Identifying inequity in family planning: The Track20 equity tool [version 1; peer review: awaiting peer review]

Kristin Bietsch¹, Katherine LaNasa², Emily Sonneveldt¹

¹Avenir Health, Glastonbury, CT, 06033, USA
²Tulane University, New Orleans, Louisiana, USA

Abstract
Background: With increases in contraceptive use in most countries in the world, within country inequities persist. Equity in family planning does not mean an equal level of contraceptive use among all groups; differences in use of contraception could reflect variation in cultural beliefs and values and therefore not inequity.

Methods: Focusing on demand satisfied for modern methods and five dimensions (age, education, geography, parity, and wealth), we map inequities within 15 sub-Saharan African countries and across time. We create a “Concentration of Inequity” to highlight the intersectionality of inequities in family planning and allows for more data informed programming.

Results: Inequities exist in all countries included in this analysis, though the range varies substantially. Over 85% of the countries included in this analysis had at least 1 subgroup in the population with demand satisfied 30% or more below the national level of demand satisfied. To help visualize inequities and stimulate discussion, we create an online tool to display multiple aspects of inequity.

Conclusions: Using demand satisfied with modern methods to measure inequity for family planning allows us to focus attention on women with desire to delay or limit childbearing. Studying the intersections of demographic factors is fundamental for a deeper understanding of family planning equity.

Keywords
Family Planning, Equity, Demand Satisfied
Introduction

The concept of equity in health stems from the universal right to health, first established in the Constitution for the World Health Organization in 1946 which stated that “the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition”. Since then, the WHO has established a more concrete definition of health equity which states, “Equity is the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically or geographically.”. Equity is a prominent topic in international health and has been a component included in the Millennium Development Goals (MDG), Sustainable Development Goals (SDG) and Universal Health Care (UHC).

Inequity is notably different from inequality. According to Whitehead, inequities in health are those that are avoidable, unnecessary and unjust. However, the term inequity is sometimes also used to refer to disparities in health that are unfair or unjust. The WHO has acknowledged this distinction by stating, “Health inequities involve more than inequality with respect to health determinants, access to the resources needed to be healthy or health outcomes. They also entail a failure to avoid or overcome inequalities that infringe on fairness.”.

When identifying an inequity in health, Gillespie et al. note four conditions that must be met for an issue to be considered an inequity:

1. It must be disproportionately present in a disadvantaged population relative to better-off population segments;
2. It must be amenable to effective interventions;
3. It must be undesirable; and
4. Interventions to relieve or lessen this condition are less available to the disadvantaged than to wealthier populations.

Poverty is a dimension of health inequity that has dominated the literature. However, researchers have noted that inequities may compound in people’s lives, which means it is important to consider a broader human rights perspective in order to understand and address multiple dimensions of disparities beyond economic ones. The framework from Healthy People 2020 in the United States is useful for categorizing different dimensions of inequity into three categories:

1. Economic: wealth, poverty, socioeconomic status;
2. Social: sex, age, education, marital status, race/ethnicity, language, sexual orientation, disability, other social marginalization; and
3. Environmental: geographic location, environmentally degraded area; humanitarian setting.

Within family planning, equity means that all individuals have the ability to access comprehensive contraceptive information and services, including access to all available methods of contraceptives, free from discrimination, coercion and violence, so that they are able to make decisions about their fertility and use of contraception and are able to act upon those decisions. Equity in family planning also implies that the quality of services and treatment from providers does not vary by non-medical characteristics. Prior research on equity in family planning has examined outcomes such as use of modern contraception and unmet need for family planning.

To date, the majority of studies in equitable family planning have focused on the economic dimension of inequity. Wealth quintiles are simple to calculate using the Demographic and Health Surveys (DHS) wealth index, and are a common economic equity measure used in family planning studies. In a study across 46 countries, Ross found that although women in the poorest wealth quintile have a consistently lower use of modern contraception than women in the richest quintile, the rate of increase in use has been faster among the poorest group and the gap between the two quintiles has narrowed by 25% over 14 years. In the social dimension of inequity, differences in contraceptive use among women with differing levels of education have been well documented. A multi-country study by the WHO found that the median mCPR was nearly twice as high among women with a secondary or higher education compared to women with no education. Finally, environmental inequities included in family planning studies most often include urban and rural residence and sometimes geographic region. Consistently, women in rural areas tend to use less modern contraception, have less access to services, and are less knowledgeable about family planning than women living in urban areas. An example of within-country regional variation comes from a study in India that found a large amount of heterogeneity in mCPR between subregions, with a difference of up to 55.1 percentage points.

It is important to note that equity in family planning does not necessarily mean an equal level of contraceptive use among all groups; differences in use of contraception could reflect variation in cultural beliefs and values and therefore not inequity. Hardee et al. notes that uniformly high use of contraception is only equitable if it adheres to the choice of individuals in the groups. The High-Impact Practices in Family Planning Technical Advisory Group recommends that researchers incorporate measures beyond just modern contraceptive use, such as, demand satisfied for contraception, unintended pregnancy, and parity above the ideal family size. These measures take into account the preferences of individuals regarding their own reproductive goals and contraceptive use. Hardee et al. note it is also important to consider the group level exposure to family planning programs and quality information and services when measuring equity in family planning. An analysis of 11 countries found that, in general, the mean ideal number of children increased as poverty level increased and conversely the percent of demand satisfied by modern methods decreased. Another multi-country study highlighted important variation in demand satisfied by modern methods within countries. The authors found that even in countries with national demand satisfied by modern methods above 20%, women...
in the poorest wealth quintiles, youngest age groups, lowest education levels and living in rural areas had significantly lower demand satisfied by modern methods. This paper aims to assess inequity in family planning across 15 countries in sub-Saharan Africa (SSA) using five dimensions of equity: age, education, geography, parity, and wealth. The specific objectives of this paper are to 1) assess the distribution of inequity in family planning across countries, 2) assess the ratio of inequity within each country and dimension and over time, 3) examine the intersection of dimensions of inequity within each country, and 4) present a new online tool which was developed to examine inequity in family planning.

Methods
Track20 has developed a tool to visualize inequity for family planning by age, education, geography, parity, and wealth. We selected demand satisfied by modern methods as the family planning measure of interest because of its focus on women either using contraception or wanting to delay childbearing for at least two years. By focusing on this subset of the population the measure is comparable across time and populations and takes into account different fertility intentions of women in different sub-groups. The tool shows demand satisfied at the national level and defines inequitable groups as subsets of the population with demand satisfied either 10%, 20%, or 30% below the national average.

That data for this project comes from the Demographic and Health Survey (DHS). Fifteen countries in sub-Saharan Africa were selected for analysis (21 surveys).

We began by creating a visualization of the concentration of inequity in each country. Many women are part of a subpopulation that experiences inequity, some are members of several groups. If planners only look at inequity from a single dimension (i.e. wealth) they may not plan for the intersectionality of inequities. To develop the concentration of inequity, we first calculated the national demand satisfied by modern methods, defined as the proportion of women who do not wish to become pregnant in the next two years and are currently using a modern method of contraception. Next, we calculated the demand satisfied for all geographic regions, wealth quintiles, five-year age groups, educational achievement groups (none, primary, secondary, and higher), and parity groups (top coded at 6 or more children). The demand satisfied for each group was then compared to the national demand satisfied. Subgroups were classified as inequitable if the group’s demand satisfied was 10% (or 20%, 30%) below the national level. Next, all women in the identified subgroup (for example parity 3) are classified as belonging to an inequitable group, regardless of their individual demand satisfied measurement. A woman could have her own demand satisfied or have no need for modern methods but is part of an inequitable group and thus coded as a member of that inequitable group. Moving through all five dimensions of inequity, we calculated the number of inequity subgroups each woman was in. Finally, sample weights were applied to find the distribution of the population by concentration of inequity.

Next, we wanted to look at the distribution of inequity within dimensions by plotting each subdomain compared to the national average. In order to visualize the extent of inequity within a dimension, we calculated the ratio of highest to lowest demand satisfied subgroup. For example, the ratio of demand satisfied among women with no education compared to women with higher education. All three visualizations can include temporal change- plotting multiple surveys on the same graph to show how demand satisfied and equity have changed over time.

All analysis was conducted using R. Code for the preprocessing of datasets is available on GitHub. To visualize the results, an online interactive tool was developed which is publicly available on the Track20 website. The tool was developed in R and the code used to create this tool is also available in the GitHub repository.

Results
At the national level, the percent of demand for family planning satisfied by modern methods ranged from 19.5% in the Democratic Republic of Congo (DRC) to 84.8% in Zimbabwe. Over 85% of the countries included in this analysis had at least 1 subgroup in the population with demand satisfied 30% or more below the national level of demand satisfied. Ghana and Sierra Leone were the only countries that did not have any groups of women with demand satisfied 30% below the national level, however there were subgroups with inequity at 20% below the national level of demand satisfied within these two countries.

Dimensions of inequity
Age. In the most recent surveys, there were no age subgroups with demand satisfied 30% below the national level in any of the 15 countries. However, in nine countries women at the ends of the reproductive age spectrum, 15–19 and 40–49, had demand satisfied 20% lower than the national level. All 15 countries in this study had at least 1 age group with demand satisfied 10% below the national level. Guinea had the highest number of age groups (four groups) classified as inequitable. The most common age group with inequitable demand satisfied was young women 15–19 years. Women ages 20–24 across all countries did not have demand satisfied 10% or more below the national average.

Wealth. Wealth subgroups in five countries had demand satisfied 30% below the national average. In Cameroon, Guinea, Mali and Nigeria, women in the poorest wealth quintile had demand satisfied 30% below the national level and in the DRC, women in the middle, poorer and poorest quintiles also had demand satisfied 30% below the national average. In three countries, Ethiopia, Tanzania and Uganda, women in the poorest wealth quintile had 20% less demand satisfied than the national level. In addition, women in the poorer wealth quintile in Mali and Nigeria also had 20% less demand satisfied. Wealth subgroups classified as inequitable based on demand satisfied 10% below the national average included the poorest quintile in 12 countries, the poorer quintile in eight countries, and the middle quintile in three countries. Wealth was not a dimension of inequity at any level in Ghana, Malawi, and Zimbabwe.
**Parity.** Parity was a dimension of inequity 30% below the national level of demand satisfied in four countries. In Malawi, Zambia and Zimbabwe, women with no children had 30% less demand satisfied than the national average, while the opposite pattern was observed in Guinea, where women with six or more children were classified as inequitable. Parity was a dimension of inequity at 20% below the national level in an additional five countries. Finally, 13 countries had at least one parity group classified as inequitable based on demand satisfied 10% below the national level. The most common inequitable parity subgroup was women with six or more children (reported in nine countries), however, women with no children also reported inequitable demand satisfied in four countries. Parity was not a dimension of inequity in Ghana and Uganda.

**Education.** Groups of education level were classified as inequitable based on demand satisfied 30% below the national average in three countries, Cameroon, Nigeria, and the DRC. At 20% below the national level of demand satisfied, education was also a dimension of inequity in Togo and Uganda. Finally, education was a dimension of inequity at 10% below the national level of demand satisfied in 12 countries, all of which included women with no education. Uniquely, women with a primary education in the DRC also reported demand satisfied 30% below the national level and women with higher education in Tanzania reported demand satisfied 10% below the national level (women with higher education in Tanzania have disproportionately high traditional method use compared to women of other levels of education, and women using traditional methods are considered to have their demand for modern methods not satisfied). Education was not a dimension of inequity in Ethiopia, Ghana, and Malawi.

**Geography.** Finally, nine countries had at least one geographic region with demand satisfied 30% or more below the national level, 10 countries had regions with demand satisfied 20% lower than the national level and 13 countries had regions with demand satisfied at least 10% lower than the national level. Tanzania had as many as eight regions with 30% below the national level, while the other countries ranged from one to three regions. Geography was not a dimension of inequity at any level in Malawi and Zimbabwe.

**Ratio of inequity**

The ratio of demand satisfied by modern methods in the lowest and highest subgroups for each dimension were compared based on the most recent survey data. The distribution of inequity by country and dimension is presented in Figure 1. The country with the largest ratio of inequity between age groups was Guinea, where women ages 15–19 had 1.68 times more demand satisfied than women ages 40–44. There were two countries, Cameroon and the DRC, where women with the highest level of education had over three times higher demand satisfied than women with no education. The countries with the two highest ratios of inequity between parity groups had inverse relationships. In Guinea, women with no children had 2.5 times higher demand satisfied than women with six or more children. In contrast, in Zambia, women with two children had two times higher demand satisfied than women with no children. Within the wealth dimension, the DRC and Guinea had the largest inequity ratios (3.2 and 3.1 respectively) between women in the richest and poorest wealth quintiles. The largest inequity ratios observed were within the geography dimension. Ethiopia had the largest disparity between regions; women living in Addis Ababa had 7.9 times higher demand satisfied than women living in the

![Figure 1. Inequity ratios by dimension in 15 countries.](image-url)
Somali region. Mali had the second largest inequity ratio of 6.9 between the Bamako region (highest demand satisfied) and Kidal region (lowest demand satisfied).

**Change over time**

Eight countries had data available from two recent DHS surveys to compare change in the ratio of demand satisfied over time. In six out of eight countries, the inequity ratio between age groups decreased. In seven countries, the inequity ratio between education levels decreased. The largest change was in Nigeria, where the ratio in demand satisfied between women with no education and higher education decreased from 5.6 to 2.3. In Zimbabwe, the gap in demand satisfied increased by 0.15 between women with no education and higher education. In all countries, the ratio of inequity decreased between parity groups. The largest change occurred in Guinea where the ratio in demand satisfied between women with no children (highest demand satisfied) and 6 or more children (lowest demand satisfied) decreased by 2.0. In seven countries, the gap in demand satisfied decreased between wealth quintiles. Cameroon had the largest inequity ratio decrease of 2.3 between the richest and poorest quintiles. Ethiopia was the only country where the inequity ratio increased between geographic groups. The ratio in demand satisfied by modern methods in Somali and Addis Ababa increased from 5.1 to 7.9.

### Concentration of inequity

The proportion of demand satisfied was also measured at the intersection of inequity dimensions. With five dimensions of inequity, there are 31 possible combinations of intersecting groups. Within each country, the proportion of women in each group with inequitable demand satisfied was assessed. The group with the largest proportion of women with inequity below the national level was then identified. When measuring inequity at 10% less demand satisfied than the national level, there were five countries where the group containing the highest proportion of women was classified as inequitable based on two or more categories. When measuring inequity at 20% less demand satisfied than the national level, there were four countries where the group with the highest proportion of women consisted of two or more dimensions of inequity. Finally, the DRC was the only country where the group with the largest proportion of women who reported 30% less demand satisfied than the national level consisted of two or more dimensions of inequity. Specifically, 24.4% of women in the DRC who have demand satisfied 30% lower than the national average belonged to inequitable education and wealth subgroups.

The proportion of women belonging to subgroups classified as inequitable are presented in Table 1. Out of the 15 countries in this study, Ghana has the lowest amount of inequity as 60% of

### Table 1. Proportion of women with demand satisfied by modern methods 10%, 20%, and 30% below the national average, by number of dimensions of inequity.

<table>
<thead>
<tr>
<th>Country</th>
<th>10% below national level</th>
<th>20% below national level</th>
<th>30% below national level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2+</td>
</tr>
<tr>
<td>Benin</td>
<td>17.4</td>
<td>36.1</td>
<td>46.4</td>
</tr>
<tr>
<td>Cameroon</td>
<td>33.1</td>
<td>25.9</td>
<td>41.0</td>
</tr>
<tr>
<td>DRC</td>
<td>15.5</td>
<td>20.7</td>
<td>63.8</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>29.3</td>
<td>34.7</td>
<td>36.0</td>
</tr>
<tr>
<td>Ghana</td>
<td>60.0</td>
<td>35.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Guinea</td>
<td>13.0</td>
<td>17.6</td>
<td>69.4</td>
</tr>
<tr>
<td>Malawi</td>
<td>72.7</td>
<td>10.6</td>
<td>16.7</td>
</tr>
<tr>
<td>Mali</td>
<td>13.9</td>
<td>27.7</td>
<td>58.4</td>
</tr>
<tr>
<td>Nigeria</td>
<td>23.1</td>
<td>27.0</td>
<td>49.9</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>32.3</td>
<td>23.0</td>
<td>44.6</td>
</tr>
<tr>
<td>Tanzania</td>
<td>29.2</td>
<td>29.9</td>
<td>40.9</td>
</tr>
<tr>
<td>Togo</td>
<td>24.4</td>
<td>28.0</td>
<td>47.6</td>
</tr>
<tr>
<td>Uganda</td>
<td>42.3</td>
<td>36.3</td>
<td>21.4</td>
</tr>
<tr>
<td>Zambia</td>
<td>44.0</td>
<td>27.6</td>
<td>28.4</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>62.8</td>
<td>18.4</td>
<td>18.8</td>
</tr>
</tbody>
</table>
women are not in a group where demand satisfied is less than 10% of the national average. More than a quarter of all women have 10% less demand satisfied based on two or more dimensions of inequity in 11 countries. There are 4 countries where more than 25% of women report 20% less demand satisfied than the national average based on multiple dimensions of inequity. In the DRC, nearly half of all women belong to subgroups containing multiple dimensions of inequity which report 30% lower demand satisfied than the national average.

Online tool
An innovative online application was developed to model equity in family planning in selected countries using recent DHS data. The application is available to the public through the Track20 project at. Users are able to select a country and inequity level, either 10%, 20% or 30% below the national level of demand satisfied by modern methods. First, the application displays the concentration of inequity within a country at the selected inequity level, as shown in Figure 2 as the proportion of women with inequity based on the number of inequitable subgroups they belong to. The dimensions of inequity are listed as A for age group, E for education level, G for geography, P for parity, and W for wealth quintile.

Using Nigeria as an example, the app shows that when inequity is defined as demand satisfied 30% below the national average, over half of women in 2018 did not have inequitable demand satisfied, and the largest group with inequity was women with no education. This has changed since 2013, when there were more groups with demand satisfied 30% below the national average, as shown in the multi-colored sections of the bar graphs in Figure 2.

Next, the app displays the range in demand satisfied within the five dimensions of inequity (Figure 3). The national average is shown as the red line, indicating which sub-groups are above and below the average. In Nigeria, all age groups had demand satisfied similar to the national average in both 2013 and 2018. By 2018, women of all education levels were closer to the national average than in 2013, although women with no education remained about 20% lower than the average. Inequity based on geography also decreased between 2013 and 2018 so that only women in the North West and North East regions reported demand satisfied 10% lower than the average which was an improvement from 2013 when women in the North East region reported 30% lower demand satisfied. Although the range in demand satisfied among parity groups decreased over time, women with six or more children remained at a similar lower level of demand satisfied. The poorest and poorer wealth quintile groups increased in the level of demand satisfied, however they remained below the national average.

Finally, the ratio of demand satisfied between the subgroups with the highest and lowest levels is compared in Figure 4, so that a higher ratio represents higher inequity within that dimension. In Nigeria, the app shows that with the exception of age (which did not change between survey years), the ratios of inequity decreased between 2013 and 2018. In 2013 women with a higher education had demand satisfied over five times higher than women with no education and by 2018, this ratio had decreased by about half down to 2.5. The largest decrease was between wealth quintiles. In 2013, women in the richest quintile had about 8 times higher demand satisfied than women in the poorest quintile, and by 2018, this ratio decreased to about 2.5.

Discussion and conclusion
The Track20 Equity Tool was developed to assist program implementers and funders in identifying the most inequitable groups and lead to better prioritization of resources. Intersectionality of dimensions is key to this work, as it allows policy makers to see how different groups overlap, for example young women in the poorest quintile or nulliparous women with no education. By looking at the distribution of women across groups, the concentration of inequity analysis identifies the largest populations with low levels of demand satisfied. Highlighting these groups allows for more targeted programming.

Figure 2. Concentration of Inequity Tool in Nigeria.
Figure 3. Demand satisfied distribution in Nigeria.

Figure 4. Ratio of inequity in Nigeria.
Data availability
Underlying data
This study uses secondary data from the Demographic Health Surveys which provide anonymized data to researchers. The Demographic and Health Surveys are available from https://dhsprogram.com/ at no cost for academic research.


Datasets are available as SAS, Stata, SPSS, and Flat Ascii files.


This project contains the following files:
- DHSEquity_dsbelow080421.csv
- DHSEquity_dsbelow080421_clean.csv

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).


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Code is available under an MIT license.

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