

November 2020



APPROACH FOR DIAGNOSING INEQUITY IN FAMILY PLANNING PROGRAMS

Methodology and Replication Guide

NOVEMBER 2020

This publication was prepared by Kaja Jurczynska (Palladium), Kevin Ward (Palladium), Shiza Farid (Avenir Health), Lyubov Teplitskaya (Palladium), and Kristin Bietsch (Avenir Health) of the Health Policy Plus project.

Photo credit, cover: Audrée Montpetit for USAID.

Suggested citation: Jurczynska, K., K. Ward, S. Farid, L Teplitskaya, and K. Bietsch. 2020. *Approach for Diagnosing Inequity in Family Planning Programs: Methodology and Replication Guide*. Washington, DC: Palladium, Health Policy Plus.

ISBN: 978-1-59560-263-3

Health Policy Plus (HP+) is a seven-year cooperative agreement funded by the U.S. Agency for International Development under Agreement No. AID-OAA-A-15-00051, beginning August 28, 2015. HP+ is implemented by Palladium, in collaboration with Avenir Health, Futures Group Global Outreach, Plan International USA, Population Reference Bureau, RTI International, ThinkWell, and the White Ribbon Alliance for Safe Motherhood.

This guide was produced for review by the U.S. Agency for International Development. It was prepared by HP+. The information provided in this guide is not official U.S. Government information and does not necessarily reflect the views or positions of the U.S. Agency for International Development or the U.S. Government.

Contents

Executive Summary.....	v
Introduction	1
HP+’s Approach for Diagnosing Inequity in Family Planning Programs	5
Overview	5
Methodology	5
Limitations.....	13
Guide to Replicating the Approach for Diagnosing Inequity in Family Planning Programs	14
Step 1: HP+ Code and R Software Download	14
Step 2: Survey Selection and Download.....	16
Step 3: R Code Setup.....	19
Step 4: Running the Code and Generating Results and Visuals.....	24
References	30

Acknowledgments

The development of the *Approach for Diagnosing Inequity in Family Planning Programs* benefited from guidance and technical review of Jay Gribble, Arin Dutta, Sara Stratton, and Bill Winfrey.

Abbreviations

AAAQ	availability, accessibility, acceptability, and quality
DHS	Demographic and Health Surveys
FP	family planning
FP2020	Family Planning 2020
HEAT Plus	Health Equity Assessment Toolkit Plus
HP+	Health Policy Plus
MICS	Multiple Indicator Cluster Survey
PMA2020	Performance Monitoring and Accountability 2020
SII	slope index of inequality

Executive Summary

Globally, the share of women using modern methods of contraception has increased by one-fifth between 1990 and 2020 (United Nations, 2020). In recent years, many countries have cemented their commitments to family planning through costed implementation plans, as well as commitments under the Family Planning 2020 partnership. These plans and commitments commonly aspire to eliminate inequities in access to and use of family planning for the most vulnerable populations. This has been done through extending services to rural or hard-to-reach areas, removing financial barriers to family planning for the poor, and creating an enabling environment for youth and adolescent access.

Despite these efforts, quality family planning information and services have not yet reached those with the greatest need. Part of the challenge in eliminating inequities is gaining an adequate understanding of who is affected, in what component of family planning (e.g., quality of services), and where. Existing methods for assessing inequities in health, and family planning specifically, offer limited utility given: a dominant focus on wealth-based inequities compared to other dimensions by which individuals vary, a focus on inequities in outcome measures rather than essential elements of care, inadequate attention to subnational-level compared to national-level realities, and limited replicability by those who design and implement policies and programs.

To support progress toward equitable healthcare, the U.S. Agency for International Development-funded Health Policy Plus (HP+) project developed an approach for diagnosing inequity in family planning programs. This approach identifies inequities (1) for a range of disadvantaged subgroups, (2) for various programmatic components of family planning, and (3) at national and subnational levels. Replicable across countries through HP+'s open source code, the approach enables users to easily transform Demographic and Health Survey data to develop evidence for policy, financing, and programmatic decisions at national and subnational levels. This guide describes the detailed methodology of the approach and includes a replication guide to enable the identification of inequities by users across a broad range of countries and subnational geographies.

Introduction

Avoidable, unfair, and unjust differences between individuals or groups in health opportunities and outcomes are referred to as inequities (Whitehead, 1992). An ethical concept, inequity is distinguished from inequality, which refers to measurable differences in health that are unavoidable—often the result of natural biological variation (Arcaya et al., 2015; Gillespie et al., 2007; Braveman, 2006). Equity in health is cemented in treaties, declarations, and covenants, including the right to the highest attainable standard of health (UNGA, 1966; UNCESCR, 2000). This right extends to equity in the experience of four interrelated and essential elements of care that shape health outcomes: the availability, accessibility, acceptability, and quality of health services—collectively referred to as AAAQ (UNCESCR, 2000).

Equity in health means that everyone has a fair opportunity to reach their health potential, regardless of wealth, education, sex, age, race or ethnic group, residence, disability, and other status or social group (WHO, n.d.).

The right to health includes family planning information and services (UNCESCR, 2016). Equity in family planning does not necessarily mean equal use. Use of family planning is equitable only if it adheres to free choice and reflects need (Hardee et al., 2019). In order to decide freely and responsibly the number and timing of children, groups must experience equitable AAAQ (see Table 1) (Hardee et al., 2019, 2013). As one of the eight guiding principles of the Family Planning High Impact Practices initiative, and a key element of rights-based services under Family Planning 2020 (FP2020), equity should serve as a central pillar of family planning programs (FP2020, 2015; HIPs, 2020; Hardee et al., 2019).

Family planning is especially susceptible to inequities because, as Kumar (2015) describes, it is “an elective, preventative health care service related to sexuality and fertility, burdening it with religious and cultural sensitivities, gender and power dynamics, and population implications that distinguish it from other health care services.” As a result, those who have the greatest need for services often experience inequitable conditions. Inequities may originate from many sources, including through provider bias toward young and older women, poor empowerment and self-care among those who are poorest or least educated, and cultural biases that limit access for unmarried women or minorities. While over 50 million additional women and girls began using modern methods of family planning in the last decade alone (FP2020, 2019), family planning information and services have not yet reached many facing the greatest need; approximately 218 million women in low- and middle-income countries have an unmet need for modern contraception (Sully et al., 2020). Part of the challenge in eliminating inequities is having an adequate understanding of who is affected, in what component of family planning, and where.

Table 1. Key Features of Availability, Accessibility, Acceptability, and Quality of Health Services in Family Planning Programs

Element	Features	
Availability		There are an adequate number of, and distribution of, trained family planning providers and facilities offering a full range of services. A broad choice of contraceptive methods is offered and available.
Accessibility		Family planning information, services, and commodities are available within safe geographic and physical reach for all.
		Family planning commodities and services are provided at no cost or in a manner that does not disproportionately burden individuals with health expenses.
		Everyone can access evidence-based family planning information consistent with need, taking into consideration age, language ability, education level, disability, and other status.
Acceptability		Family planning information, services, and commodities are respectful of culture and sensitive/responsive to gender, age, disability, sexual diversity, and life-cycle requirements.
Quality		Information, services, and commodities are of good quality—they are evidence-based, scientifically and medically appropriate, and up-to-date.

Definitions based on UNCESCR, 2016 and Hardee et al., 2013.

There are numerous approaches for identifying and measuring inequities and inequalities in health, many of which have been applied to reproductive, maternal, newborn, and child health as well as family planning.¹ Generally, these approaches fall into the domains of either descriptive or inferential statistics. Several tools have been produced to identify or explain inequities utilizing one or more of these methods.

Descriptive statistics:

- *Tabulations:* household surveys—such as Demographic and Health Surveys (DHS)—produce tabulations of indicators (e.g., coverage) by select background variables, such as residence, sex, education, age, and wealth quintile. These tabulations provide basic insights about the relationship between variables, but do not shed light on statistical significance.
- *Simple summary measures of absolute or relative differences:* researchers and programmers have computed absolute and relative inequality through several simple summary calculations such as the difference—subtracting the level of health coverage in the most disadvantaged group from that of the most advantaged group—and ratio—the level of

¹ Distinctions between inequity and inequality are not always clear or explicitly made in literature. Often, terms like inequality or disparity are used to connote inequity.

health intervention coverage in the most advantaged group is divided by that of the most disadvantaged (WHO, 2015; Ross, 2015).

Inferential statistical approaches:

- *Bivariate and multivariate statistical approaches:* researchers have also used statistical tests—commonly, logistic regression analysis—to identify and/or measure the influence of various factors on health outcomes of interest (Mbugua and MacQuarrie, 2018; Bradley et al., 2009; Bibha et al., 2007; MacQuarrie and Aziz, 2020). These factors—often referred to as determinants, or something that influences or has an association with the subject being studied—move beyond individual background characteristics (like age, ethnicity, race, occupation, etc.) to enabling elements (the logistical aspects of obtaining care, such as the means to access and afford services), need factors (like wantedness of pregnancy, parity, and birth order), and other categories of variables (Andersen, 1995). These studies are typically focused on identifying the broad range of factors, at the individual-level and beyond, associated with reproductive, maternal, newborn, and child health service utilization.
- *The slope index of inequality (SII):* studies have increasingly used the SII, a measure of absolute inequality, to quantify differences by wealth or education. When used for coverage indicators, SII scores range from -100 to 100 and point to the absolute difference in health coverage between the extremes of wealth and education distribution (e.g., most educated to least educated) (WHO, 2017; Barros et al., 2020). Values greater than zero demarcate an inequality in which the most advantaged group has greater coverage than the most disadvantaged. A score of zero points to equality or no inequality, while negative values indicate greater coverage for the most disadvantaged group (WHO, 2017). Authors have commonly estimated the SII of the composite coverage index—a combined measure of coverage with eight reproductive, maternal, newborn, and child health interventions—to better assess levels and trends across countries (Barros and Victora, 2013; Victora et al., 2017; Barros et al., 2020; Wehrmeister et al., 2020).
- *Concentration index:* researchers have also increasingly leveraged the concentration index to quantify the degree of income-related inequality in a specific health variable (Gillespie et al., 2007; Leahy Madsen and Greenbaum, 2018). Scores on the concentration index, a relative measure of inequality, range from -1 and 1. As with the SII, values greater than zero indicate an inequality that favors the most advantaged group, negative values point to an inequality that favors the most disadvantaged group, and zero represents equality. Studies employing the concentration index are typically focused on reproductive, maternal, newborn, and child health and family planning service utilization.

Tools and data visualization platforms:

- Several tools are available to users to identify and measure inequities in health. One prominent tool, the Health Equity Assessment Toolkit Plus (HEAT Plus), enables users to assess inequalities at the global, national, or subnational level for a range of health indicators and dimensions of inequality (Hosseinpoor et al., 2018). Through the software,

users can access existing databases, or upload their own, and choose from a range of absolute and relative measures (difference, population attributable risk, SII, relative concentration index) to diagnose inequalities. While HEAT Plus is useful in providing an overview on inequalities related to family planning uptake indicators (for example, in demand satisfied and modern contraceptive use), it does not examine inequities in the factors that affect use. Other family planning-specific tools, such as PSI's Modern Contraceptive Use/Need Explorer Tool, compares family planning uptake indicators by subgroup.

Despite the abundance of methods and tools, several limitations and gaps exist with regard to their utility and application for family planning programming. First, equity analyses are almost exclusively focused on outcome measures of family planning—indicators of utilization/coverage, such as contraceptive prevalence rate (all methods or modern only), unmet need, and demand satisfied for family planning. These analyses omit consideration of AAAQ, the essential elements of care that shape health outcomes. Employing statistical approaches to understand inequities in these four elements may be more telling of systematic barriers and contribute to explaining why inequities in outcomes exist, thereby facilitating deeper policy dialogue and action.

Secondly, equity has been examined largely along socioeconomic lines, with a focus on wealth-based differences using the methods noted above. There is comparatively less attention focused on the other dimensions by which individuals vary, such as age, education, disability, race, ethnicity, residence (rural or urban areas, refugees and internally displaced persons, etc.), and other statuses. In order to enable governments to better tailor their programs and meet needs—for instance, making the case for the inclusion of family planning services within social health insurance schemes and ensuring that access is progressing toward universal health coverage—a greater understanding of the range of inequities is required.

Furthermore, studies in family planning have been largely focused on identifying inequities at the national level in an era where decentralization and the localization of decision making are rapidly progressing. This requires a greater focus on diagnosing inequities at subnational levels; where health resources are scarce, this can support allocative efficiency. Lastly, approaches used by researchers and academics are not easily replicable by those without a statistical background or software package. A replicable, statistical approach is needed to understand inequities in all family planning components, at the subnational level, and across a broad range of disadvantaged women.

HP+'s Approach for Diagnosing Inequity in Family Planning Programs

Overview

To support countries in the next phase of family planning policy, programming, and funding decisions, the U.S. Agency for International Development-funded Health Policy Plus (HP+) project developed an approach for diagnosing inequity in family planning programs. The approach answers the “who, what, and where” of inequities in family planning, specifically:

- **Who** is experiencing inequity?
- **What** components of family planning are not delivered equitably?
- **Where**, geographically, is inequity occurring?

Replicable across countries through HP+'s open source code in R,² the approach enables users to easily transform DHS data to develop evidence for decision making at national and subnational levels. In HP+'s approach, equity is interrogated across five components of family planning for seven commonly disadvantaged groups. Multivariate logistic regression analysis is used to assess whether the experience of each component of family planning—access to information, access to services, acceptability, quality, and use—is equitable for those who are disadvantaged compared to those who are typically less marginalized. Results generated enable users to examine national inequities, the distribution of inequities across subnational regions, and the profile of inequity for each subnational unit.

Inequities or Inequalities?

HP+ refers to all differences in family planning components between the most and least disadvantaged subgroups as inequities. Although the criteria for judging something as unjust varies across authors, HP+ determined that differences in the experience of AAAQ elements and demand satisfied for modern methods are unlikely to result from natural biological variation, are not the result of free choice, and should not exist along non-medically indicated characteristics.

Methodology

Survey Selection

The approach was developed using the Phase 7 DHS Model Woman's Questionnaire (2018). The approach was applied using the Uganda 2016 DHS, and subsequently tested for Albania (2017-18) and Guinea (2018). Prior to the selection of the DHS, HP+ also considered the Multiple Indicator Cluster Survey (MICS) as well as Performance Monitoring and Accountability 2020 (PMA2020) surveys and questionnaires. Like the DHS, both collect nationally and, in some cases, subnationally representative sample data from households and women in order to

² R is a free software environment for statistical computing and graphics. For more information, see <https://www.r-project.org/>.

estimate family planning and other health indicators. Unlike the DHS and MICS, PMA2020 features new questions on family planning beyond utilization, enabling analysis of both outcomes (like contraceptive use) as well as a broader range of AAAQ components. Following a comparison of these alternative data sources, the DHS was chosen because it (1) offered the most individual background characteristics, (2) contained the most options for dependent variables shared across countries and survey years, and (3) was most likely to be subnationally representative and meet HP+’s sample size cutoffs of a minimum of 100 observations.

Dependent Variables

After a thorough review of the DHS questionnaire, HP+ selected five dependent variables for the approach. Variables were selected based on their conceptual/theoretical fit. The selected measures are summarized in Table 2. Several of these variables were manually recoded to become binary—a key criterion for logistic regression analysis. In a few cases, the variables were also recoded to expand the denominator to all women. A more detailed description of these variable recodes can be found in the accompanying R code. Notably, there is no measure for availability. This measure—often proxied as commodities in stock or family planning methods offered—is a distinct concept at the facility level and not asked in the Woman’s Questionnaire. HP+ recognizes that adequately capturing each of these concepts is complex and dependent on the survey questionnaire. Any dependent variables will necessarily be imperfect proxies.

Table 2. Family Planning Components Assessed

Family Planning Component	Measure	Population
Availability	N/A	N/A
Accessibility (information)	Exposed to any form of family planning mass media	All women of reproductive age
Accessibility (services)	Told of family planning by provider at facility or by community health worker	All women of reproductive age
Acceptability	Not prevented from using family planning due to acceptability issues	All women of reproductive age
Quality	Informed of method side effects, what to do if side effects occur, and other available methods	Women of reproductive age using modern methods of contraception
Use	Demand for family planning satisfied with modern methods	Women of reproductive age with need for limiting or spacing

Accessibility

Family planning information and services should be physically and geographically accessible, and affordable, for all. Additionally, information should be evidence-based and widely available in forms consistent with people’s needs (UNCESCR, 2016). Moreover, enabling access to family planning includes avoiding missed opportunities for service provision (Hardee et al., 2013).

DHS variables v384a–v384d, which are based on response options (a)–(d) of Question No. 815 of the Model Woman’s Questionnaire, were selected as measures of access to family planning information. This question is asked of all women of reproductive age. Any woman who answers “Yes” to at least one of the four options was recoded as having access to family planning information. While adequate as a proxy, the study team recognizes that this question does not capture all relevant aspects of access to information. For example, this measure does not: speak to the content of the message; indicate whether it was received in a language that the respondent understands; or cover channels of communication in which a woman is likely to receive more targeted information.

Question No. 815. *In the last few months have you:*

- (a) *Received a voice or text message about FP [family planning] on a mobile phone?*
- (b) *Read about FP in a newspaper or magazine?*
- (c) *Seen anything about FP on the television?*
- (d) *Heard about FP on the radio?*

For measuring access to family planning services, the study team selected DHS variables v393a and v395. These variables are based on Question No. 328 and Question No. 330 of the Model Woman’s Questionnaire, respectively. Both questions are asked of all women. If a woman answers “Yes” to either question, she was coded as having access to family planning services.

Question No. 328. *Did the fieldworker [who visited you in the last 12 months] talk to you about family planning?*

- (a) *Yes*
- (b) *No*

Question No. 330. *Did any staff member at the health facility [that you visited in the last 12 months] speak to you about family planning methods?*

- (a) *Yes*
- (b) *No*

There are some common measures of accessibility that HP+ was unable to include due to the limits of the DHS questionnaire and subnational sampling across countries. Specifically, physical accessibility is commonly measured by distance or travel time to the nearest source of family planning. Financial accessibility (affordability) is gauged using the cost of goods and services. A cluster-based household survey is not an effective design to get a complete picture of metrics that can vary considerably from one village to the next. Potential proxy measures for physical and financial access are the share of non-users citing “lack of access/too far” and “costs too much” as reasons for non-use in Question No. 810 of the Model Woman’s Questionnaire. However, both response options were uncommon among respondents in all surveys reviewed by HP+. With too few positive responses to meaningfully examine inequities, HP+ did not include either proxy measure in the methodology.

Acceptability

Family planning information and services should be designed and delivered so that they are acceptable for all. Services must be respectful of medical ethics, culturally appropriate, and sensitive to the range of evolving needs. In other words, family planning programs should be

attentive to clients' satisfaction and therefore responsive to requirements across statuses and the life-course, including youth- and disability-friendly services (UNCESCR, 2016; Hardee et al., 2013). In the absence of such intentional program design, there may be opposition to use of contraception by women, their partners, their family members, and others.

HP+ created its measure of acceptability based on variables v3a08i–v3a08l, which correspond to the response options (i)–(l) for Question No. 810 of the Model Woman's Questionnaire. This question is asked of women of reproductive age who stated that they (1) do not want (a/another) child soon or did not want any (more) children, and (2) are not using any contraceptive methods. If the respondent selected one or more response options that indicate acceptability issues ("respondent opposed," "husband/partner opposed," "others opposed," or "religious prohibition"), they were coded as facing acceptability issues. Women who are not using a contraceptive method for other reasons and women who are using a contraceptive method were coded as not having acceptability issues.

Question No. 810. *Can you tell me why you are not using a method to prevent pregnancy?*

- (a) *Not married*
- (b) *Not having sex*
- (c) *Infrequent sex*
- (d) *Menopausal/hysterectomy*
- (e) *Can't get pregnant*
- (f) *Not menstruated since last birth*
- (g) *Breastfeeding*
- (h) *Up to God/fatalistic*
- (i) *Respondent opposed*
- (j) *Husband/partner opposed*
- (k) *Others opposed*
- (l) *Religious prohibition*
- (m) *Knows no method*
- (n) *Knows no source*
- (o) *Side effects/health concerns*
- (p) *Lack of access/too far*
- (q) *Costs too much*
- (r) *Preferred method not available*
- (s) *No method available*
- (t) *Inconvenient to use*
- (u) *Interferes with body's normal processes*
- (x) *Other: _____ (specify)*
- (z) *Don't know*

HP+ recognizes the limitation of this measure as a proxy for acceptability. Because Question No. 810 asks non-users reasons they are not using a contraceptive method, this measure misses those who face acceptability issues that do not prevent them from using family planning (current users). Moreover, this measure captures a narrow vision of acceptability, omitting important considerations such as satisfaction.

Quality

Family planning services should be of high quality, meaning that: (1) accurate, unbiased, and comprehensive information is given to clients, (2) services are delivered by providers with technical competence in facilities of high clinical quality, (3) follow-up and continuity mechanisms are in place, and (4) dignity and respect is demonstrated (UNCESCR, 2016; Hardee et al., 2013). As one measure of quality, informed choice indicates whether women are adequately counseled and therefore told about a method's side effects, what to do if side effects are experienced, and other methods they could use.

For quality of family planning services, HP+ coded an index from DHS variables v3a02, v3a04, and v3a05 (corresponding to informed choice). The variables are based on Question No. 318, 321, and 322 of the Model Woman's Questionnaire, which are follow-up questions for women currently using a modern contraceptive method. Respondents were coded as having had a quality visit only if the respondent says "Yes" to all three questions.

Question No. 318. *At that time, were you told about side effects or problems you might have with the method?*

(a) Yes

(b) No

Question No. 321. *Were you told what to do if you experienced side effects or problems?*

(a) Yes

(b) No

Question No. 322. *Were you told about other methods of family planning that you could use?*

(a) Yes

(b) No

As with the other essential elements, quality of care is a complicated concept with numerous components. While a discussion of side effects and other methods of contraception is necessary for a high-quality family planning visit, it is by no means sufficient. Visits that meet this narrow criterium could still be low quality for reasons not captured in the DHS.

Use

For use of family planning, HP+ looked at demand satisfied with a modern method of family planning, which is Sustainable Development Goals indicator 3.7.1. Family planning information and services that are available, accessible, acceptable, and high quality may lead to several favorable outcomes, including increased trust in programs, decreased discontinuation rates, and increased demand for family planning satisfied with modern contraception (Hardee et al., 2013). HP+ defined this outcome in accordance with the 2018 *Guide to DHS Statistics* (DHS-7). This is measured as modern method use divided by total demand, which consists of unmet need and total contraceptive use. The approach identifies these women with DHS variable v626a and codes as missing any women without a reported need. Current users of modern methods are identified with DHS variable v313.

Independent Variables

To identify which groups experience inequities in access, acceptability, quality, and use, HP+ reviewed the Model Woman's Questionnaire to select seven groups likely to experience inequities (Group 1) relative to their counterparts (Group 2) (see Table 3). These groupings represent common lines of schism in society and groups are deemed disadvantaged based on the prevailing norms in many low-income and lower-middle-income countries (Hardee et al., 2019). In addition, these groupings are sizeable and substantially different from their counterparts.

Table 3. Individual Background Characteristics Tested

Measure	Group 1: Identified as Disadvantaged	Group 2: Identified as Not Disadvantaged
Age	Youngest (15–19 years of age)	Older (20–49 years of age)
Education	Primary education or less	More than primary education
Marital status	Not in-union	In-union
Residence	Rural	Urban
Wealth	Poorest quintile (national)	Wealthiest quintile (national)
Ethnicity	Not largest group (region)	Largest group (region)
Religion	Not largest group (region)	Largest group (region)

All measures except for wealth were recoded as binary for ease of interpretation. For wealth, HP+ used national-level wealth quintiles to compare women in the poorest wealth quintile to women in the wealthiest quintile. This comparison of top and bottom quintiles is standard in DHS reports. However, if one wishes to compare results across surveys, wealth quintiles can be recalculated to create wealth groups based on household assets using the Global Data Lab's International Wealth Index methodology.³ If the analysis requires comparison across time or surveys, wealth groups must be reconstructed.

Ethnicity and religion groupings are defined at the regional level. If a woman belongs to the largest group in her region, she is in Group 2. If she belongs to any other group, she falls in Group 1. A major caveat is that differences between ethnic and religious groups can vary widely. One group that falls in Group 2 may be viewed as closely related to Group 1, while another is viewed as more dissimilar. It is also possible that the most populous group in a region does not have the most political or cultural power; in this case, Group 1 may actually represent the more advantaged subset.

The measures are intended to help policymakers target programs to easily identify population subgroups. There are other groups not included here—women who experience domestic

³ If the study objective is to examine trends over time, the chosen country would need to have multiple survey years available with the same subnational unit boundaries or boundaries that can be easily manipulated from the older survey to match the more recent survey.

violence, women with limited control over household finances, etc.—who may experience less equitable outcomes than their counterparts. However, these populations are difficult to identify and including them in the regression could mean obscuring an inequity experienced by a more identifiable population. Other groups—such as migrants and refugees or those with disabilities—were not included due to limitations of the DHS.⁴ HP+ reviewed its selections for collinearity to ensure inequities experienced by each group were independent of one another.

Statistical Analysis

When applying the approach, multivariate logistic regression models are used to assess if the seven subgroups explain differential family planning access to information, services, quality care, and use. These models were separately constructed for each of the five dependent variables of interest. The seven independent variables remained constant in each model. Below is an example for the model’s accessibility (information) dependent variable.

$$\log(\text{odds}(Y_i = \text{does not have exposure to family planning messages} | X_i) = \beta_{\text{(intercept)}} + \beta_{\text{(poorest)}} + \beta_{\text{(least_educated)}} + \beta_{\text{(youngest)}} + \beta_{\text{(ethnicity_EAminority)}} + \beta_{\text{(religion_EA minority)}} + \beta_{\text{(rural_residence)}} + \beta_{\text{(unmarried)}}$$

The $\beta_{(i)}$ estimates the log odds for not having exposure to family planning messages for that specific independent variable while holding all other independent variables constant. All log odds were converted to odds ratios for each of the binary independent variables. Restricting the independent variables to be binary allows for easier interpretation of results, enabling the use of results for policy and programming. All results with p-values < .05 are considered significant (significance was tested at the .05 alpha level).

Results Outputs and Interpretation

For any country in which this approach is applied, several results and formats are automatically generated for the user to support interpretation and use. These results present and demarcate unfavorable statistically significant results—labelled as “significant inequity.” In some cases, a statistically significant result will not be labelled a “significant inequity” because it represents a favorable or desired outcome (when the disadvantaged group is in fact more advantaged). Importantly, the absence of a “significant inequity” does not mean that conditions are necessarily equitable, but that an inequity does not exist in the way HP+ has chosen to define and measure it. Inequities may exist for components and subgroups that are not included in HP+’s approach. In some subnational regions, there may be insufficient sample sizes to assess inequities.

The following are outputs provided by the approach:

⁴ The Model Woman’s Questionnaire gauges disability related to vision (blind/visually impaired) using Question No. 111 related to literacy. As with other variables, this response option is uncommon among respondents in all surveys reviewed by HP+.

- *Descriptive statistics:* an Excel spreadsheet and corresponding maps featuring descriptive statistics of the family planning components are automatically generated. These descriptive statistics capture the national and subnational mean values for each of the dependent variables (see Methodology: Dependent Variables). These results can be used alongside the statistical findings to establish context. For instance, there may be situations where there are no or very few inequities in one or more family planning components (e.g., demand satisfied for modern methods), but absolute levels remain very low. In this case, even though there are no inequities, interventions are still required to improve access to modern methods.
- *Full regression results:* an Excel spreadsheet (named “FullRegressionResults”) featuring national and subnational regression results for all family planning components and individual characteristics is automatically generated. The Excel spreadsheet includes odds ratios and the p-value for each result. For ease of interpretation, a column is included that summarizes which results represent statistically significant inequities. Users can use these results to create pivot tables and other visuals as desired.
- *Summary regressions results:* for ease of interpretation, four summary outputs are produced:
 - An Excel spreadsheet, “Summary_Subgroup Inequities,” summarizes the full regression results noted above. This output calculates the total number of subgroups (out of seven) that experience statistically significant inequities by each family planning component, for each region, and at the national level.
 - An Excel spreadsheet, “Summary_Region Inequities,” summarizes the total number of regions for which there are statistically significant inequities by each disadvantaged group.
 - Figures in PNG format are produced for each of the five family planning components. Each figure features a color-coded table that clearly indicates which groups experience inequities at the national level and for each region.
 - Maps are produced in PNG format, which, unlike the descriptive statistics maps, showcase the density of inequity by summarizing the number of groups likely to experience inequities compared to their counterparts by region. Those regions with darkest colors represent areas where many different disadvantaged groups are experiencing inequities.
- *Share of all women by group:* in recognition that women are likely to experience more than one type of disadvantage simultaneously, the approach produces two Excel spreadsheets that shed light on intersecting disadvantage. The first, “Share of Women By Group,” summarizes the percent of all women in the country of study who experience one and two types of disadvantage (e.g., age 15–19; and age 15–19 and poorest). The second spreadsheet, “Share of Women by Number of Disadvantaged Groups,” computes the percent of women in the country of study who belong to one or more disadvantaged groups.

This allows users to make statements about the percent of women who, for example, experience three or more overlapping disadvantages.

Taken together, these results: (1) provide a high-level overview of inequities at the national level (who experiences the inequities across the five family planning components); (2) capture the distribution of inequity across subnational units to understand where inequities are found; and (3) look within subnational units to examine which subgroups are affected and for which components of family planning.

Limitations

While HP+’s approach is easily applicable using DHS data and provides useful policy-relevant results, there are several limitations. As described in the methodology, the measures used to represent each family planning component and the subgroups studied are constrained by what is available in the Phase 7 DHS Model Woman’s Questionnaire. The entirety of the AAAQ framework could not be evaluated. There are additional individual characteristics that are not included in the DHS questionnaire but represent important dimensions by which people differ in terms of their needs, the opportunities available to them, and the challenges they face. Moreover, this approach is unable to diagnose inequities for subgroups that are not identified as disadvantaged by the authors (such as women 20–24, women in the middle wealth quintile, or formerly married women). While HP+ has defined the groups that are at risk of being disadvantaged based on prevailing norms in low- and middle-income countries, these groupings may vary by country context and over time.

Additionally, cross-sectional surveys like the DHS provide a point-in-time snapshot and changes may have occurred since the survey, making this technique less useful for surveys older than a few years. Applying this analysis as new surveys are released would be a best practice. One limitation when applying this approach to other countries is the potential variation in the number of observations for family planning components or subgroups. For example, countries that have achieved universal primary education may have very few or no women in the no education category, eliminating the utility of education as an independent variable.

Subnational analysis is limited by DHS survey sampling; the analysis can only go as far down as the level at which the survey is representative. For some regions, results may be compromised due to insufficient sample sizes (cut-off of 100 observations per regions). Furthermore, in some countries, the subnational level at which the data are representative may not align with levels at which policy, program, or funding decisions are made. As countries are increasingly devolving their policymaking to lower administrative levels, other methods (such as small area estimation techniques) to estimate spatial differences at lower subnational levels could be considered.

While the approach does shed light on the prevalence of intersecting disadvantage, it does not account for the possibility of interaction effects (or effect modification). For instance, while the poor and youngest are disproportionately disadvantaged, the young poor are even more so. Using the current diagnostic tool should provide a starting point for deeper analysis of subgroups. Finally, given changes to subsequent rounds of the Model Woman’s Questionnaire, the R code may need to be adapted to account for revisions and recodes.

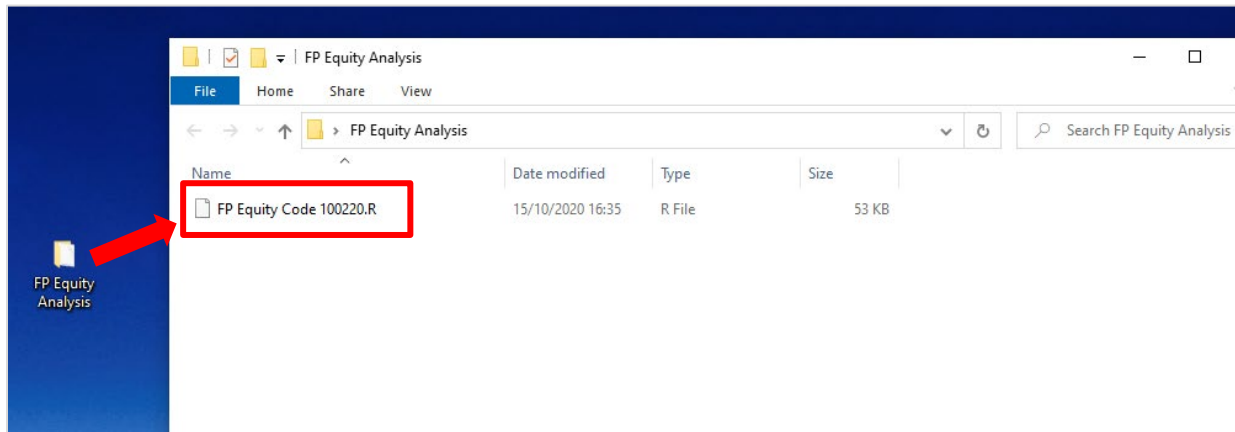
Guide to Replicating the Approach for Diagnosing Inequity in Family Planning Programs

This guide provides step by step instructions on how to replicate the approach for any country with a DHS that is sampled at the national and subnational level.

Step 1: HP+ Code and R Software Download

To begin, create a folder on your desktop or another directory. Title the folder: “FP Equity Analysis.” Next, download the free code for conducting the analysis, available through the HP+ website: <http://www.healthpolicyplus.com/models.cfm>. Save the code in the FP Equity Analysis folder (see Figure 1). The name of the code file may change from that shown in Figure 1 as it is updated in the future.

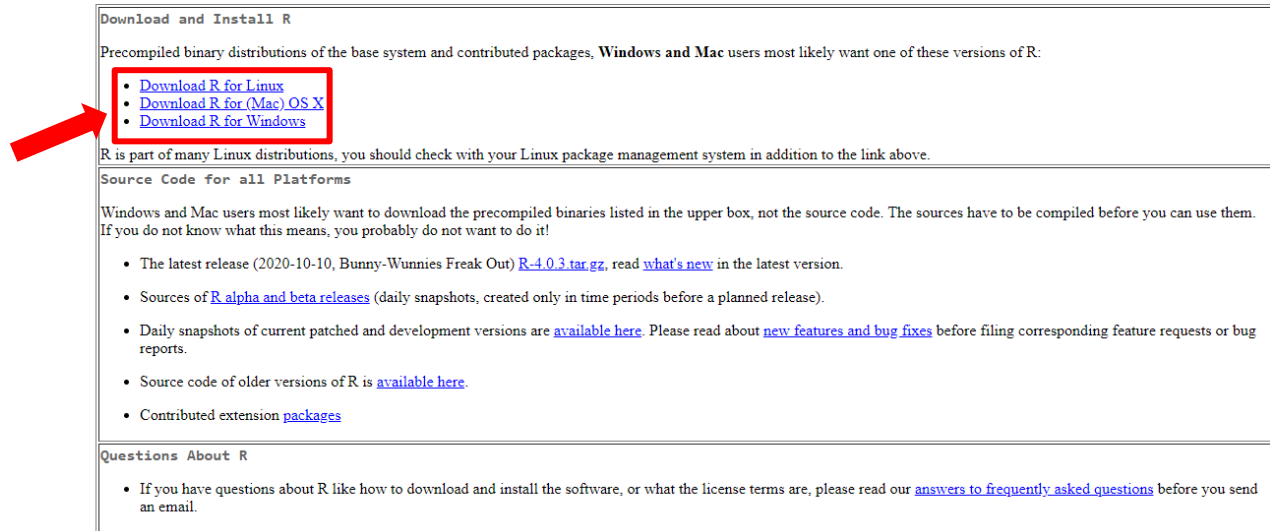
Figure 1. Create a Central Folder and Save HP+ Code



The HP+ code is written in the R programming language. In order to execute the analysis, the user must download two additional items, both of which are free: the R software environment and RStudio Desktop.

First, download R, a free software environment for statistical computing and graphics. For this download, select the Comprehensive R Archive Network located closest to you: <https://cran.r-project.org/mirrors.html>. For instance, those based in the United States will have 12 URLs to choose from. Once selected, the user will be prompted to choose an operating system (Linux, Mac OS X, Windows) (see Figure 2). Once selected, this will begin the download.

Figure 2. Download R



Download and Install R

Precompiled binary distributions of the base system and contributed packages, **Windows and Mac** users most likely want one of these versions of R:

- [Download R for Linux](#)
- [Download R for \(Mac\) OS X](#)
- [Download R for Windows](#)

R is part of many Linux distributions, you should check with your Linux package management system in addition to the link above.

Source Code for all Platforms

Windows and Mac users most likely want to download the precompiled binaries listed in the upper box, not the source code. The sources have to be compiled before you can use them. If you do not know what this means, you probably do not want to do it!

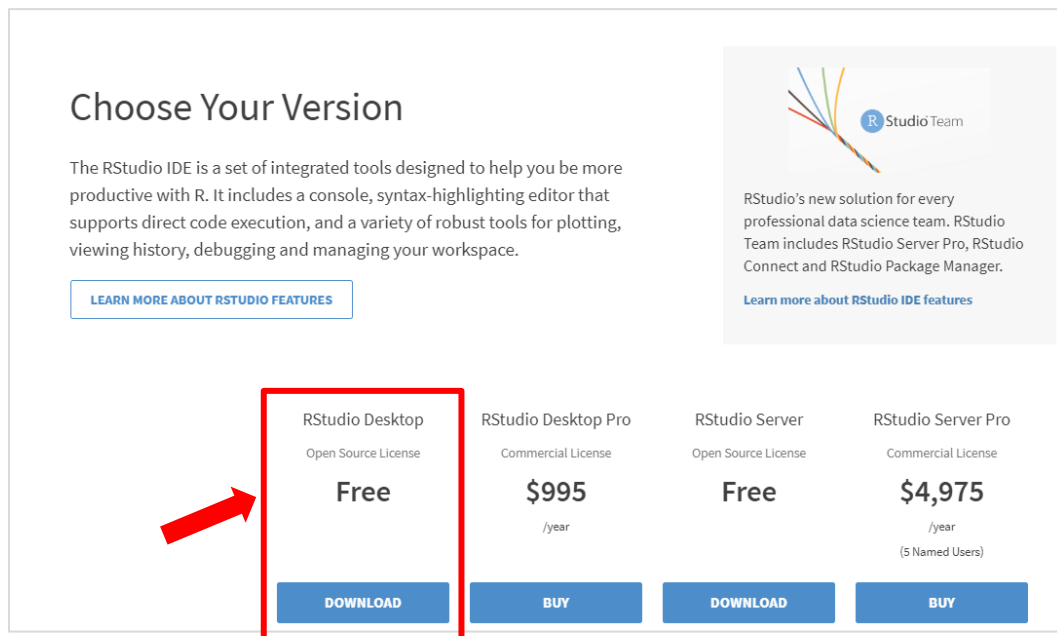
- The latest release (2020-10-10, Bunny-Wunnies Freak Out) [R-4.0.3.tar.gz](#), read [what's new](#) in the latest version.
- Sources of [R alpha and beta releases](#) (daily snapshots, created only in time periods before a planned release).
- Daily snapshots of current patched and development versions are [available here](#). Please read about [new features and bug fixes](#) before filing corresponding feature requests or bug reports.
- Source code of older versions of R is [available here](#).
- Contributed extension [packages](#)

Questions About R

- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

Second, download RStudio Desktop, a free integrated development environment for the R language: <https://rstudio.com/products/rstudio/download/>. From the download options, select “RStudio Desktop” (see Figure 3).

Figure 3. Download RStudio Desktop



Choose Your Version

The RStudio IDE is a set of integrated tools designed to help you be more productive with R. It includes a console, syntax-highlighting editor that supports direct code execution, and a variety of robust tools for plotting, viewing history, debugging and managing your workspace.

[LEARN MORE ABOUT RSTUDIO FEATURES](#)

RStudio Desktop
Open Source License
Free
[DOWNLOAD](#)

RStudio Desktop Pro
Commercial License
\$995
/year
[BUY](#)

RStudio Server
Open Source License
Free
[DOWNLOAD](#)

RStudio Server Pro
Commercial License
\$4,975
/year
(5 Named Users)
[BUY](#)

Step 2: Survey Selection and Download

While this analysis can be executed exclusively at the national level, it is advisable to select a survey that is subnationally representative. This is particularly salient if decision making for family planning has been devolved. To assess to which administrative levels the DHS has sampled by country/survey, see: <https://spatialdata.dhsprogram.com/boundaries/#view=table&countryId=AF>.

For example, the Afghanistan 2015 DHS is representative at the Administrative I level (34 regions). Conversely, the 2014-15 India DHS is representative at the Administrative I level (36 states) and Administrative II level (640 districts). Some older DHS surveys, like the 1997 Yemen DHS, are only representative at the national level.

Once the DHS country/survey has been chosen, two sets of files must be downloaded: the female questionnaire dataset (.DTA) and the corresponding shapefile data. The .DTA file captures all the necessary variables for the multivariate logistics regression analysis. The shapefile features boundaries needed for generating maps. To download the files, you must be registered with the DHS (free): <https://dhsprogram.com/data/new-user-registration.cfm>.

For the .DTA file, navigate to the DHS download site: <https://dhsprogram.com/data/available-datasets.cfm>. Select the desired survey and subsequently the “Survey Datasets”; see Figure 4, featuring an example using the Uganda 2016 survey.

Figure 4. Download DHS Dataset

Uganda							
Survey	Type	Phase	Recode	Survey Datasets	GPS Datasets	HIV/Other Biomarkers Datasets	SPA Datasets
Uganda 2018-19	MIS	DHS-VII	DHS-VII	Data Available	Data Available	Not Collected	Not Applicable
Uganda 2016	Standard DHS	DHS-VII	DHS-VII	Data Available	Data Available	Other Biomarkers Data Available	Not Applicable
Uganda 2014-15	MIS	DHS-VII	DHS-VI	Data Available	Data Available	Not Collected	Not Applicable
Uganda 2011 ^(a)	Standard AIS	DHS-VI	DHS-VI	Data Available	Data Available	Data Available	Not Applicable
Uganda 2011	Standard DHS	DHS-VI	DHS-VI	Data Available	Data Available	Not Collected	Not Applicable

To complete the download, the user may be prompted to sign-in. Next, the user is directed to the main download page. Navigate to “Individual Recode” and select the Stata (.DTA) dataset (see Figure 5).

Once the zip file has downloaded, open the folder. Select the Stata .DTA file from the zipped folder and paste or drag it into the FP Equity Analysis folder (see Figure 6).

Figure 5. Download .DTA File

Uganda: Standard DHS, 2016

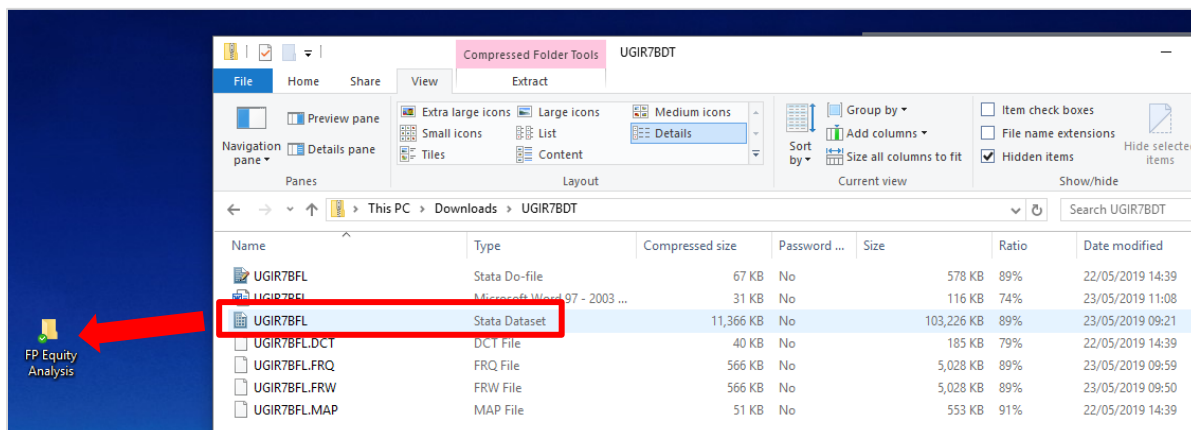
Select files individually or by file format type then press the button below the list of files to start the download process.

ALL STATA ☐ ALL FLAT ☐ ALL SAS ☐ ALL SPSS ☐ ALL HIERARCHICAL ☐

Survey Datasets

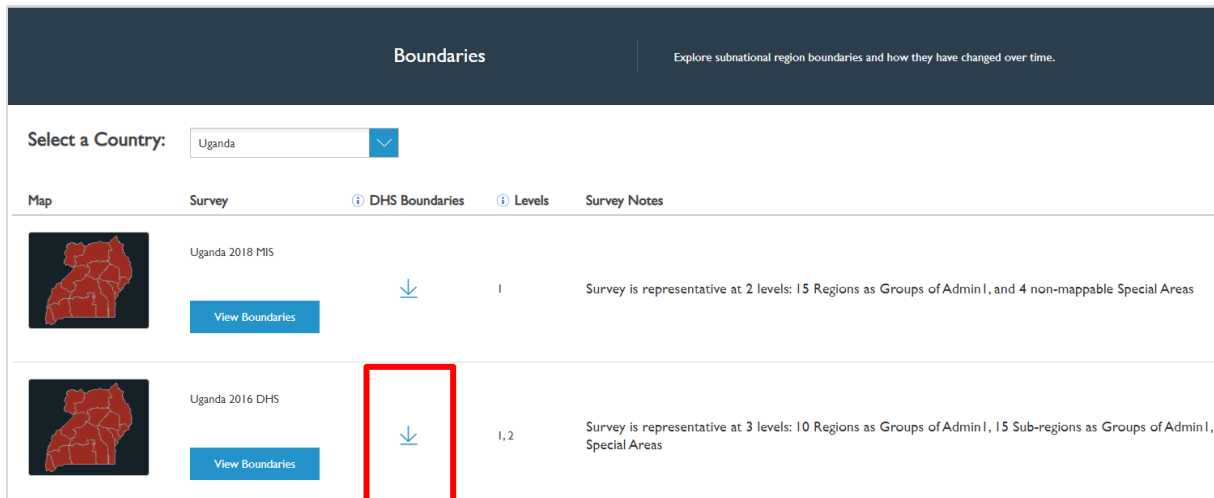
File Name	File Size	File Format
Births Recode		
☐ UGBR7BDT.ZIP	7.43 MB	Stata dataset (.dta)
☐ UGBR7BFL.ZIP	7.66 MB	Flat ASCII data (.dat)
☐ UGBR7BSD.ZIP	13.4 MB	SAS dataset (.sas7bdat)
☐ UGBR7BSV.ZIP	10.5 MB	SPSS dataset (.sav)
Couples' Recode		
☐ UGCR7BDT.ZIP	2.36 MB	Stata dataset (.dta)
☐ UGCR7BFL.ZIP	2.60 MB	Flat ASCII data (.dat)
☐ UGCR7BSD.ZIP	3.21 MB	SAS dataset (.sas7bdat)
☐ UGCR7BSV.ZIP	2.62 MB	SPSS dataset (.sav)
Fieldworker Questionnaire		
☐ UGFW7B.ZIP	6.94 KB	Hierarchical ASCII data (.dat)
☐ UGFW7BDT.ZIP	9.12 KB	Stata dataset (.dta)
☐ UGFW7BFL.ZIP	14.2 KB	Flat ASCII data (.dat)
☐ UGFW7BSD.ZIP	8.78 KB	SAS dataset (.sas7bdat)
☐ UGFW7BSV.ZIP	10.9 KB	SPSS dataset (.sav)
Household Recode		
☐ UGHR7BDT.ZIP	7.78 MB	Stata dataset (.dta)
☐ UGHR7BFL.ZIP	7.95 MB	Flat ASCII data (.dat)
☐ UGHR7BSD.ZIP	12.0 MB	SAS dataset (.sas7bdat)
☐ UGHR7BSV.ZIP	8.30 MB	SPSS dataset (.sav)
Individual Recode		
☐ UGIR7B.ZIP	17.0 MB	Hierarchical ASCII data (.dat)
☐ UGIR7BDT.ZIP	12.4 MB	Stata dataset (.dta)
☐ UGIR7BFL.ZIP	12.6 MB	Flat ASCII data (.dat)
☐ UGIR7BSD.ZIP	18.6 MB	SAS dataset (.sas7bdat)
☐ UGIR7BSV.ZIP	13.0 MB	SPSS dataset (.sav)

Figure 6. Move .DTA File



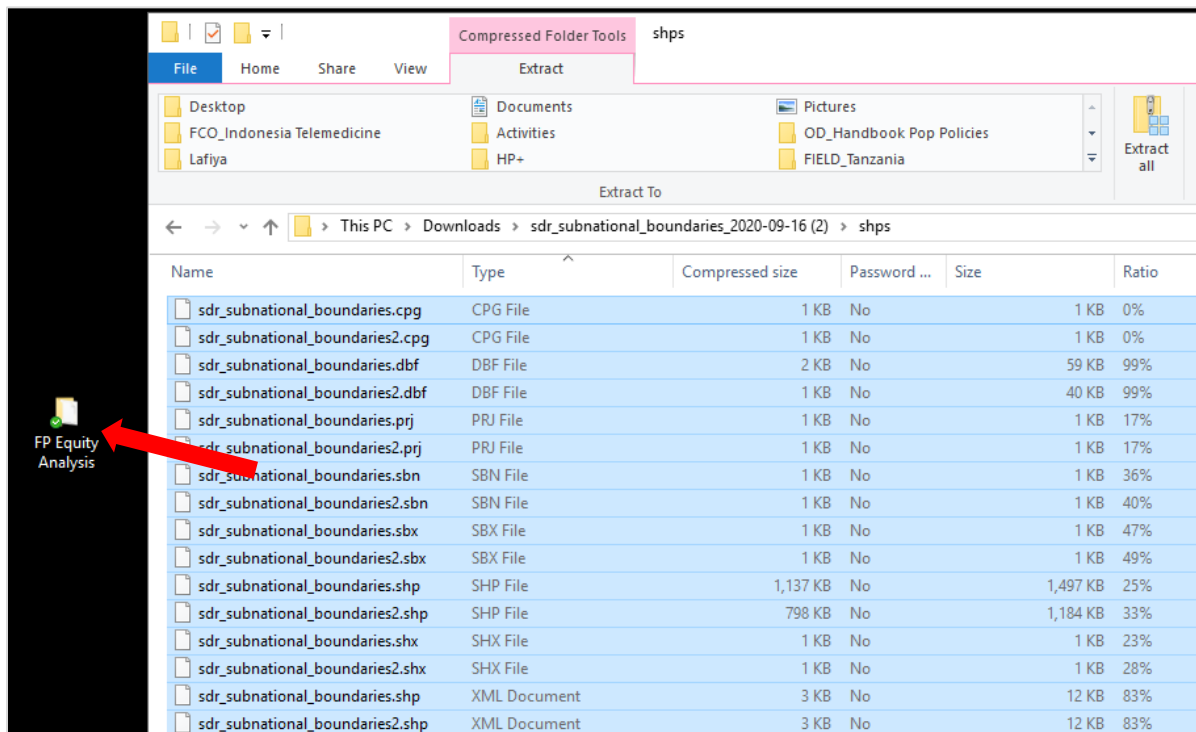
Next, navigate to the DHS’s Spatial Data Repository site to download the survey boundaries accompanying the survey: <https://spatialdata.dhsprogram.com/home/>. Select “Survey Boundaries.” On the “Survey Boundaries” site, choose your focus country and survey, then select the button to download the boundaries (see Figure 7 using the Uganda 2016 example).

Figure 7. Download .SHP Files



Once the zip file has downloaded, open the folder. Select all items in the subfolder “shps.” Next, paste or drag these files into the FP Equity Analysis folder (see Figure 8).

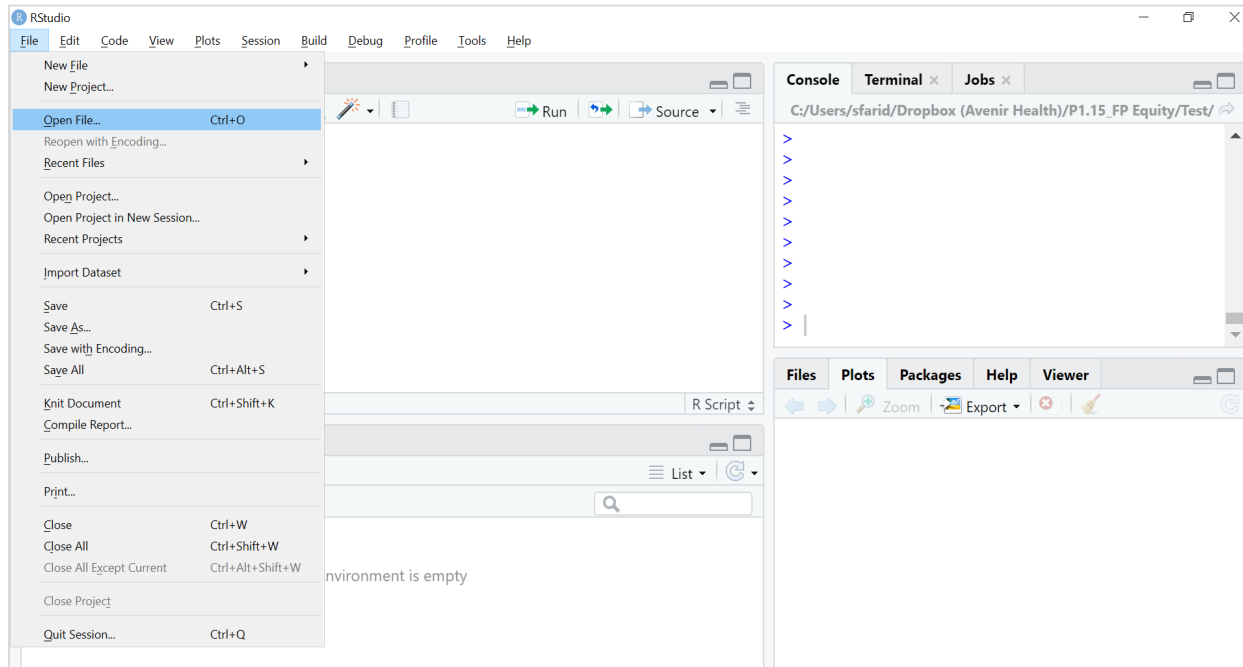
Figure 8. Move Map Files



Step 3: R Code Setup

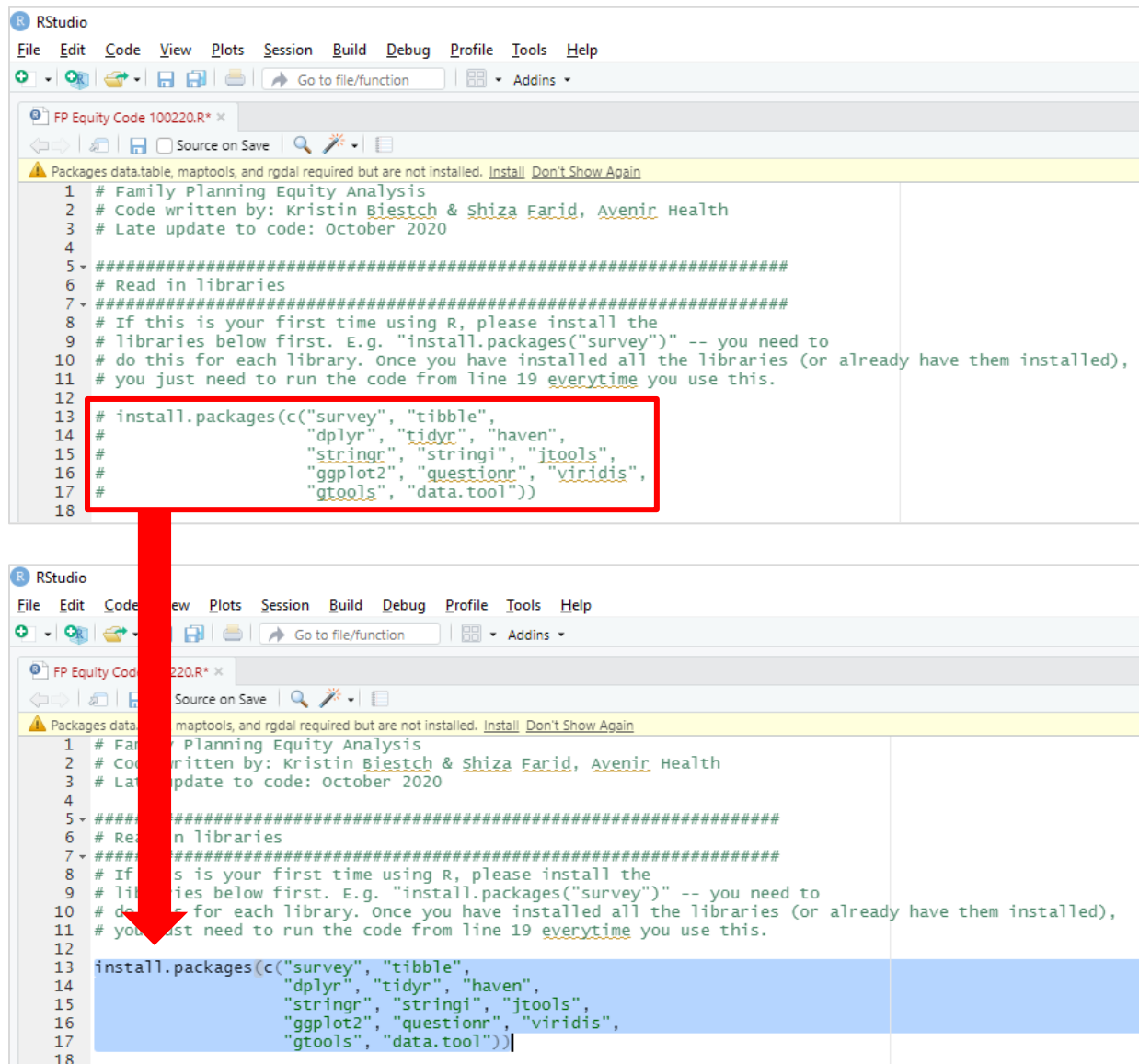
Next, open RStudio by selecting it from your list of installed applications or programs. Load HP+’s code by selecting “File,” and then locating the code from the FP Equity Analysis folder (see Figure 9).

Figure 9. Loading R Code



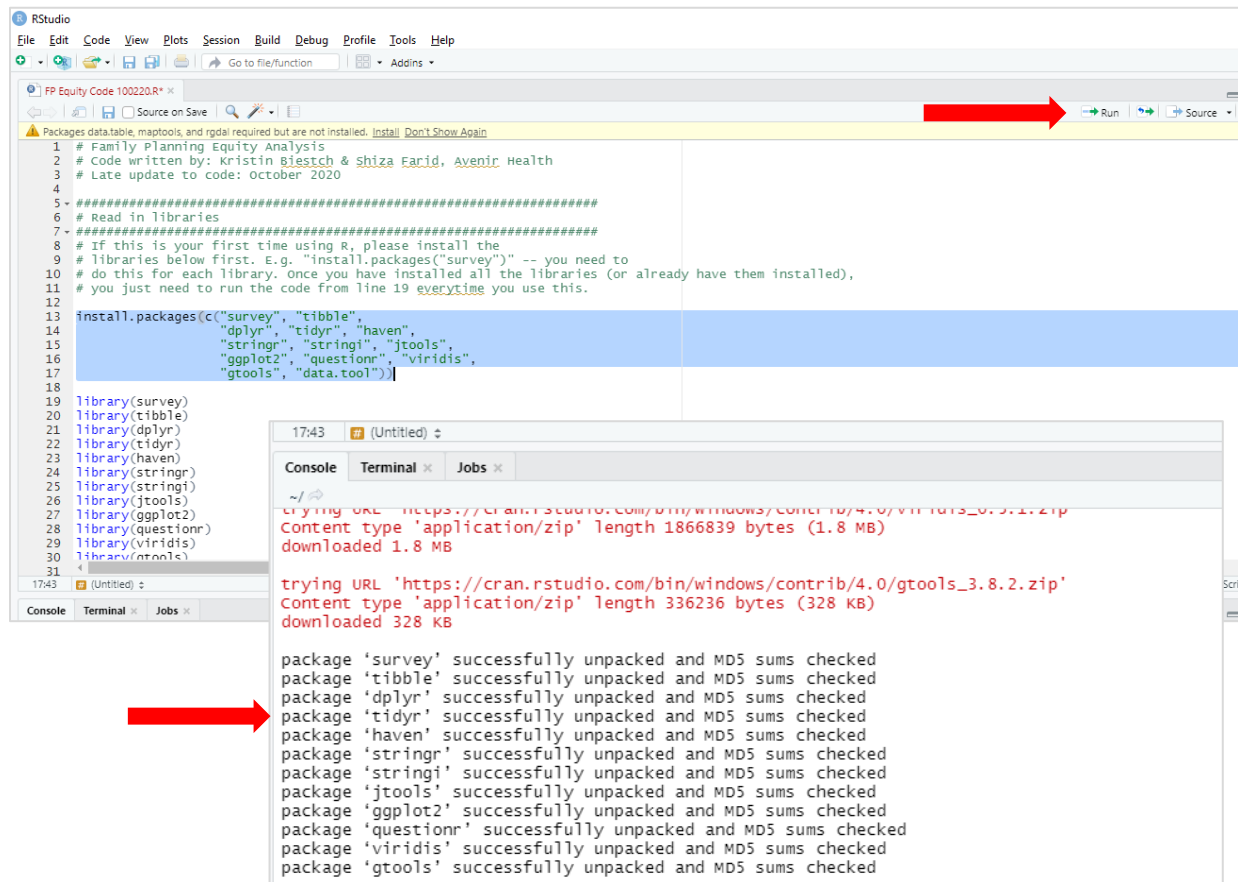
Several R packages are required to run the code. To install these packages, begin by “uncommenting the code”; this can be done by removing the hashtag symbols (#) for lines 13–17. You can do this automatically by pressing SHIFT + CTRL + C when lines 13–17 are highlighted (see Figure 10). You may also be prompted to install these packages automatically through a yellow ribbon that appears at the top of the screen.

Figure 10. Uncommenting Code



After highlighting the code, select the “Run” button (or press CTRL + ENTER). In the console window, you will see code describing the download process; this code may be in red. Allow the code to run fully. You will receive confirmation in the console window that your packages have downloaded (see Figure 11). You may receive a notification that RStudio should restart R in order to continue with the installation. If so, agree to restarting R prior to installing the packages.

Figure 11. Install Packages



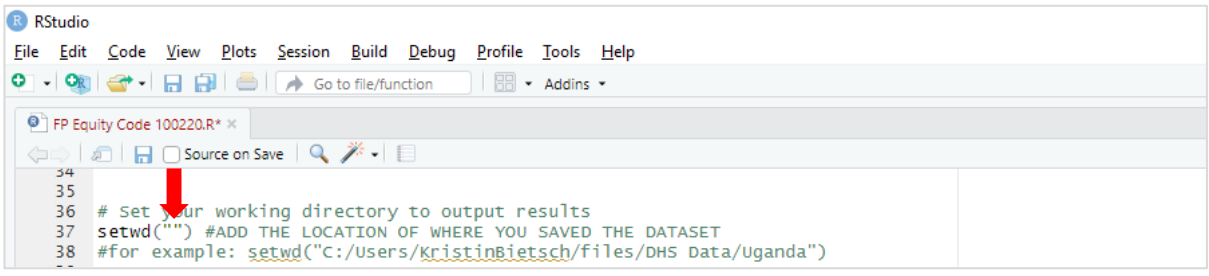
Next, a few modifications must be made to the code so that it can run for the user's chosen survey.

First, add the location (folder) to where you saved the DHS .DTA dataset within the parenthesis following the “`setwd`” code, which can be found on line 37. In this example, the location is your FP Equity Analysis folder. To find the full location name, open the FP Equity Analysis folder and select (click on) the folder name pathway (step A in Figure 12). Next, copy the folder name and paste it in a new document or notepad. Change any backslashes to forward slashes (step B in Figure 12). Finally, copy and paste this location in line 37 (step C in Figure 12).

Next, add the name of the DHS .DTA file following the “`read_dta`” code on line 44. This will direct R and RStudio to the data for which this analysis will be conducted. To do this, find the name of the DHS .DTA file in your FP Equity Analysis folder (step A in Figure 13). Add this name to the end of the file location (step B in Figure 13). Finally, copy this location and file name into the code on line 44.

Figure 12. Find and Edit Location

A

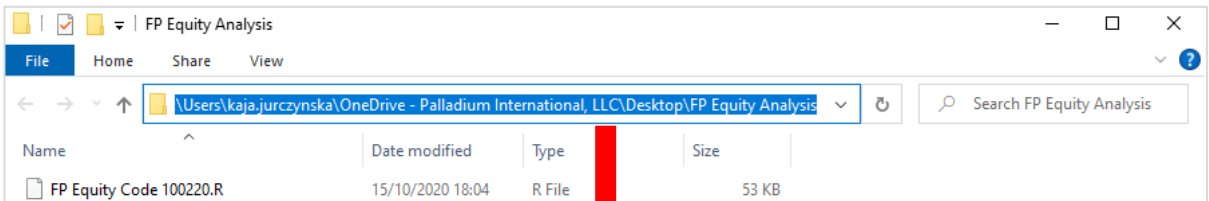


```

34
35
36 # Set your working directory to output results
37 setwd("") #ADD THE LOCATION OF WHERE YOU SAVED THE DATASET
38 #for example: setwd("C:/Users/KristinBietsch/files/DHS Data/Uganda")

```

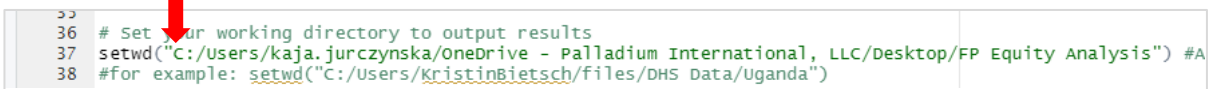
B



C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis

C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis

C



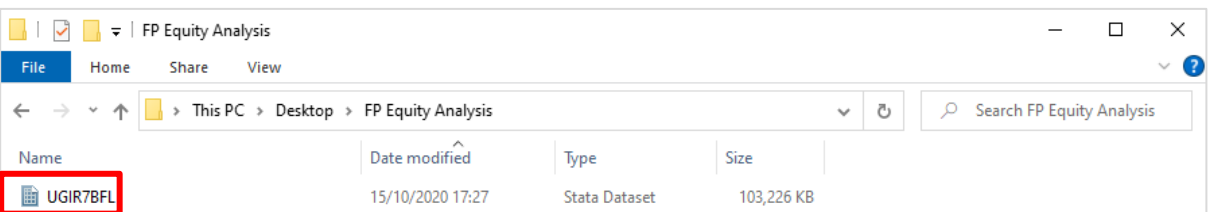
```

35
36 # Set your working directory to output results
37 setwd("C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis") #A
38 #for example: setwd("C:/Users/KristinBietsch/files/DHS Data/Uganda")

```

Figure 13. Embed Name of Data File

A

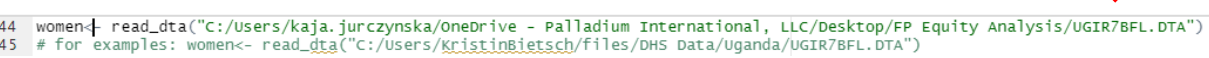


UGIR7BFL

B

C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis/UGIR7BFL.DTA

C



```

44 women<- read_dta("C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis/UGIR7BFL.DTA")
45 # for examples: women<- read_dta("C:/Users/KristinBietsch/files/DHS Data/Uganda/UGIR7BFL.DTA")

```

Once the location of the data is entered and the packages are installed, highlight and run lines 19–107. Once the code runs, the console pane will indicate if all required variables for the analysis are in the dataset (see Figure 14). In some cases—for instance, with older surveys or those that may be produced in the future and utilize different variables—not all the selected dependent and independent variables will be available in the dataset. In these cases, adjustments to the code will be required. For advanced R users, the code can easily be customized.

Figure 14. Locate Variables

```

82 "v3a08k",
83 "v3a08l",
84 "v3a02",
85 "v3a04",
86 "v3a05",
87 "v313",
88 "v626a",
89 "v106",
90 "v013",
91 "v023",
92 "v131",
93 "v130",
94 "v102",
95 "v502")
96
97
98 for (i in 1:length(variables)){
99   if(variables[i] %in% colnames(women))
100   {
101     print(paste("Yes,",variables[i],"is in there!"));
102   }
103   if(!variables[i] %in% colnames(women))
104   {
105     print(paste("No,",variables[i],"is not in there -- edit the code b
106   })
107 }
108 #####
109 # If not all variables are in the dataset, adapt the code below
110 # based on what is available in the dataset.
111 #####
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000

```

```

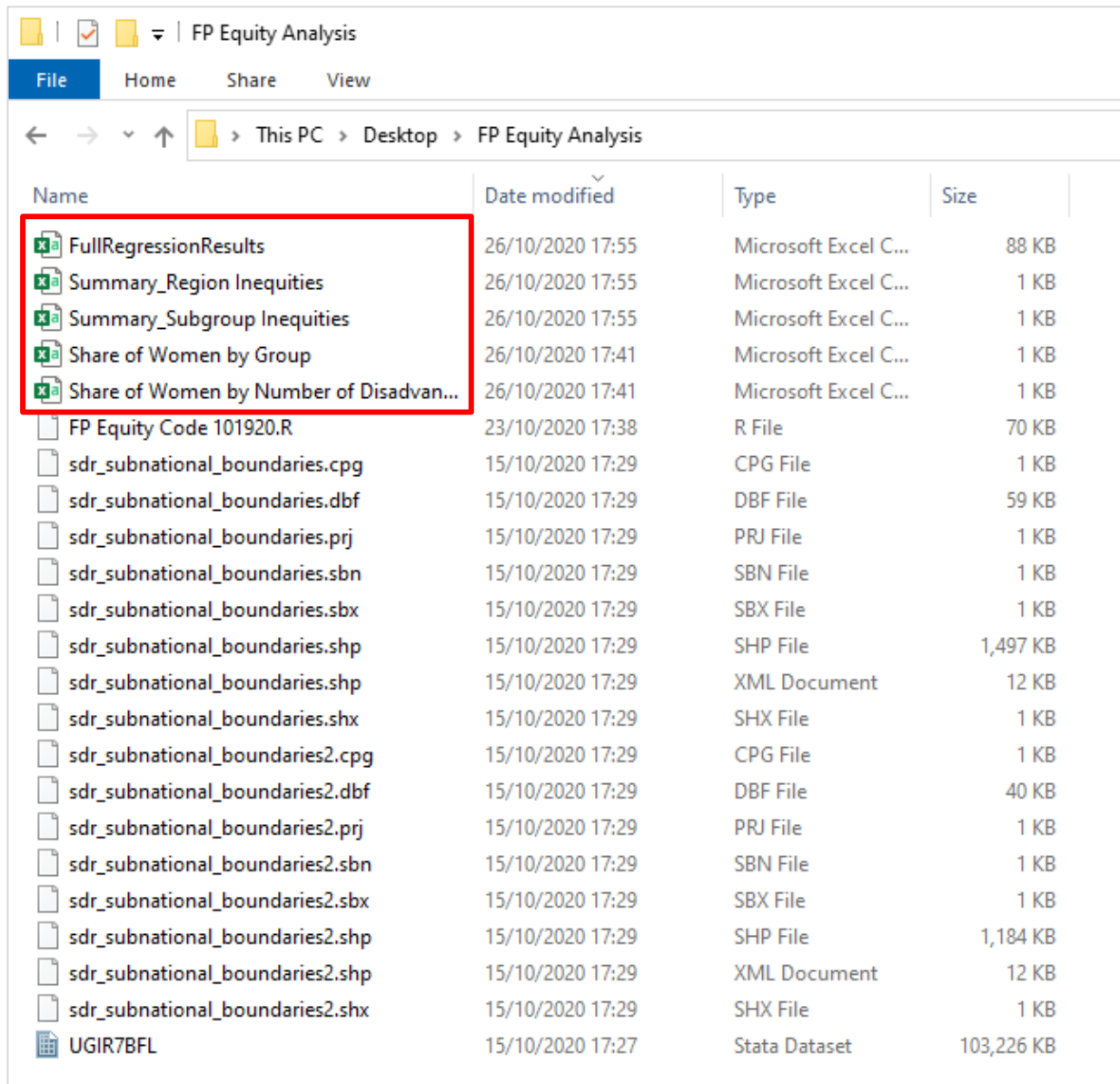
[1] "Yes, v395 is in there!"
[1] "Yes, v393a is in there!"
[1] "Yes, v384a is in there!"
[1] "Yes, v384b is in there!"
[1] "Yes, v384c is in there!"
[1] "Yes, v384d is in there!"
[1] "Yes, v3a08i is in there!"
[1] "Yes, v3a08j is in there!"
[1] "Yes, v3a08k is in there!"
[1] "Yes, v3a08l is in there!"
[1] "Yes, v3a02 is in there!"
[1] "Yes, v3a04 is in there!"
[1] "Yes, v3a05 is in there!"
[1] "Yes, v313 is in there!"
[1] "Yes, v626a is in there!"
[1] "Yes, v106 is in there!"
[1] "Yes, v013 is in there!"
[1] "Yes, v023 is in there!"
[1] "Yes, v131 is in there!"
[1] "Yes, v130 is in there!"
[1] "Yes, v102 is in there!"
[1] "Yes, v502 is in there!"

```

Step 4: Running the Code and Generating Results and Visuals

To run the analysis and produce full Excel results, run the code from line 119 until line 525. Before running the code, ensure that you have closed any other applications, programs, and web browsers. Once this code has completed running, which may take up to 20 minutes, open the FP Equity Analysis folder. Here, you should find five Excel files with outputs (see Figure 15). For a description of these files and the information they contain, see Results Outputs and Interpretation under the Methodology section of this guide.

Figure 15. Check Output Files



Name	Date modified	Type	Size
FullRegressionResults	26/10/2020 17:55	Microsoft Excel C...	88 KB
Summary_Region Inequities	26/10/2020 17:55	Microsoft Excel C...	1 KB
Summary_Subgroup Inequities	26/10/2020 17:55	Microsoft Excel C...	1 KB
Share of Women by Group	26/10/2020 17:41	Microsoft Excel C...	1 KB
Share of Women by Number of Disadvan...	26/10/2020 17:41	Microsoft Excel C...	1 KB
FP Equity Code 101920.R	23/10/2020 17:38	R File	70 KB
sdr_subnational_boundaries.cpg	15/10/2020 17:29	CPG File	1 KB
sdr_subnational_boundaries.dbf	15/10/2020 17:29	DBF File	59 KB
sdr_subnational_boundaries.prj	15/10/2020 17:29	PRJ File	1 KB
sdr_subnational_boundaries.sbn	15/10/2020 17:29	SBN File	1 KB
sdr_subnational_boundaries.sbx	15/10/2020 17:29	SBX File	1 KB
sdr_subnational_boundaries.shp	15/10/2020 17:29	SHP File	1,497 KB
sdr_subnational_boundaries.shp	15/10/2020 17:29	XML Document	12 KB
sdr_subnational_boundaries.shx	15/10/2020 17:29	SHX File	1 KB
sdr_subnational_boundaries2.cpg	15/10/2020 17:29	CPG File	1 KB
sdr_subnational_boundaries2.dbf	15/10/2020 17:29	DBF File	40 KB
sdr_subnational_boundaries2.prj	15/10/2020 17:29	PRJ File	1 KB
sdr_subnational_boundaries2.sbn	15/10/2020 17:29	SBN File	1 KB
sdr_subnational_boundaries2.sbx	15/10/2020 17:29	SBX File	1 KB
sdr_subnational_boundaries2.shp	15/10/2020 17:29	SHP File	1,184 KB
sdr_subnational_boundaries2.shp	15/10/2020 17:29	XML Document	12 KB
sdr_subnational_boundaries2.shx	15/10/2020 17:29	SHX File	1 KB
UGIR7BFL	15/10/2020 17:27	Stata Dataset	103,226 KB

Next, to produce visuals, the user must add region names generated for the chosen country. To find the names of the regions in your dataset, highlight line 538 and select the “Run” button (step A in Figure 16). This will generate a list of regions in the console window (step B in Figure 16). Manually enter those names in reverse alphabetical order starting from line 545 of the code (step C in Figure 16). Delete (or write over) any example regions listed in the code, deleting any regions that are not featured in your dataset.

Figure 16. Enter Region Names

```

528 # Graphics
529 #####
530
531 #####
532 # Country specific coding
533 #####
534
535 # Country specific coding!
536
537 # You need to reorder your regions for graphing
538 levels(as.factor(data_full$Geography))
539
540 #####REMOVE ALL SPECIAL CHARACTERS FROM CITY NAMES #####
541 ## THE REGION NAME "N'zérékoré" WAS CHANGED TO "Zerek"
542 ## EXAMPLE IF YOU NEED TO: data.clean$Geography[data.clean$Geography=="N'zérékoré"]="Zerek"
543
544 # Putting in reverse order ##### ADD IN NAMES OF THE REGIONS YOU'RE WORKING WITH #####
545 data_full$Geography <- factor(data_full$Geography, levels = c(
546     "West Nile",
547     "Tooro",
548     "Teso",
549     "South Buganda",
550     "North Buganda",
551     "Lango",
552     "Kigezi",
553     "Karamoja",
554     "Kampala",
555     "Busoga",
556     "Bunyoro",
557     "Bukedi",
558     "Bugisu",
559     "Ankole",
560     "Achoi",
561     "National" ))
  
```



```

> levels(as.factor(data_full$Geography))
[1] "Achoi"      "Ankole"     "Bugisu"     "Bukedi"     "Bunyoro"    "Busoga"     "Kampala"
[9] "Kigezi"     "Lango"      "National"    "North Buganda" "South Buganda" "Teso"       "Tooro"
  
```

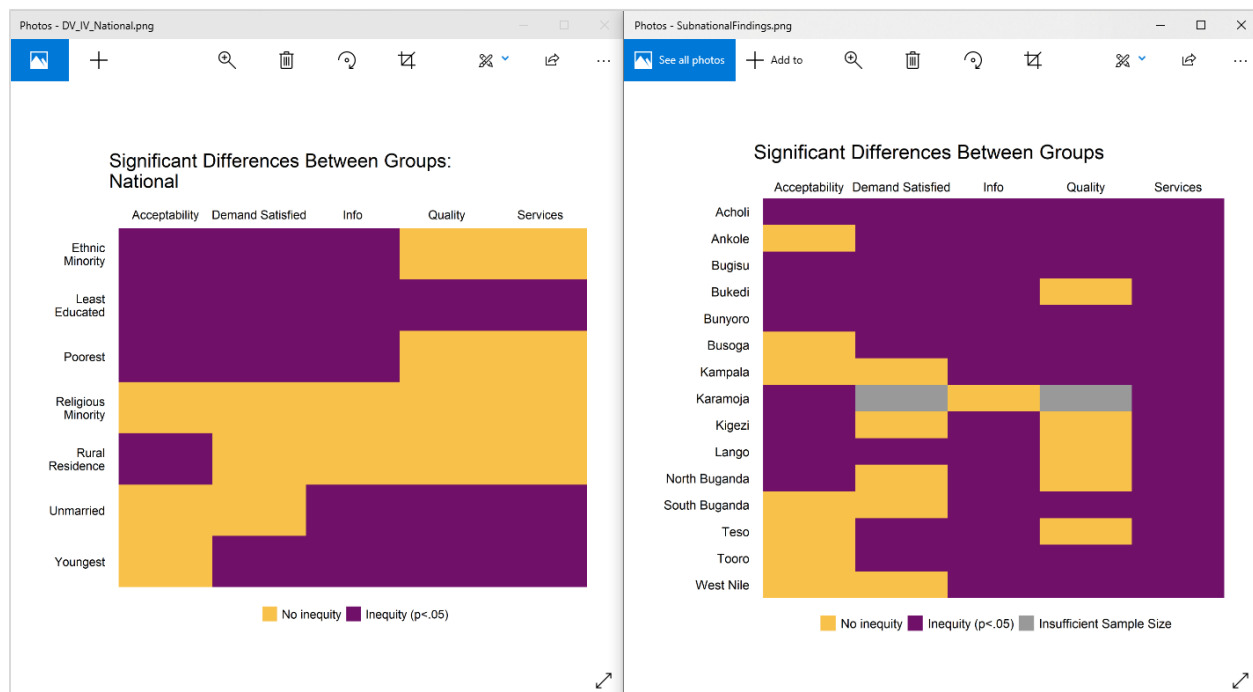
Next, run the code from lines 544 to 703—as before, do this by highlighting the code and selecting the “Run” button. This will produce five additional files, which can be found in the FP Equity Analysis folder on your Desktop (see Figure 17). Each of these files features a color-coded table that clearly indicates which groups experience inequities for each region across the components of family planning tested under this approach.

Figure 17. Table Visuals

Name	Date modified	Type	Size
Services	29/10/2020 17:30	PNG File	89 KB
Quality	29/10/2020 17:30	PNG File	76 KB
Info	29/10/2020 17:30	PNG File	84 KB
DemandSatisfied	29/10/2020 17:30	PNG File	81 KB
Acceptability	29/10/2020 17:30	PNG File	80 KB

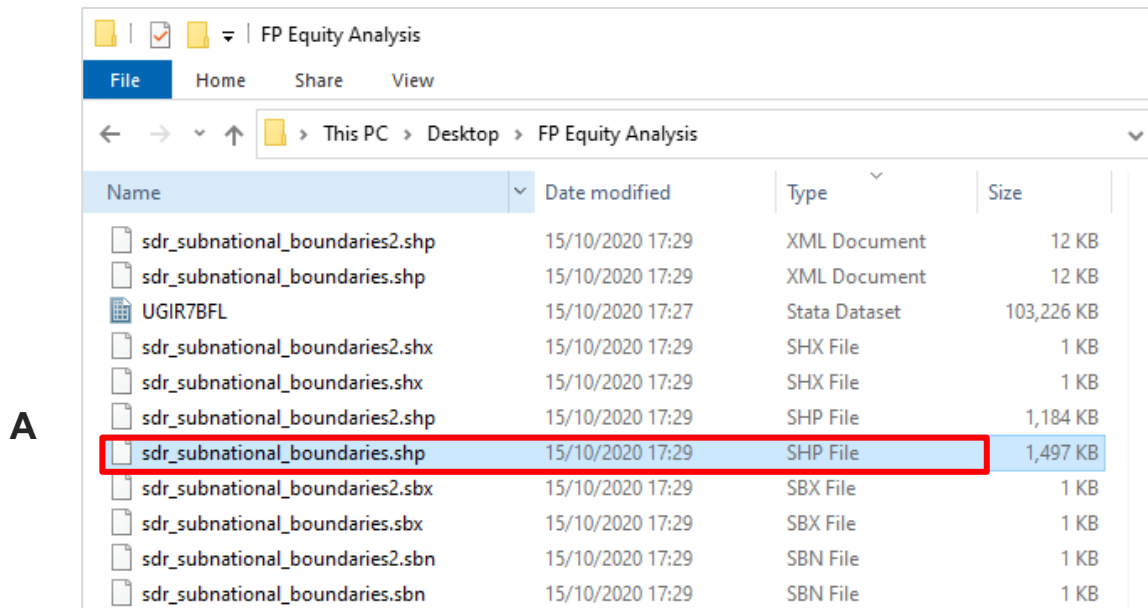
Next, run the code from line 707 to 770. This will produce two additional files, which again can be found in the FP Equity Analysis folder. These PNG files, like those from the previous step, consist of color-coded tables that indicate which groups experience inequities. These are summary tables for all components of family planning at both national and subnational levels (see Figure 18, which illustrates the outputs for Uganda). Region-specific color-coded tables can also be produced. The code for this can be found from lines 774 to 801—this code uses the region of Bunyoro in Uganda as an example. This code must be uncommented (removing the # manually or highlighting these lines and pressing SHIFT + CTRL + C) and the name of the desired region must replace all references to “Bunyoro.”

Figure 18. Example Summary Visuals for Uganda



Next, maps featuring descriptive statistics and the results will be produced from line 805. To do this, on line 830 in between the quotation marks following “readShapePoly(” enter the location and name of the shapefile. This file is in the FP Equity Analysis folder—the file location is identical to that entered in Step 3 (step C in Figure 12). Add the name of the .SHP data file at the end of the file location (see steps A and B in Figure 19).

Figure 19. Entering the .SHP File Location



B C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis/sdr_subnational_boundaries.shp

Next, run all of the remaining code from line 805. If the code produces errors, uncomment lines 840 through 847 (as before, by removing the # manually or highlighting these lines and pressing SHIFT + CTRL + C) (see Figure 20) and re-run the code from line 805 to the end. This completes the entire analysis and data visualization process. The final maps will be automatically placed in the FP Equity Analysis folder and can be viewed by the user (see Figure 21).

Figure 20. Generating Maps

```

803 #####
804 # Mapping Data
805
806 regions$Geography <- stri_trans_totitle(regions$Region)
807 geo_value <- regions %>% dplyr::select(Geography, value)
808 geo_value <- full_join(geo_value, summary.region, by="value")
809
810 summary.dv.region<- geo_value %>% dplyr::select(-value)
811 summary.dv.region <- bind_rows(summary.national, summary.dv.region)
812 write.csv(summary.dv.region, "NationalRegionalMeans.csv", row.names = F)
813
814 data.map <- data.clean %>% group_by(Geography, DV) %>%
815 summarise(inequalities=sum(stars)) %>%
816 spread(DV, inequalities) %>%
817 filter(Geography!="National") %>%
818 rename(DS="Demand Satisfied")
819 data.map <- full_join(data.map, geo_value, by="Geography")
820
821 require("rgdal")
822 require("maptools")
823
824 # You can download shapefiles for DHS Countries from their website
825 #http://spatialdata.dhsprogram.com/boundaries/#view-table&countryid=AF
826
827 projection.bounds <- CRS("+proj=longlat +datum=WGS84")
828
829 ## Map Bounds
830
831 shapefile <- readShapePoly("C:/Users/kaja.jurczynska/OneDrive - Palladium International, LLC/Desktop/FP Equity Analysis/sdr_subnational_boundaries.shp", verbose=TRUE,
832 #shapefile <- readShapePoly("C:/Users/KristinBietsch/Files/HP Plus/sdr_subnational_boundaries_2020-05-13/shps/sdr_subnational_boundaries.shp", verbose=TRUE, proj4strir
833
834 # Check Region coding
835 shapefile.df <- as.data.frame(shapefile)
836 uganda.bounds.fortify <- fortify(shapefile, region = "REGCODE")
837 uganda <- merge(uganda.bounds.fortify, data.map, by="id", by.y="value")
838
839 ### IF THE CODE ABOVE "MAP BOUNDS" DOES NOT WORK UNCOMMENT THE CODE BELOW (SHIFT+CTRL+C) AND USE THIS
840 |
841 |
842 library(rgdal)
843 setwd("C:/Users/kaja.jurczynska/OneDrive - palladium International, LLC/Desktop/FP Equity Analysis")
844 shapefile<-readOGR("sdr_subnational_boundaries.shp", layer = "sdr_subnational_boundaries")
845
846 #Check Region coding
847 shapefile.df <- as.data.frame(shapefile)
848 uganda.bounds.fortify <- fortify(shapefile, region = "REGCODE")
849 uganda <- merge(uganda.bounds.fortify, shapefile, by="id", by.y="REGCODE")
850

```

Figure 21. Map Outputs

2016 shps				
File	Home	Share	View	
Shiza Farid > Dropbox (Avenir Health) > P1.15_FP Equity > Maps > 2016 shps				
Name	Date modified	Type	Size	
Acceptability.mean.Map.png	9/11/2020 3:54 PM	PNG File	73 KB	
AcceptabilityMap.png	9/11/2020 3:53 PM	PNG File	53 KB	
DemandSatisfied.mean.Map.png	9/11/2020 3:54 PM	PNG File	71 KB	
DemandSatisfiedMap.png	9/11/2020 3:53 PM	PNG File	54 KB	
Info.mean.Map.png	9/11/2020 3:54 PM	PNG File	71 KB	
InfoMap.png	9/11/2020 3:54 PM	PNG File	54 KB	
Quality.mean.Map.png	9/11/2020 3:54 PM	PNG File	76 KB	
QualityMap.png	9/11/2020 3:54 PM	PNG File	58 KB	
sdr_subnational_boundaries.cpg	3/5/2020 9:35 AM	CPG File	1 KB	
sdr_subnational_boundaries.dbf	3/5/2020 9:35 AM	DBF File	59 KB	
sdr_subnational_boundaries.prj	3/5/2020 9:35 AM	PRJ File	1 KB	
sdr_subnational_boundaries.sbn	3/5/2020 9:35 AM	SBN File	1 KB	
sdr_subnational_boundaries.sbx	3/5/2020 9:35 AM	SBX File	1 KB	
sdr_subnational_boundaries.shp	3/5/2020 9:35 AM	SHP File	1,184 KB	
sdr_subnational_boundaries.shp.xml	3/5/2020 9:35 AM	XML Document	12 KB	
sdr_subnational_boundaries.shx	3/5/2020 9:35 AM	SHX File	1 KB	
sdr_subnational_boundaries2.cpg	3/5/2020 9:35 AM	CPG File	1 KB	
sdr_subnational_boundaries2.dbf	3/5/2020 9:35 AM	DBF File	40 KB	
sdr_subnational_boundaries2.prj	3/5/2020 9:35 AM	PRJ File	1 KB	
sdr_subnational_boundaries2.sbn	3/5/2020 9:35 AM	SBN File	1 KB	
sdr_subnational_boundaries2.sbx	3/5/2020 9:35 AM	SBX File	1 KB	
sdr_subnational_boundaries2.shp	3/5/2020 9:35 AM	SHP File	1,184 KB	
sdr_subnational_boundaries2.shp.xml	3/5/2020 9:35 AM	XML Document	12 KB	
sdr_subnational_boundaries2.shx	3/5/2020 9:35 AM	SHX File	1 KB	
Services.mean.Map.png	9/11/2020 3:54 PM	PNG File	75 KB	

All the maps will be saved in the same folder as the spatial files.

Now the user is able to review all of the outputs and draw conclusions based on the findings. Refer to the Results Outputs and Interpretation section of this guide for further details on the result types generated and their potential uses. For an examination of how results of the Uganda 2016 DHS were messaged and packaged, refer to the following HP+ webinar recording and policy brief:

- “Are Family Planning Programs Reaching the Most Disadvantaged? An Equity Case Study from Uganda.” YouTube video, 1:00:52. Posted by the Health Policy Project, June 1, 2020. Available at: <http://www.healthpolicyplus.com/FPinUgandaWebinar.cfm>.
- Jurczynska, K., K. Ward, L. Teplitskaya, S. Farid, and K. Bietsch. 2020. *Are Family Planning Programs Reaching the Disadvantaged? An Equity Case Study of Uganda*. Washington, DC: Palladium, Health Policy Plus. Available at: <http://www.healthpolicyplus.com/pubs.cfm?get=18431>.

References

- Andersen, R.M. 1995. "Revisiting the Behavioral Model and Access to Medical Care: Does it Matter?" *Journal of Health and Social Behavior* 36(1): 1–10.
- Arcaya, M.C., A.L. Arcaya, and S.V. Subramanian. 2015. "Inequalities in Health: Definitions, Concepts, and Theories." *Global Health Action* 8: 1.
- Barros, A.J.D. and C.G. Victora. 2013. "Measuring Coverage in MNCH: Determining and Interpreting Inequalities in Coverage of Maternal, Newborn, and Child Health Interventions." *PLoS Medicine* 10(5): e1001390.
- Barros, A.J.D., F.C. Wehrmesiter, L.Z. Ferreira, et al. 2020. "Are the Poorest being Left Behind? Estimating Global Inequalities in Reproductive, Maternal, Newborn and Child Health." *BMJ Global Health* 5: e002229.
- Bibha, S., E.R. van Teijlingen, M. Porter, and P. Simkhada. 2007. "Factors Affecting the Utilization of Antenatal Care in Developing Countries: Systematic Review of Literature." *Journal of Advanced Nursing* 61(3): 244–260.
- Bradley, S.E.K., H.M. Schwandt, and S. Kan. 2009. *Levels, Trends, and Reasons for Contraceptive Discontinuation*. DHS Analytical Studies No. 20. Calverton, Maryland: ICF Macro.
- Braveman, P. 2006. "Health Disparities and Health Equity: Concepts and Measurement." *Annual Review of Public Health* 27: 167–94.
- Family Planning 2020 (FP2020). 2015. "Rights and Empowerment Principles for Family Planning." Available at: https://www.familyplanning2020.org/sites/default/files/FP2020_Statement_of_Principles_11x17_EN_092215.pdf.
- Family Planning 2020 (FP2020). 2019. *FP2020 Women at the Center: 2018-2019*. Washington, DC: FP2020.
- Family Planning High Impact Practices (HIPs). 2020. "Overview." Available at: <https://www.fphighimpactpractices.org/overview/>.
- Gillespie, D., S. Ahmed, A. Tsui, and S. Randloff. 2007. "Unwanted Fertility Among the Poor: An Inequity?" *Bulletin of the World Health Organization* 85: 100–107.
- Hardee, K., E. Houghtaling, S. Stratton, I. Askew, C. Venkatraman, et al. 2019. *Discussion Paper on Equity for the High Impact Practices Partnership*. Washington, DC: Family Planning High Impact Practices Initiative.

- Hardee, K., K. Newman, L. Bakamjian, J. Kumar, S. Harris, et al. 2013. *Voluntary Family Planning Programs that Respect, Protect, and Fulfill Human Rights: A Conceptual Framework*. Washington, DC: Futures Group.
- Hosseinpoor, A.R., A. Schlotheuber, D. Nambiar, and Z. Ross. 2018. “Health Equity Assessment Toolkit Plus (HEAT Plus): Software for Exploring and Comparing Health Inequalities Using Uploaded Datasets.” *Global Health Action* 11: 144078.
- Kumar, J. 2015. *How Does Quality of Care Relate to a Rights-based Approach to Family Planning Programs?* New York: Population Council.
- Leahy Madsen, E. and C. Greenbaum. 2018. “Family Planning Equity Among Youth: Where Are We Now?” *Population Bulletin*. Washington, DC: PRB.
- MacQuarrie, K.L.D. and A. Aziz. 2020. *Trends, Differentials, and Determinants of Modern Contraceptive Use in Pakistan, 1990-2018*. Rockville, Maryland: ICF.
- Mbugua, S. and K.L.D. MacQuarrie. 2018. *Determinants of Maternal Care Seeking in Kenya. DHS Further Analysis Reports No. 111*. Rockville, Maryland: ICF.
- Ross, J. 2015. “Improved Reproductive Health Equity Between the Poor and the Rich: An Analysis of Trends in 46 Low- and Middle-Income Countries.” *Global Health: Science and Practice* 3(3): 419–445.
- Sully, E.A., A. Biddlecom, J.E. Darroch, T. Riley, L.S. Ashford, et al. 2020. *Adding It Up: Investing in Sexual and Reproductive Health 2019*. New York: Guttmacher Institute.
- United Nations, Department of Economic and Social Affairs, Population Division. 2020. *Estimates and Projections of Family Planning Indicators 2020*. New York: United Nations.
- United Nations Committee on Economic, Social and Cultural Rights (UNCESCR). 2000. *CESCR General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12)*. Available at: <https://www.refworld.org/pdfid/4538838do.pdf>.
- United Nations Committee on Economic, Social and Cultural Rights (UNCESCR). 2016. *CESCR General Comment No. 22 on the Right to Sexual and Reproductive Health (Article 12 of the International Covenant on Economic, Social and Cultural Rights)*. Available at: <https://digitallibrary.un.org/record/832961?ln=en>.
- United Nations General Assembly (UNGA). 1966. “International Covenant on Economic, Social and Cultural Rights.” Available at: <https://www.ohchr.org/Documents/ProfessionalInterest/cescr.pdf>.
- Victora, C.G., A.J. Barros, G.V. França, I.C. da Silva, L. Carvajal-Velez, and A. Amouzou. 2017. “The Contribution of Poor and Rural Populations to National Trends in Reproductive, Maternal, Newborn, and Child Health Coverage: Analyses of Cross-Sectional Surveys from 64 Countries.” *The Lancet Global Health* 5(4): e402–e407.

Wehrmeister, F.C., A.J.D. Barros, A.R. Hosseinpoor, T. Boerma, and C.G. Victora. 2020. “Measuring Universal Health Coverage in Reproductive, Maternal, Newborn and Child Health: An Update of the Composite Coverage Index.” *PLoS ONE* 15(4): e0232350.

Whitehead, M. 1992. “The Concepts and Principles of Equity in Health.” *International Journal of Health Services* 22: 429–445.

World Health Organization (WHO). n.d. “Health Equity.” Available at: https://www.who.int/topics/health_equity/en/.

World Health Organization (WHO). 2015. *State of Inequality: Reproductive, Maternal, Newborn and Child Health*. Geneva: WHO and the International Centre for Equity in Health | Pelotas.

World Health Organization (WHO). 2017. *Health Equity Assessment Toolkit (HEAT): Software for Exploring and Comparing Health Inequalities in Countries*. Built-in database edition. Version 2.0. Geneva: WHO.

For more information, contact:

Health Policy Plus
Palladium
1331 Pennsylvania Ave NW, Suite 600
Washington, DC 20004
Tel: (202) 775-9680
Fax: (202) 775-9694
Email: policyinfo@thepalladiumgroup.com
www.healthpolicyplus.com

