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Inequalities in Unsatisfied Demand for Modern Contraception within and across Low- and Middle-Income Countries

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Abstract:

Broad gains in contraceptive use have been made in low-income countries over the past two decades, but progress has been uneven. Given FP2020 goals to meet demand for modern contraception and the SDGs' emphasis on equitable progress, there is renewed interest in measuring inequalities in modern contraceptive coverage. Studies of this topic are typically constrained by the fact that standard poverty measures are relative within surveys. This paper develops and uses a measure of absolute poverty for 31 countries with recent DHS surveys and prior surveys on average 10 years older. It appears that inequalities within and across countries are declining, but that within-country inequalities are declining faster than across-country inequalities. Our first objective is to statistically test this hypothesis with controls in the full paper. Our second objective is to test whether absolute poverty level or country-level fixed effects are a better determinant of unsatisfied demand for modern methods.

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Recognized as a highly cost-effective development intervention, family planning empowers women and couples to shape their own lives, supports healthier families, and helps to reduce poverty by increasing opportunities for economic growth (Alkema et al. 2013; Bongaarts et al. 2012; Carr et al. 2012; FP2020 2017b; UNFPA 2017; United Nations, Department of Economic and Social Affairs, and Population Division 2017b). If all unmet need for modern contraception in developing countries were fulfilled, the number of unintended pregnancies, unplanned births, and induced abortions would decline by about 75%, and the resulting health benefits would be substantial, including far fewer maternal deaths (Guttmacher Institute 2017). In most developing countries, however, women in the bottom 20% of households by wealth, and particularly women in rural areas, are far less likely to have access to contraceptives than wealthier women and urban residents (UNFPA 2017).

The Sustainable Development Goals (SDGs) have placed emphasis on reductions in inequality, and in disaggregating outcomes by several categories including income (United Nations 2017). These goals, along with those of Family Planning 2020 (FP2020), have spurred interest in measuring and monitoring inequality in family planning outcomes. However, to date, research on fertility preferences, family planning, and poverty has been broadly constrained by the fact that most nationally representative surveys that produce these indicators, including the Demographic and Health Surveys (DHS), measure poverty in relative terms. The DHS Wealth Index (Rutstein and Johnson 2004) is widely used to compare relative economic status, based on household assets, construction materials, and services. Its resulting scores and quintile rankings enable researchers to measure relative inequality in health outcomes at different points in time, but respondents cannot be compared in their economic status across countries or over time. The wealthiest 20% of the household population in a poor country may not be anywhere near what would be considered wealthy in their actual standard of living; conversely, in an affluent country the poorest may not be extremely poor by global living standards.

Absolute measures of poverty and their relationship with family planning outcomes are the focus of this study. First, are recent gains in demand satisfied similar among the extremely poor, the poor, and the non-poor? Second, given differential levels of effort and funding toward family planning programs and policies, how have changes in within-country inequality compared to changes in across-country inequality in demand satisfied? Finally, is country (policy, funding, cultural) context a greater or lesser determinant of demand satisfied for modern methods than absolute poverty level? The results are expected to help policymakers and donors choose where to invest limited time and money.

Data and Methods

Data

This study employs data from countries with nationally representative Demographic and Health Surveys (DHS) based on the following criteria: (1) The country was among the current list of FP2020 focus countries (FP2020 2018); (2) A standard DHS survey was conducted in 2012 or later that was available by May 1, 2018; (3) A DHS survey was available that was at least five years older than the more recent survey and was conducted after 1995; and (4) Both surveys included all variables necessary for the analysis of absolute poverty. If more than one older survey met the criteria for year and variables, we gave preference to the survey that was closest to a 10-year difference from the most recent survey. If two older surveys were equally close to 10 years, we gave preference to the earlier of the two.

Our analysis focuses solely on currently married women of reproductive age (15-49). Per standard DHS definitions, the term ‘currently married’ means that the woman is married or living with a man as if married. The 62 surveys we study are shown in Table 1 along with the corresponding weighted sample sizes of married women. Surveys included in the study were fielded as early as 1996 and as late as 2016; intra-country gaps ranged from 5 years (Sierra Leone) to 16 years (Comoros). On average there was a 10-year difference between survey rounds.

Outcome

The outcome we use in this study is a Sustainable Development Goal (SDG): demand satisfied by modern methods (DSMM). DSMM is defined as the number of women who are currently using, or whose sexual partner is currently using, at least one modern contraceptive method as a proportion of the number of women of reproductive age who use any method of family planning or who have an unmet need for family planning (FP2020 2017b; United Nations, Department of Economic and Social Affairs, and Population Division 2017b).

Absolute Poverty Measurement

Despite the enduring value of the DHS Wealth Index, its key limitation is that measurement is relative for any given country at a point in time, based on the specific assets, services, and construction materials asked about in that survey and their distribution within the population. The principal components analysis used in computations assigns scores to assets based in part on their prevalence; as asset ownership becomes more widespread and as construction materials and access to household services such as electricity and running water improve, the scores assigned to these assets and services by the principal components index shift. For example, having a cellphone in an early survey might be an important indicator of wealth, but in a later survey, if cellphones have become nearly ubiquitous, the wealth score gained by owning a cellphone might be near zero. Hence, a household with a stable bundle of assets, services, and construction materials might be scored as wealthy in one survey and poor in another. Thus, while the DHS Wealth Index is enormously useful within countries, it is constrained by its specificity to a given country and time period.

Inspired by Amartya Sen's seminal work on measuring poverty in terms of absolute, not relative deprivations (1976, 1982), we developed for this paper a 'direct method' of poverty measurement: we measure a household's achievement of basic needs to assess what standard of living a household actually affords. Our approach follows a line of earlier work on multidimensional poverty measurement using an index of unsatisfied basic needs (UBN). This framework, often referred to in the literature by its Spanish name *Indice de Necesidades Básicas Insatisfechas*, was formalized by the U.N. Economic Commission for Latin America (ECLAC) and the Census Institute in Argentina in the 1980s (Feres and Mancero 2001; Instituto Nacional de Estadística y Censos [INDEC] 1984). The UBN was designed to capture dimensions of poverty that could be determined from census data and that would be difficult to observe from income alone. It originally aimed to measure human deprivations, but over time other nonmonetary aspects of poverty—such as household crowding and children's non-enrollment in school, which were associated with poverty—were added to the measure. The index is now widely used across Latin America (Feres and Mancero 2001). Although there is no single definition of unsatisfied basic needs, the index typically involves setting a threshold cutpoint for several measures of deprivation or poverty—for example, overcrowding, inadequate sanitation, inadequate water, lack of schooling—and summing them to produce a poverty index (Hicks 1998).

Drawing in part from our own previous work on comparable poverty measures in Rutstein et al. (2016), we developed a measure of absolute poverty using DHS data for the purposes of this analysis. It relies on a definition of UBN and, to distinguish among the poorest households, also relies on an index of asset poverty similar to that used by the multidimensional poverty index (Alkire and Kanagaratnam 2018). Note that asset variables sometimes have a small number of missing cases. As is standard with the DHS Wealth Index, definitions are affirmative—for example in order to *not* be counted as lacking a radio or electricity, the respondent to the household survey must affirm that the household has a radio or electricity.

We define the four unsatisfied basic needs as follows:

- **Inadequate water or sanitation:** The household's time to reach their source of drinking water is 30 minutes or more or, as per the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation, and Hygiene (JMP) guidelines (WHO and UNICEF 2017), either the household does

not have improved sanitation,[1] or the household does not have access to improved drinking water.[2]

- **Inadequate floors:** The household has earth, dirt, mud, dung, or clay floors.
- **Insufficient schooling:** No working-age adult de jure member of the household (age 15-64) has at least five years of education, or there are no adult de jure members of the household.
- **No electricity:** The household does not have electricity.

Our measurement of absolute poverty is unique in that we consider deprivations differently from ownership of certain consumer durable goods (assets): while assets typically signal wealth, one can live a healthy and productive life even without specific consumer goods. However, in combination with deprivation, the absence of consumer goods may signal an even more extreme type of poverty. We therefore use asset poverty to differentiate among the extremely poor.

For the purposes of our study, household **asset poverty** is defined as: not having a car or truck; and not having more than one of the following small assets: bicycle, radio, telephone (landline or mobile),[3] television, refrigerator, or motorcycle/scooter. Note that asset poverty proved to be a useful means of differentiation among the extremely poor but not among the poor and non-poor: less than 6% of the poor and 1% of the non-poor were also asset poor.

Based on the above criteria, we classified households into one of four absolute poverty groups—non-poor, poor, extremely poor but not asset poor, and extremely poor and asset poor—using the definitions shown in Figure 1. Non-poor should not be interpreted synonymously with wealthy or well-off. As our paper is focused on gradations of poverty, we have grouped together households that do not have any of the four UBNs; hence, non-poor households likely span a wide range of actual incomes.

Computations

We used Stata 15 to compute absolute poverty and to tabulate the outcome indicators using standard DHS definitions and weights. Graphical displays were created in part by using equiplot commands in Stata.[4] Average relative decadal changes were calculated as:

$$I^r = \frac{10}{(Y_2 - Y_1)} \times \frac{(I_2 - I_1)}{I_1}$$

[1] Per JMP, improved sanitation means one of the following: networked flush and pour flush toilets connected to sewers, on-site flush and pour flush toilets or latrines connected to septic tanks or pits, on-site ventilated improved pit latrines, on-site pit latrines with slabs, or on-site composting toilets, including twin pit latrines and container-based systems. All households that did not affirmatively have one of these types of toilets were considered to have unimproved sanitation.

[2] Per JMP, improved drinking water means one of the following: piped supplies (tap water in the dwelling, yard, or plot; public standposts), boreholes/tubewells, protected wells and springs, rainwater, packaged water (including bottled water and sachet water), or delivered water (including tanker trucks and small carts). All households that did not affirmatively have one of these types of drinking water were considered to have unimproved drinking water.

[3] If the survey asked about both types of telephones, both were included.

[4] See http://www.equidade.org/equiplot.

where I^r is the relative decadal change of indicator I, Y is the calendar year of the survey, I is the specific indicator, the subscript $_1$ denotes the earlier survey of the pair, and the subscript $_2$ the latter survey. Surveys that overlapped two calendar years were assumed to have been fielded at the midpoint between the years.

Significance testing for decadal changes was conducted via regression analysis for pooled data from each country. Changes in DSMM were assessed using logit regression. All regression results were computed using complex sampling weights. Given the large number of surveys and indicators, coefficients have been suppressed for ease of interpretation; regression results are shown by direction (positive or negative) and statistical significance.

Initial Results

Figures 2 to 4 show the percentage of demand satisfied for modern contraceptive methods by absolute poverty level in the three regions. Across all surveys, DSMM ranged from 12% in DR Congo 2007 to 85% in Zimbabwe 2015. South Asia, Southeast Asia, and Other Areas had the highest level of DSMM in the first round of surveys, while Eastern and Southern Africa had the highest level in the most recent surveys. There are substantial inequalities in DSMM in many countries.

Figure 2 shows that in Central and Western Africa the trends and disparities in DSMM by absolute poverty level broadly resemble those in mCPR in the same region. Generally, levels of DSMM increased over the decade and disparities by poverty level declined; Chad and Guinea, however, experienced declines in DSMM, and relative disparities widened in Liberia and Niger.

Figure 3 shows demand satisfied for modern contraception among married women in Eastern and Southern Africa. Except for Burundi and Comoros, in every country of the region the demand for modern methods was satisfied among a majority of married women nationwide by the time of the most recent survey. Disparities between non-poor and extremely poor and asset poor groups narrowed in every country except Comoros, and even inverted in the second survey in Tanzania, whereby non-poor married women had a lower percentage of demand satisfied than all other groups.

Figure 4 shows the percentage of demand for modern methods satisfied in South Asia, Southeast Asia, and Other Areas by absolute poverty levels. With the exception of Haiti, Pakistan, and Timor-Leste, demand for modern contraception was satisfied for a majority of women in all countries of the region by the time of the second survey. Disparities between the poorest and the non-poor typically declined between survey rounds, and even inverted in Cambodia and Haiti; Indonesia, where DSMM fell among the poorest group, was an exception to this pattern.

Table 2 shows relative changes in DSMM over the decade by absolute poverty levels and country. Of the 31 countries studied, 27 experienced a statistically significant increase in DSMM over the decade, while Chad, Kyrgyz Republic, and Nepal experienced statistically significant declines. Egypt had no significant change in DSMM. India, which had a statistically significant decline in mCPR over the decade, experienced a small but statistically significant relative decadal increase in DSMM of 4%. Ethiopia and Liberia had decadal-standardized increases in DSMM that would have meant a doubling, and Rwanda and Sierra Leone had increases that would have meant a tripling nationwide over the course of a decade.

Improvements in DSMM were relatively and statistically significant most often among the poorest group. Of 29 countries with sufficient sample sizes of married women in extreme and asset poverty, 22 experienced an increase in the percentage of demand for modern methods satisfied with modern contraceptive use between the two surveys. Only in Chad did the percentage of demand satisfied decline among the poorest group. By comparison, non-poor married women had a statistically significant increase in the percentage of demand satisfied in only four countries, all in sub-Saharan Africa—Rwanda, Senegal, Zambia, and

Zimbabwe. Across all regions, average improvements in demand satisfied for modern methods were over four times as high in the poorest group as in any other absolute poverty group.

Preliminary Conclusions and Next Steps

On average across surveys, 45% of the demand for family planning was satisfied by the use of modern contraceptive methods; however, variation was substantial across countries and within poverty groups. As expected, the level of absolute poverty nearly always had an inverse relationship with demand satisfied by modern methods. Differentials in demand satisfied by modern methods between the poorest group of women and the non-poor ranged from 43 percentage points in Uganda 2006 to a reverse differential of 7 percentage points in Cambodia 2014, where a higher percentage of women in the extremely poor and asset poor group compared with the non-poor group had their demand for family planning satisfied with modern contraceptive use.

While South and Southeast Asia and the Other Areas group of countries had both the highest level of demand satisfied by modern methods in the first survey, by the time of the most recent survey the average country in Eastern and Southern Africa was slightly higher—despite substantial differences in absolute poverty between the regions. By the time of the second survey, Burundi and Comoros were the only countries in Eastern and Southern Africa in which the majority of married women did not have their demand for modern methods satisfied. In contrast, in Haiti, Pakistan, Timor-Leste, and none of the 10 study countries in Central and Western Africa was demand for modern methods over 50%.

In 27 of the 31 countries there were statistically significant increases in demand satisfied by modern methods. Increases were most often significant among the extremely poor and asset poor, both numerically and statistically. Even so, overall levels of demand satisfied continue to be unacceptably low in many countries and significant disparities by absolute poverty group remain. In Chad, Mali, Niger, Nigeria, Senegal, and Zambia in the most recent survey, a disparity of more than a 20 percentage points in the level of demand satisfied still exists between the non-poor group and the extremely poor and asset poor group. An additional 10 countries have a disparity of between 10 and 20 percentage points in demand satisfied by modern methods between the poorest and wealthiest groups.

Differentials in demand satisfied by modern methods across countries were substantial within every absolute poverty group—for example, demand satisfied by modern methods among the poorest group ranged from 9% in DR Congo 2007 to 82% in Zimbabwe 2015, suggesting the importance of national context. Indeed, absolute poverty level is a singular designation—women in a given poverty group are likely to have differences in education, residence, access to health care, levels of empowerment, and so forth. Although disparities tended to decline while levels of demand satisfied increased, more work remains to be done. The extreme diversity in outcomes even among women at the same absolute poverty level suggest the presence of substantial disparities in local policy environments and in access to family planning among the countries.

Given these intriguing results, in the full paper we plan to statistically test the hypothesis that within-country inequalities in demand satisfied have declined among relative and absolute poverty groups more quickly than across-country inequalities. We also intend to assess the importance of absolute poverty versus country (thus policy, funding, and cultural context) on demand satisfied using country fixed effects.

Figure 1 Definitions of absolute poverty groups used in the study

1. **Non-poor:** the household does not have any of the four unsatisfied basic needs (UBNs)
2. **Poor:** the household has one UBN
3. **Extremely poor but not asset poor:** the household has two or more UBNs but is not asset poor
4. **Extremely poor and asset poor:** the household has two or more UBNs and is also asset poor

Figure 2 **Demand satisfied for modern methods by absolute poverty level, Central and Western Africa**

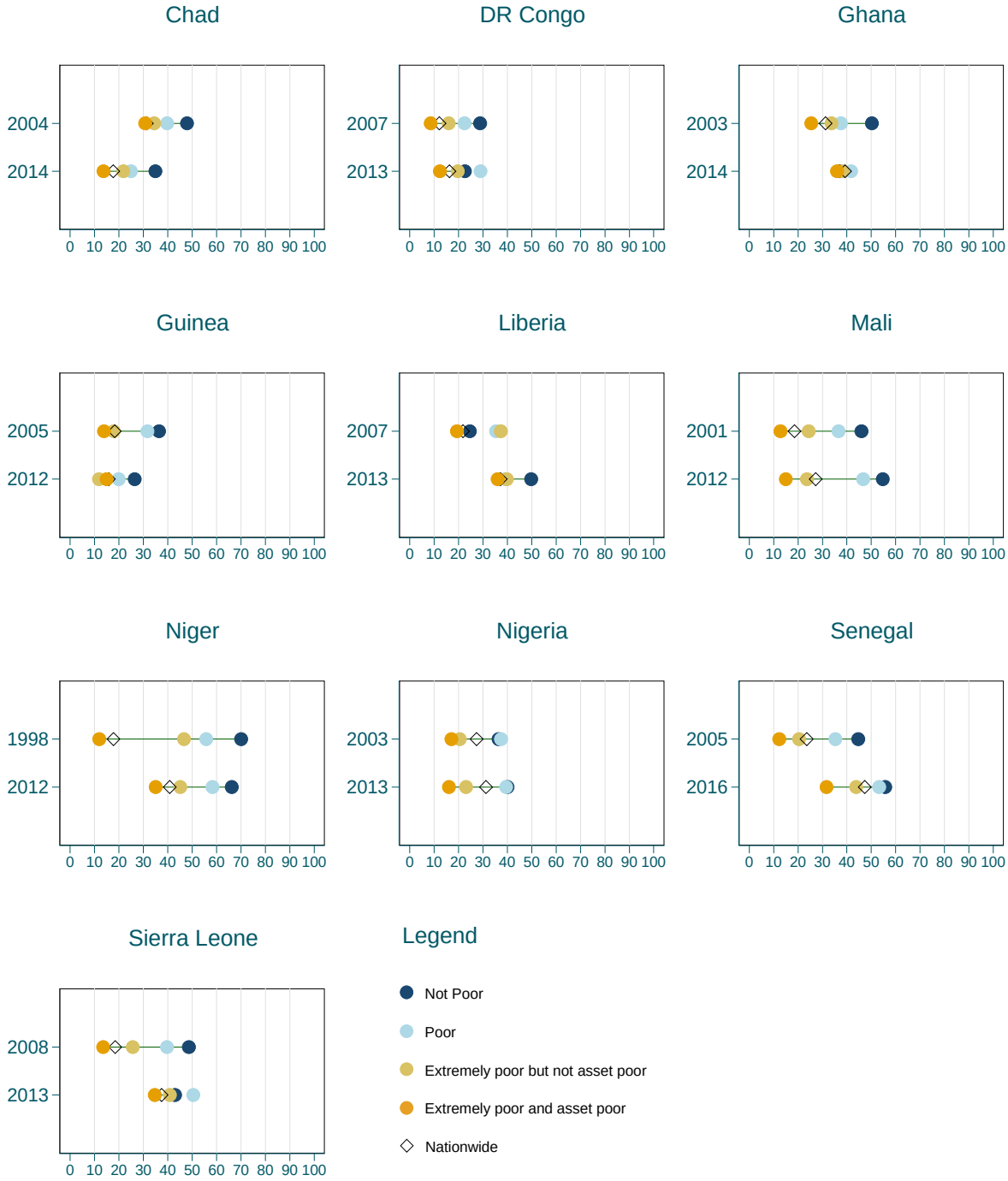

Figure 3 **Demand satisfied for modern methods by absolute poverty level, Eastern and Southern Africa**

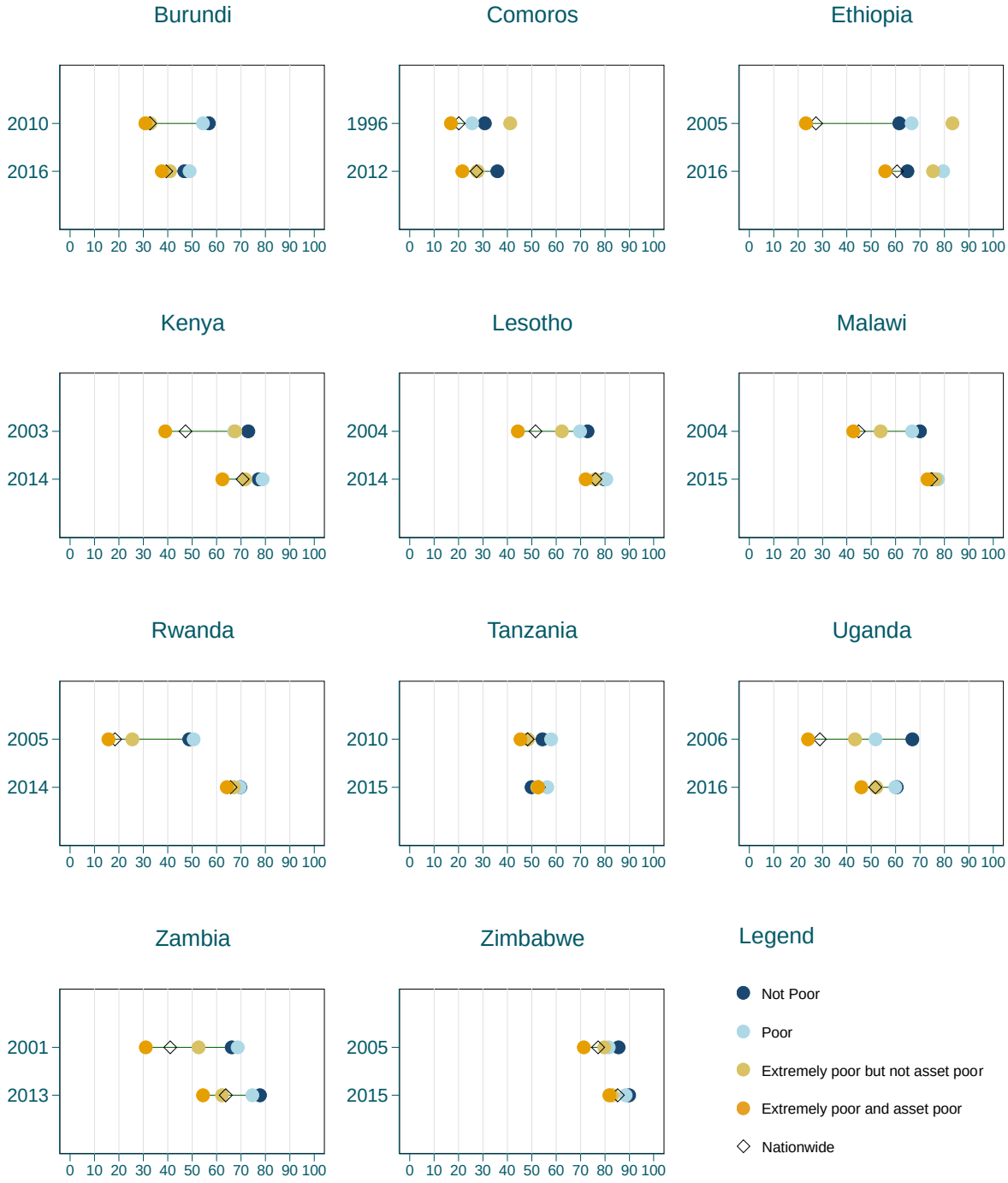

Figure 4 **Demand satisfied for modern methods by absolute poverty level, South Asia, Southeast Asia, and Other Areas**

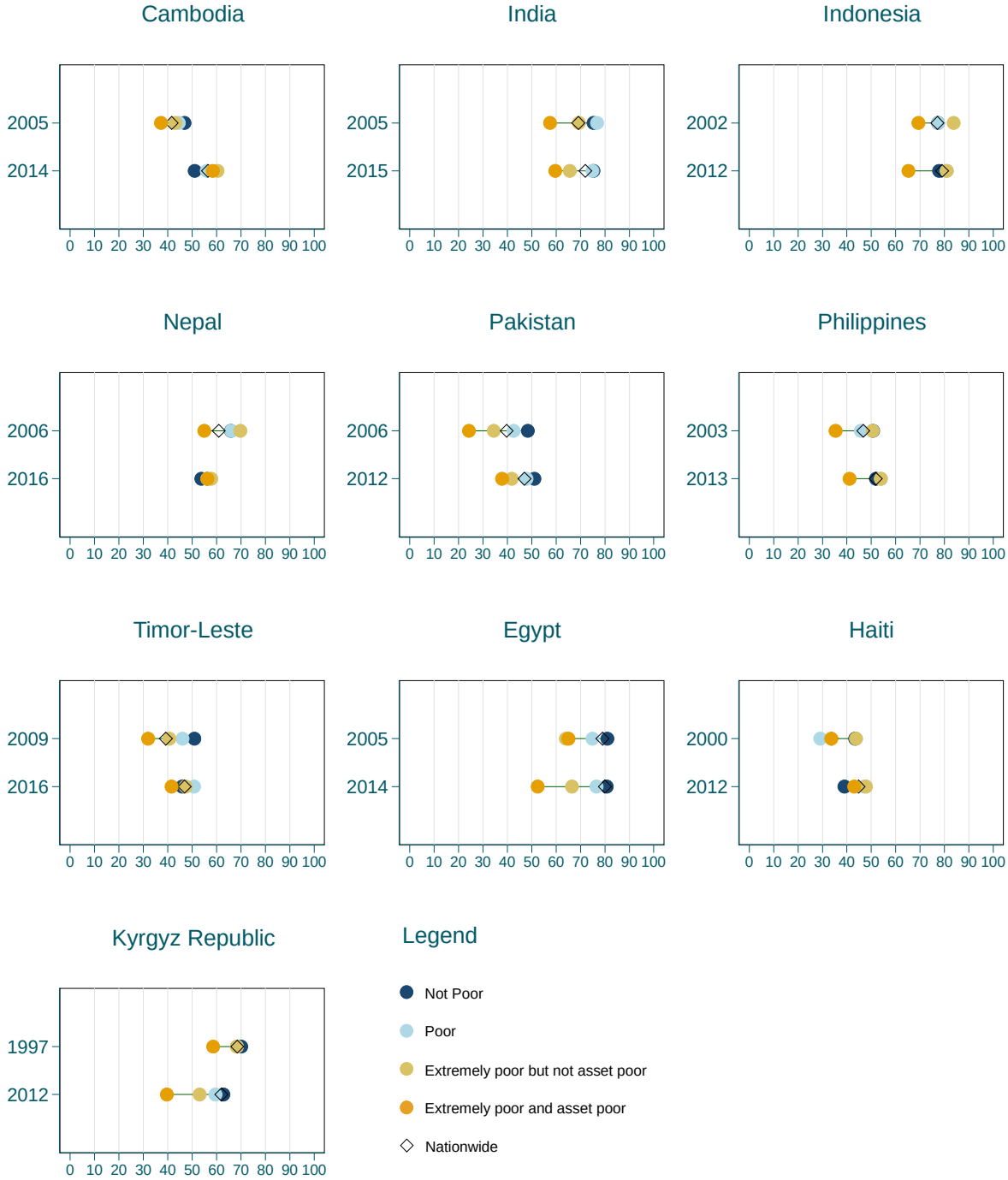

Table 1 Surveys included in the analysis

	Survey 1		Survey 2		Number of years between survey rounds[1]
	Year	Sample size	Year	Sample size	
Central and Western Africa					
Chad	2004	4,663	2014-15	13,263	10.5
DR Congo	2007	6,622	2013-14	12,096	6.5
Ghana	2003	3,549	2014	5,322	11.0
Guinea	2005	6,292	2012	6,726	7.0
Liberia	2007	4,540	2013	5,386	6.0
Mali	2001	10,723	2012-13	8,820	11.5
Niger	1998	6,382	2012	9,881	14.0
Nigeria	2003	5,336	2013	27,830	10.0
Senegal	2005	9,866	2016	5,883	11.0
Sierra Leone	2008	5,525	2013	10,903	5.0
Eastern and Southern Africa					
Burundi	2010	5,421	2016-17	9,782	6.5
Comoros	1996	1,634	2012	3,261	16.0
Ethiopia	2005	9,066	2016	10,223	11.0
Kenya	2003	4,919	2014	8,710	11.0
Lesotho	2004	3,709	2014	3,612	10.0
Malawi	2004	8,312	2015-16	16,130	11.5
Rwanda	2005	5,510	2014-15	6,982	9.5
Tanzania	2010	6,412	2015-16	8,210	5.5
Uganda	2006	5,337	2016	11,223	10.0
Zambia	2001-02	4,694	2013-14	9,859	12.0
Zimbabwe	2005-06	5,143	2015	6,151	9.5
South and Southeast Asia					
Cambodia	2005	10,087	2014	11,899	9.0
India	2005-06	93,089	2015-16	511,373	10.0
Indonesia	2002-03	27,857	2012	33,465	9.5
Nepal	2006	8,257	2016	9,875	10.0
Pakistan	2006-07	9,556	2012-13	12,937	6.0
Philippines	2003	8,671	2013	9,729	10.0
Timor-Leste	2009-10	7,906	2016	7,697	6.5
Other Areas					
Egypt	2005	18,187	2014	20,460	9.0
Haiti	2000	5,958	2012	7,808	12.0
Kyrgyz Republic	1997	2,675	2012	5,256	15.0

[1] If survey fieldwork spans two years, it is assumed to have been fielded at the midpoint between those years, e.g., 2014.5 for a 2014-15 survey.

Table 2 Average relative decadal changes in demand satisfied for modern methods, by absolute poverty level and country

	Average relative decadal change (%)						Statistical significance of change				
	Non-Poor	Poor	Extremely Poor but not Asset Poor	Extremely Poor and Asset Poor	Total	Years of difference between surveys	Non-Poor	Poor	Extremely Poor but not Asset Poor	Extremely Poor and Asset Poor	Total
Central and Western Africa											
Chad	-26	-36	-35	-53	-42	10.5			--	--	--
DR Congo	-33	45	36	67	52	6.5				+	++
Ghana	-24	10	12	38	23	11.0	--			++	++
Guinea	-39	-53	-48	11	-19	7.0		--			
Liberia	170	18	11	143	118	6.0				++	++
Mali	17	24	-3	15	41	11.5		+			++
Niger	(-4)	3	-2	138	93	14.0				++	++
Nigeria	10	6	12	-6	14	10.0					+
Senegal	22	46	104	143	92	11.0	+	++	++	++	++
Sierra Leone	-23	54	118	313	207	5.0		+	++	++	++
Eastern and Southern Africa											
Burundi	-27	-15	38	34	32	6.5			+	++	++
Comoros	10	6	(-20)	17	23	16.0					++
Ethiopia	5	18	-9	127	110	11.0		++		++	++
Kenya	5	16	6	55	45	11.0		++		++	++
Lesotho	9	15	22	63	48	10.0		++	++	++	++
Malawi	6	14	36	62	58	11.5		++	++	++	++
Rwanda	45	39	*	325	271	9.5	++	++	*	++	++
Tanzania	-15	-5	14	29	17	5.5				++	++
Uganda	-10	15	20	91	78	10.0			+	++	++
Zambia	15	7	15	63	46	12.0	++			++	++
Zimbabwe	5	9	4	15	11	9.5	+	++		++	++
South and Southeast Asia											
Cambodia	10	28	45	63	40	9.0		++	++	++	++
India	0	-3	-5	4	4	10.0		--	--	++	++
Indonesia	1	5	-4	-6	3	9.5		++			+
Nepal	-18	-15	-17	2	-8	10.0	--	--	--		-
Pakistan	9	21	36	93	31	6.0		+	++	++	++
Philippines	2	18	7	16	11	10.0		++		+	++
Timor-Leste	-15	16	25	46	30	6.5				++	++
Other Areas											
Egypt	0	2	4	*	1	9.0				*	
Haiti	-8	52	8	23	27	12.0		++		++	++
Kyrgyz Republic	-7	-9	-15	*	-6	15.0	-	--		*	--

Notes:

++ indicates there was a statistically significant increase at p<.01 from earlier to later survey.

+ indicates there was a statistically significant increase at p<.05 from earlier to later survey.

-- indicates there was a statistically significant decrease at p<.01 from earlier to later survey.

- indicates there was a statistically significant decrease at p<.05 from earlier to later survey.

Figures in parentheses are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.

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