BMJ Global Health

Using the Demographic Health Survey wealth index to create family planning market segments based on absolute income levels

Nicole Bellows , Michelle Weinberger, Meghan Reidy

To cite: Bellows N, Weinberger M, Reidy M. Using the Demographic Health Survey wealth index to create family planning market segments based on absolute income levels. *BMJ Global Health* 2020;**5**:e002450. doi:10.1136/bmjgh-2020-002450

Handling editor Sanni Yaya

► Additional material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjgh-2020-002450).

Received 3 March 2020
Revised 5 August 2020
Accepted 9 August 2020

Avenir Health, Glastonbury, Connecticut, USA

Correspondence to
Dr Nicole Bellows;
nbellows@avenirhealth.org

ABSTRACT

Family planning market segmentation approaches typically include analysis by wealth, particularly when considering whether individuals can afford out-of-pocket expenses in the private sector. Most commonly, this is done using the Demographic and Health Survey (DHS) wealth index, which uses a *relative* approach by summing household asset questions and categorising respondents into five groups from poorest to wealthiest within a country. In addition, the use of *absolute* measures, such as segmenting populations based on whether one lives below or above the International Poverty line, defined by the World Bank as US$1.90 per person per day, may provide further useful insights when designing strategies to ensure access to family planning. While such measures are not readily available in the DHS, a simple approach can be used to combine the wealth index and World Bank poverty lines to generate an absolute measure for an additional perspective when conducting family planning market segmentation. Family planning market size estimates were made for 24 low-income countries using wealth quintiles and World Bank poverty lines. The results show large variations in market size based on what measure is used, particularly for countries with a high density of poverty. Looking at both types of measures and understanding the reasons for the differences in market size estimates between the approaches can help lend a more nuanced understanding of the distribution of wealth and income in a country, leading to improved family planning market segmentation and ultimately to ensure more women have access to a method of their choice.

Summary box

- Measures of socioeconomic position are important to consider in global health, including understanding a person's ability to pay for family planning goods and services or ensuring that the most vulnerable have access to free or subsidised services.
- Family planning market segmentation commonly uses wealth quintiles readily available in Demographic and Health Surveys (DHS), which provide a *relative* measure that divides populations within a country into five even groups ranging from the poorest 20% to the wealthiest 20%.
- Market segmentation can benefit from using *absolute* measures of socioeconomic position like the World Bank International Poverty Lines, such as when estimating market size based on an individual's ability to pay for family planning goods and services out of pocket.
- Using the described methodology and provided code, researchers can generate absolute measures from the DHS surveys based on the World Bank International Poverty Lines.
- Understanding the intersection of the relative and absolute measures of socioeconomic position yields a more informed understanding of the economic distribution in the population, which can better guide family planning programs.

INTRODUCTION

The relationship between one's socioeconomic position and their access to health goods and services is a critical component in women's health, where wealthier women have greater utilisation of modern contraception, antenatal care and facility-based deliveries.[1] Family planning (FP) programmes often seek to ensure that all women, regardless of their socioeconomic position, have access to a full range of contraceptive methods and FP market segmentation is an important part of planning such programmes.[2] In some cases, programmes seek to segment FP markets so that those with fewest resources have access to free goods and services, primarily through the public sector, whereas wealthier individuals have greater access to the private sector due to their ability to pay for FP out of pocket.[3 4] These types of market segmentations are typically done using wealth quintiles, which is a relative measure that segments the population into five equally sized groups (ranked from poorest to richest).[5] The Demographic Health Survey (DHS) wealth quintiles are widely used across several health areas for examining health outcomes by wealth status

in low- and middle- income countries to understand patterns of service utilisation and inequalities and disparities.[4 6–9]

While wealth quintiles are the primary approach used for examining disparities in access to health services, segmenting by absolute socioeconomic measures may also provide a useful lens for market segmentation. Absolute measures, like the World Bank's International Poverty lines, estimate the share of the population living below a set income threshold. A simple methodology can use DHS data to generate segments based on the World Bank Poverty Lines. We compare FP market size estimates using relative and absolute socioeconomic measures based on the DHS and discuss how both can provide important insights in market segmentation analyses.

TWO COMMON MEASURES OF SOCIOECONOMIC POSITION

There are two common approaches to analysing socioeconomic position. The first approach looks at the *relative* wealth within a country or population. The DHS wealth index uses this approach, where questions about household construction materials, water and sanitation access, and ownership of various assets (eg, television) are determined at the household level and then individuals are ranked based on the score of the households they live in. Next, the rank positions are used to categorise individuals into five groups from poorest to wealthiest within a country. While useful to understand relative wealth within a country; someone deemed 'richer' according to the wealth quintiles might still have few resources for out-of-pocket expenditures. Further, this measure can be difficult to compare across countries since the richest households in one country might have fewer resources than the richest households in another country.[10] Additionally, wealth quintiles do not allow one to examine changes in overall wealth over time. To address these challenges, alternatives such as the Comparative Wealth Index, Harmonized Wealth Index and International Wealth Index have been proposed.[10–12]

In contrast, absolute measures of socioeconomic position are typically based on the flow of resources via income and expenditures. The World Bank generates poverty headcount estimates for most countries based on a complex methodology using multiple sources and assumptions, including country-specific survey data on income and consumption and information on prices, exchange rates and purchasing power parity.[13] These estimates classify the proportion of a country's population living under the International Poverty Line, as defined as US$1.90 per person per day, in 2015 based on 2011 purchasing power parity. Additional measures of poverty at higher thresholds, US$3.20 (lower middle income poverty line) and US$5.50 (upper middle income poverty line), are also calculated.

It is important to recognise that *wealth* and *income* are not the same thing; rather they provide different means of quantifying socioeconomic position.[14] Many alternative measures exist, including the Unsatisfied Basic Needs measure, which focuses on non-income aspects of poverty and the Multidimensional Poverty Index that includes health, education and living standards and considers incidence and intensity of deprivation.[15–17] While these and other measures play an important role in understanding deprivation and inequality, our focus is on the DHS wealth index and World Bank poverty thresholds, since they are widely used and can be easily interpreted for integration into DHS market segmentations.

APPLYING ABSOLUTE DOLLAR THRESHOLDS TO DHS RELATIVE WEALTH DATA

Since income variables are not included in the DHS, one can use the relative wealth index and apply an absolute threshold to the World Bank poverty thresholds. This is done by ranking individuals according to the wealth index and then using the absolute dollar thresholds to generate new variables that incorporate absolute measures. For example, if 50% of the population in a country live below the US$1.90 per day threshold, then the bottom 50% of

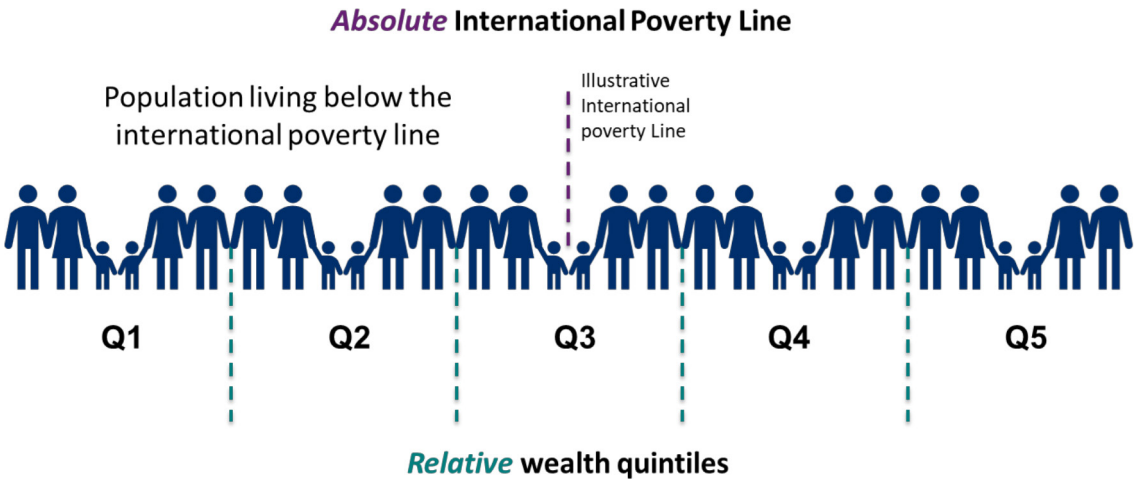

Figure 1 Comparing the international poverty line and wealth quintiles.

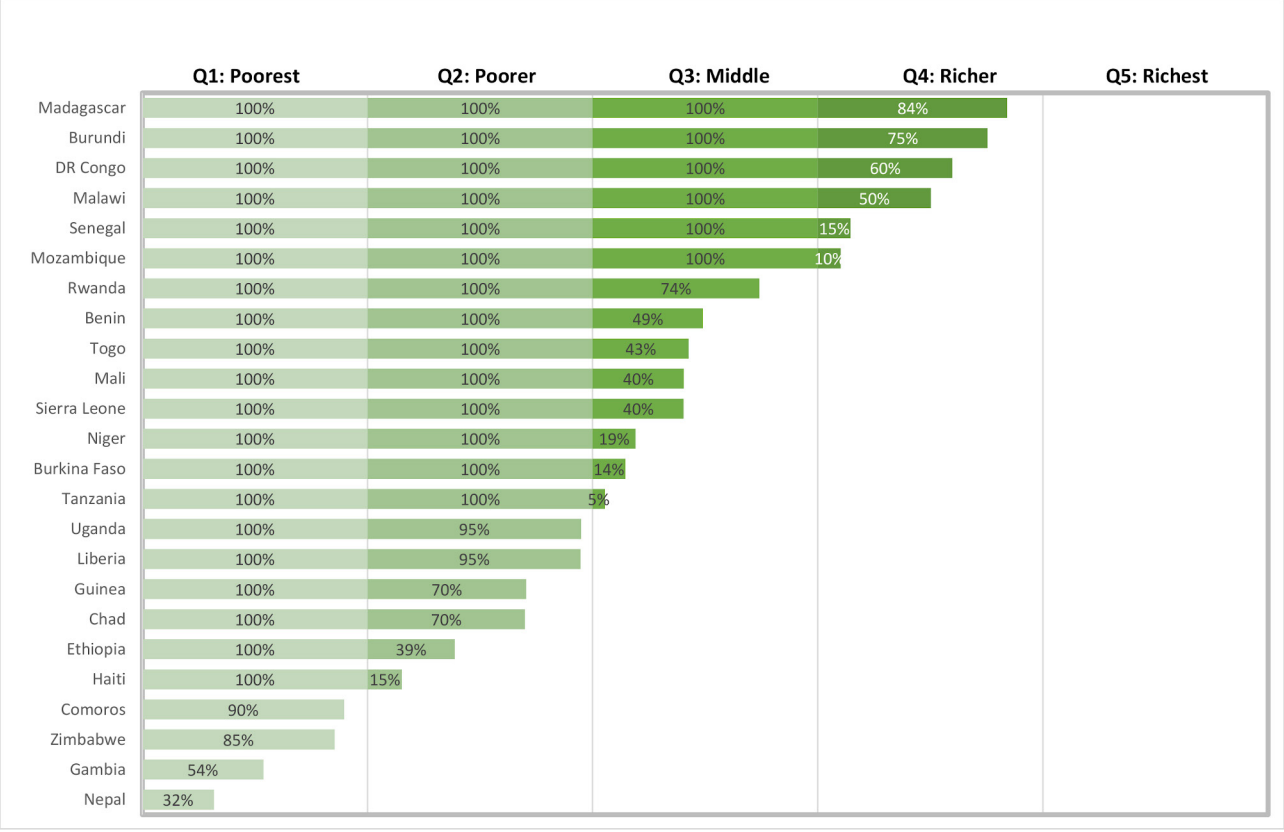

Figure 2 Per cent of women of reproductive age in each wealth quintile living below the US$1.90 per day poverty line among 24 low-income countries.

individuals as measured by the wealth index are considered to live in extreme poverty (figure 1), as defined by the World Bank.[18] This approach assumes that if you lined up everyone in a country from poorest to richest based on the wealth index, people would stay in a similar order if instead you lined them up based on their household income. While the order will not be identical, researchers have found this assumption sufficient for developing an absolute measure based on wealth variables.[19–21]

To compare relative and absolute measures, we examined DHS data from 24 countries that met three criteria: (1) they were designated by the World Bank as low-income countries in 2017, (2) World Bank poverty headcount percentages were available and (3) a DHS survey was available between 2010 and 2019. We generated an income-based variable that used the DHS wealth index rank and applied World Bank poverty thresholds for those living below US$1.90 per day and those living above the upper middle income poverty line of US$5.50 per day.[22]

Figure 2 shows the proportion of women of reproductive age (WRA) in each wealth quintile that is estimated to be living in absolute poverty. This figure shows substantial variation by country, from Madagascar where 100% of the bottom three quintiles ('poorest', 'poorer' and 'middle') and 84% of the fourth 'richer' quintile are living in absolute poverty, to Nepal, where less than a third (32%) of those in the poorest quintile are living in absolute poverty. This variation is important when considering how policy-makers segment the population by these metrics and what they mean for understanding FP markets, as demonstrated in the two scenarios described below. For simplicity, these scenarios only look at these two measures of relative wealth and absolute poverty and potential FP users based on current FP use and future FP intentions. When conducting a full market segmentation analysis, it is important to also include a wide range of other variables related to demographics, prior contraceptive use, knowledge and attitudes around FP, and other market factors.[23]

SCENARIO 1: ESTIMATING THE MARKET SIZE FOR FP VOUCHERS AIMED AT POOR WOMEN

Consider a scenario where an organisation wants to increase access to FP for the poor in a low-income country by providing vouchers that can be exchanged for free FP services at designated clinics. Using the DHS wealth index, one might aim to serve the two bottom quintiles (poorest and poor), consisting of approximately 40% of WRA. Alternatively, one may consider the number of WRA who are living below the International Poverty Line.

For each of the 24 countries, the potential market size for FP services was estimated as WRA who were already using some form of FP or indicated an intent to use FP in the future in the most recent DHS survey. These

Table 1 Market size estimate for family planning voucher aimed at poor women or reproductive age in 24 low-income countries

Country	Estimate of market size for vouchers for poor WRA*			
	Absolute: WB poverty line (<US$1.90/day)	Relative: 2 bottom quintiles (poorest, poorer)	Absolute—relative	
DR Congo	6391000	3321000	3070000	Larger estimate using poverty line
Madagascar	2699000	1213000	1486000	
Malawi	2386000	1377000	1009000	
Burundi	1353000	704000	649000	
Mozambique	1615000	1003000	612000	
Rwanda	1319000	940000	379000	
Mali	754000	577000	177000	
Benin	542000	399000	143000	
Tanzania	2956000	2848000	108000	
Burkina Faso	1031000	925000	106000	
Niger	764000	675000	89000	
Togo	392000	319000	73000	
Sierra Leone	416000	347000	69000	
Liberia	216000	219000	3000	Larger estimate using quintiles
Uganda	2287000	2292000	5000	
Comoros	7000	17000	10000	
Gambia	9000	39000	30000	
Guinea	217000	255000	38000	
Chad	254000	294000	40000	
Senegal	448000	521000	73000	
Haiti	351000	605000	254000	
Zimbabwe	500000	1208000	708000	
Ethiopia	3368000	5081000	1713000	
Nepal	382000	2438000	2056000	
Total	30657000	27617000	3040000	

*Includes women of reproductive age (WRA; 15–49) who report current use of family planning (modern or traditional) or intent to use family planning in the future.
†
WB, World Bank.

proportions were applied to the 2017 estimate of WRA based on the World Population Prospects published by the United Nations Population Division. Next, two estimates of the potential market for FP vouchers were made by applying two different definitions of 'the poor': (1) proportion living under US$1.90 per day (absolute poverty) and (2) proportion in the bottom two wealth quintiles (eg, relative poverty).

Table 1 shows that across the 24 countries, the totals are not dramatically different at 31 million women using the absolute poverty line and 28 million women using the poorest and poor quintiles. When looking at individual countries, however, the resulting market size can vary widely depending on which measure is used. For example, in the Democratic Republic of the Congo, using absolute poverty results in 6.4 million women while using relative poverty results in 3.3 million women. The difference between these two estimates can be explained by looking at figure 2, where those living in absolute poverty are not just those in the 'poorest' and 'poorer' quintiles, but include all women in the 'middle' quintile and 60% of those in the 'richer' quintile.

Interventions in low-income countries often express the challenges of reaching the poorest of the poor.[24 25] While efforts should certainly be made to reach those most in need, for countries with a high proportion of the population living in absolute poverty, targeting voucher services only to the bottom quintiles may inadvertently leave out women who could benefit greatly from receiving free or subsidised services. In contrast, in places like the Gambia, where only 54% of those in the poorest quintile are living in absolute poverty, targeting a voucher programme to focus only on those living in absolute poverty may limit the reach of such programme. In this context, and others

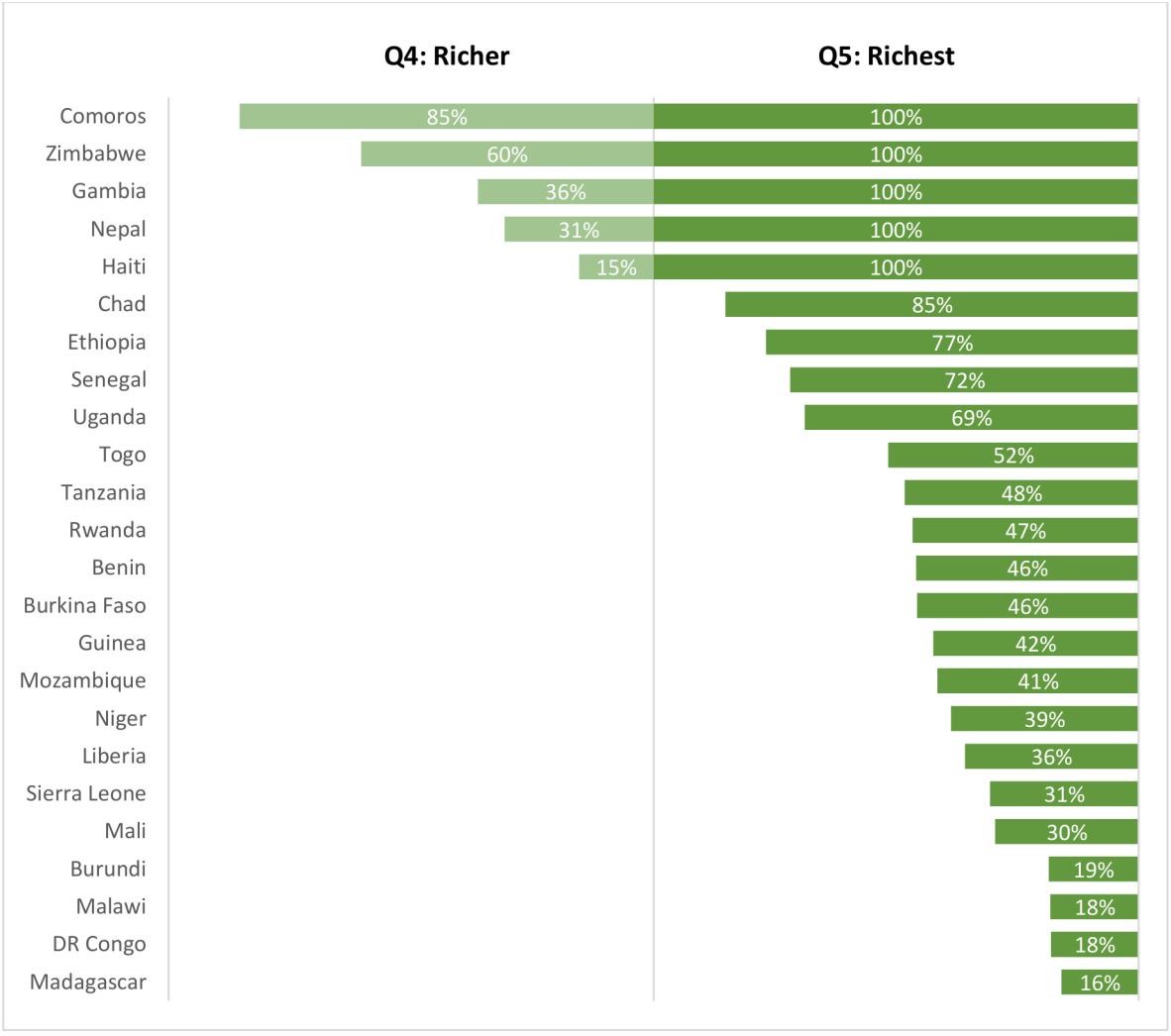

Figure 3 Per cent of women of reproductive age in the fourth and fifth quintile living above the US$5.50 per day poverty line in 24 low-income countries.

with a lower density of poverty, a quintile approach may be more useful for estimating market size.

SCENARIO 2: ESTIMATING MARKET SIZE FOR FP COMMODITIES AIMED AT WEALTHIER WOMEN

Now, consider a scenario where an organisation that wants to estimate the market size for a new brand of oral contraception that would be available in pharmacies and drug shops over the counter but would require the client pay out of pocket for the product. In this scenario, one would want to estimate the number of potential users with the ability to pay. Focusing again on women who are currently using or intend to use FP, one can estimate the richest 20% of WRA as those with the means to pay for this product. Alternatively, one could examine the proportion of the population living above the upper-middle income poverty line of US$5.50 per person per day. While US$5.50 a day translates to approximately US$8000 per year for a family of 4 and certainly does not designate one as wealthy, it can serve as a measure of one being comfortably above the poverty line in a low-income country.

Figure 3 details the overlay of the relative and absolute variable for the 24 low-income countries. For five countries (Comoros, Zimbabwe, Gambia, Nepal and Haiti), all the women in the 'richest' quintile and many in the 'richer' quintile are living on more than US$5.50 per day. The remaining 19 countries show less than 100% of women in the 'richest' quintile living above US$5.50 per day. Table 2 shows substantial differences in the estimated market size based on whether the absolute or relative measures is used, with the use of the US$5.50 threshold resulting in a much smaller market size estimate on average. Malawi and Madagascar show particularly stark differences with the top quintile yielding 5.5 and 6.6 times that of the absolute US$5.50 threshold, respectively. This is because, as shown in in figure 3, in both countries only a small share of women in the richest quintile live on more than US$5.50 per day.

For a programme seeking to size the market potential for a contraceptive pill that must be purchased at either a

Table 2 Market size estimate for social marketed family planning commodity aimed at wealthier women of reproductive age (WRA) in 24 low-income countries

Country	Estimate of market size for social marketing product for wealthier WRA			
	Absolute: WB middle-income poverty line (>US$5.50/day)	Relative: top quintile (richest)	Absolute—relative	
Zimbabwe	1 449 000	935 000	514 000	Larger estimate using > US$5.50
Nepal	1 988 000	1 517 000	471 000	
Haiti	497 000	432 000	65 000	
Gambia	58 000	46 000	12 000	
Comoros	24 000	13 000	11 000	
Chad	230 000	250 000	20 000	Larger estimate using top quintile
Liberia	54 000	165 000	111 000	
Togo	136 000	261 000	125 000	
Senegal	409 000	548 000	139 000	
Guinea	128 000	289 000	161 000	
Benin	140 000	302 000	162 000	
Sierra Leone	84 000	282 000	198 000	
Rwanda	277 000	593 000	316 000	
Burundi	81 000	407 000	326 000	
Niger	230 000	568 000	338 000	
Mali	191 000	600 000	409 000	
Burkina Faso	404 000	847 000	443 000	
Uganda	1 238 000	1 805 000	567 000	
Mozambique	443 000	1 017 000	574 000	
Malawi	152 000	843 000	691 000	
Madagascar	170 000	1 121 000	951 000	
Ethiopia	3 822 000	4 936 000	1 114 000	
Tanzania	1 271 000	2 637 000	1 366 000	
DR Congo	689 000	3 437 000	2 748 000	
Total	14 165 000	23 851 000	9 686 000	

WB, World Bank.

commercial or subsidised price, focusing on those living on more than US$5.50 per day will likely provide a more useful estimate in most contexts than looking that looking membership in the top quintile. However, further considerations likely factor in the ability or willingness to pay for a contraceptive pill and programmers should also incorporate data from market research studies to address consumer preferences and willingness to pay.

WHEN TO USE A RELATIVE VERSUS ABSOLUTE APPROACH?

We recommend that programme planners explore both approaches within their market segmentation work and determine which approach makes the most sense for the given context and question. While there is not a simple answer to which approach is better, several factors are relevant to help determine which approach to use for making FP market size estimates.

The *distribution of income* within a country or countries is the first important consideration. In countries like Nepal and the Gambia, with few women living under the poverty line and many living above US$5.50 per day, a quintile approach makes sense when trying to reach the poorest or wealthiest in the country. In contrast, using quintiles may be insufficient in countries with high levels of poverty, such as in Madagascar, Burundi, Democratic Republic of the Congo and Malawi. In these contexts, segmenting by quintiles can create misleading distinctions when the both the 'poorest' and many 'richer' women are living in extreme poverty.

Another consideration is to what extent *precision* is needed for market size estimation. While the World Bank poverty thresholds are useful in applying an absolute lens on wealth index data, there are several assumptions involved in the calculations and the estimates do not account for substantial regional variations within a country.[13] Further, the approach described in this paper allows for estimating an individual's position as above or below a poverty line but not estimating the actual income

of an individual or household. If one is in need of precise estimates, particularly when focused on a subnational region, a better approach would be to collect income and consumption data in conjunction with health data directly rather than applying the World Bank poverty thresholds to the DHS wealth index.

Finally, one should consider the overall *affordability* of FP goods and services when generating market size estimates. As demonstrated in the tables and figures, when thinking about a woman's ability to pay for FP out of pocket, her relative position in the 'richest' quintile may not be sufficient for inclusion in the market estimation. In this case, the absolute threshold of US$5.50 may be more appropriate measure for estimating those with the financial resources to pay for FP. However, as noted earlier, the US$5.50 a day threshold does not indicate that a woman is 'wealthy', and affordability could still be an issue for women living above this threshold. An examination of client preferences and willingness-to-pay measures should also be included.

A FEW WORDS OF CAUTION

As noted earlier, a key limitation of this approach is that it assumes some similarity in the distribution of households based on wealth as in the distribution of households based on income. Researchers have noted differences between these two constructs when looking at data over time and across countries. One study in China found that asset-based wealth inequality was decreasing over time while income inequality was increasing.[26] Another study found the strength of the relationship between asset-based wealth and income differs by country.[27] These findings raise important questions on how both asset-based and income-based metrics can be advanced. Important research has already been conducted in this space and we look forward to there being continued improvements in our understanding of these dynamics.

Despite these questions, other research has shown that wealth indices can be used to meaningfully provide estimates of absolute income measures.[19–21] For example, a study covering 66 countries combined DHS wealth indices with estimates of the wealth distribution in countries to estimate absolute wealth at the household level and a validation exercise found a strong correlation between World Bank Poverty Headcounts and their derived absolute measure.[20]

Acknowledging that the alignment between income and wealth is imperfect, it is important to distinguish between using the combined measure for aggregate versus individual-level analysis. At the individual level, there is a risk of individuals being misplaced around the cut-offs between thresholds and being assigned to the wrong group. For this reason, we do not advocate using the combined measure to estimate the income of individuals or to be used as an explanatory variable in regression analysis. At the aggregate, however, individual misplacement is not expected to have a substantial impact on the segmentation results. We conducted a sensitivity analysis to see the impact of assuming some displacement of women between living on less than US$1.90 per day and living on US$1.90–3.20 a day, which resulted in minimal impact on the estimated market size for vouchers for poor WRA.

In summary, given how widely DHS wealth quintiles are used to explore health inequalities and develop strategies for segmenting markets, we believe that adding this simple approach of also segmenting by absolute income level provides useful new insights from existing measures and data sources.

CONCLUSIONS

Understanding the FP market involves consideration of many important factors, such as method mix and supply, consumer preferences and market sectors. The socioeconomic position of FP clients is relevant in appropriately segmenting the market by ability to pay for FP or for targeting subsidised or free services. While disaggregation by absolute income thresholds is not published as standard results in DHS surveys, the online Family Planning Market Analyzer (http://fpmarketanalyzer.org/) includes data on FP use by absolute income segmentation data based on the most recent DHS in 58 countries, and STATA code provided in online supplemental annex A allows researchers to replicate these results for additional DHS surveys.

There are advantages to both the relative and absolute approaches to looking at socioeconomic position. Looking at both types of measures and understanding the reasons for the differences in market size estimates between the approaches can help lend a more nuanced understanding of the distribution of wealth and income in a country, leading to improved FP market segmentation.

Acknowledgements The authors would like to thank Sarah Bradley at Abt Associates for reading and providing comments on a previous version of this manuscript.

Contributors NB drafted the manuscript and created the tables and figures. Both MW and MR contributed data analysis and a detailed review and edits on the manuscript draft.

Funding This study was funded by United States Agency for International Development (AID-OAA-A-15-00067).

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository.

ORCID iD

Nicole Bellows http://orcid.org/0000-0001-7282-3178

REFERENCES

1 Ahmed S, Creanga AA, Gillespie DG, *et al*. Economic status, education and empowerment: implications for maternal health service utilization in developing countries. *PLoS One* 2010;5:e11190.
2 Berg R. Initiating public/private partnerships to finance reproductive health: the role of market segmentation analysis, 2000. Available: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.498.4310&rep=rep1&type=pdf [Accessed Jan 2020].
3 Mihayo P, Kigula R, Rahaim M. Know your market to grow your market: attaining sustainable financing for family planning sub-Saharan Africa, 2018. Available: http://www.healthpolicyplus.com/ns/pubs/7191-7347_TMA.pdf [Accessed Jan 2020].
4 Chakraborty NM, Sprockett A. Use of family planning and child health services in the private sector: an equity analysis of 12 DHS surveys. *Int J Equity Health* 2018;17:50.
5 Rutstein SO, Johnson K. *The DHS wealth index. DHS comparative reports No. 6*. Calverton, Maryland, USA: ORC Macro, 2004. http://dhsprogram.com/pubs/pdf/CR6/CR6.pdf
6 Siri JG. Independent associations of maternal education and household wealth with malaria risk in children. *Ecol Society* 2014;19:33.
7 Magadi M, Desta M. A multilevel analysis of the determinants and cross-national variations of HIV seropositivity in sub-Saharan Africa: evidence from the DHS. *Health Place* 2011;17:1067–83.
8 Mishra V, Bignami S, Greener R, *et al*. *A study of the association of HIV infection with wealth in sub-Saharan Africa. DHS working papers No. 31*. Calverton, Maryland, USA: Macro International, 2007. http://dhsprogram.com/pubs/pdf/WP31/WP31.pdf
9 Assaf S, Pullum T. *Levels and trends in maternal and child health disparities by wealth and region in eleven countries with DHS surveys. DHS comparative report No. 42*. Rockville, Maryland, USA: ICF International, 2016. http://dhsprogram.com/pubs/pdf/CR42/CR42.pdf
10 Rutstein SO, Staveteig S. *Making the demographic and health surveys wealth index comparable. DHS methodological reports No. 9*. Rockville, Maryland, USA: ICF International, 2013. https://iussp.org/sites/default/files/event_call_for_papers/ComparativeWealth-DRAFT-IUSSP.pdf
11 Staveteig S, Gebreselassie T, Kampa KT. Absolute poverty, fertility preferences, and family planning use in FP2020 focus countries. DHS comparative reports No. 48, 2018. Available: https://dhsprogram.com/pubs/pdf/CR48/CR48.pdf [Accessed Jan 2020].
12 Smits J, Steendijk R. The International wealth index (IWI). *Soc Indic Res* 2015;122:65–85.
13 Ferreira FHG, Chen S, Dabalen A, *et al*. A global count of the extreme poor in 2012: data issues, methodology and initial results. *J Econ Inequal* 2016;14:141–72.
14 Galobardes B, Lynch J, Smith GD. Measuring socioeconomic position in health research. *Br Med Bull* 2007;81-82:21–37.
15 Feres JC, Mancero X. *El Método de las necesidades básicas insatisfechas (NBI) y sus aplicaciones en América Latina. CEPAL-Serie Estudios Estadísticos y Prospectivos*. Santiago, Chile, 2001.
16 Staveteig S, Mallick L. *Intertemporal comparisons of wealth with DHS data: a harmonized asset index approach. DHS methodological reports No. 15*. Rockville, Maryland, USA: ICF International, 2014.
17 Alkire S, Kanagaratnam U, Suppa N. *The Global Multidimensional Poverty Index (MPI): 2018 revision', OPHI MPI Methodological Notes 46, Oxford Poverty and Human Development Initiative*. University of Oxford, 2018. https://ophi.org.uk/wp-content/uploads/OPHI_MPI_Meth_Note_46_vs3.pdf
18 World Bank. Ending extreme poverty, 2016. Available: https://www.worldbank.org/en/news/feature/2016/06/08/ending-extreme-poverty [Accessed Feb 2020].
19 Harttgen K, Vollmer S. Inequality decomposition without income or expenditure data: using an asset index to simulate household income. Human development research paper 2011/13, 2011. Available: http://hdr.undp.org/en/content/inequality-decomposition-without-income-or-expenditure-data [Accessed Feb 2020].
20 Hruschka DJ, Gerkey D, Hadley C. Estimating the absolute wealth of households. *Bull World Health Organ* 2015;93:483–90.
21 Fink G, Victora CG, Harttgen K, *et al*. Measuring socioeconomic inequalities with predicted absolute incomes rather than wealth Quintiles: a comparative assessment using child stunting data from national surveys. *Am J Public Health* 2017;107:550–5.
22 Bellows N, Reidy M, Weinberger M. Using the DHS wealth index and world bank poverty thresholds to examine socio-economic position in the family planning market analyzer, 2019. Available: https://shopsplusproject.org/resource-center/examining-socioeconomic-position-family-planning-market-analyzer [Accessed Jan 2020].
23 Market Segmentation Development Approaches Working Group. Market segmentation primer, 2009. Available: https://marketbookshelf.com/publications/market-development-approaches-working-group-market-segmentation-primer/ [Accessed Apr 2020].
24 Viswanathan R, Seefeld CA. Clinical social franchising compendium: an annual survey of programs: findings from 2014, 2015. Available: https://globalhealthsciences.ucsf.edu/sites/globalhealthsciences.ucsf.edu/files/pub/clinical_social_franchising_compendium_2015.pdf [Accessed Jan 2020].
25 Radovich E, Dennis ML, Barasa E, *et al*. Who pays and how much? A cross-sectional study of out-of-pocket payment for modern contraception in Kenya. *BMJ Open* 2019;9:e022414.
26 Ward P. Measuring the level and inequality of wealth: an application to China. *Rev Income Wealth* 2014;60:613–35.
27 Hlasny V, Al Azzawi S. *Asset inequality in MENA: the missing dimension? Working paper 1177. The economic research forum*, 2018.