2000. DOI: 10.1016/S0140-6736(00)02741-0.
- [24] Shiferaw, B. B., Modiba, L. M. Why do women not use skilled birth attendance service? An explorative qualitative study in north West Ethiopia. *BMC Pregnancy and Childbirth*, Vol. 20, no. 1, pp. 1-14, 2020. DOI: 10.1186/s12884-020-03312-0.
- [25] McKinnon, B., Harper, S., Kaufman, J. S., Bergevin, Y. Socioeconomic inequality in neonatal mortality in countries of low and middle income: a multi-country analysis. *The Lancet Global Health*, vol. 2, no. 3, pp. e165-e173, 2014. DOI: 10.1016/S2214-109X(14)70008-7.
- [26] WHO Definition of skilled health personnel providing care during childbirth: the 2018 joint statement by WHO, UNFPA, UNICEF, ICM, ICN, FIGO and IPA. World Health Organization; 2018. <https://www.who.int/publications/i/item/WHO-RHR-18.14>. (Retrieved June 25, 2022).
- [27] Wilson, A., Gallos, I. D., Plana, N., Lissauer, D., Khan, K. S., Zamora, J., MacArthur, C., Coomarasamy, A. Effectiveness of strategies incorporating training and support of traditional birth attendants on perinatal and maternal mortality: meta-analysis. *BMJ*, vol. 343. 2011. DOI: <https://doi.org/10.1136/bmj.d7102>.
- [28] Berhan, Y., Berhan, A. Causes of maternal mortality in Ethiopia: a significant decline in abortion related death. *Ethiopian Journal of Health Sciences*, vol. 24, pp. 15-28, 2014. DOI: 10.4314/ejhs.v24i0.3s.
- [29] WHO Maternal Mortality. Key Facts. <https://www.who.int/news-room/fact-sheets/detail/maternal-mortality> (Retrieved May 19, 2022).
- [30] Thaddeus, S., Maine, D. Too far to walk: maternal mortality in context. *Social Science & Medicine*, vol., 38, no. 8, pp. 1091-1110, 1994. DOI: 10.1016/0277-9536(94)90226-7.
- [31] Hosseinpoor A. R, Nambiar D, Schlottheuber A, Reidpath D, Ross Z. Health Equity Assessment Toolkit (HEAT): software for exploring and comparing health inequalities in countries. *BMC Medical Research Methodology*. 2016, vol. 16, no.1, pp.141.