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## **Economic Commission for Europe**

Conference of European Statisticians

### **Expert meeting on measuring poverty and inequality: SDGs 1 and 10**

Geneva, Switzerland

5–6 December 2019

Item B of the provisional agenda

**Supplemental poverty measures**

## **Household-level measurement masks gender inequality across three dimensions of poverty**

**Note by International Women's Development Agency\***

### *Summary*

Household-level data collection masks within-household inequality, thereby obscuring differences between individuals and groups, and leading to underestimates of poverty and deprivation. The conceptual and empirical insights of the Individual Deprivation Measure (IDM), a new individual-level, gender-sensitive measure of multidimensional poverty, can enhance our understanding of the links between the individual, the household, and society, enabled by data collection at the individual-level with each adult member of a household, across multiple dimensions of deprivation.

In this paper we have used individual, multidimensional data collected in poverty hotspots in Fiji in 2015-16 to construct both household and individual measures of deprivation along three dimensions commonly used to measure multidimensional poverty: health, education, and standard of living. Rather than economic inequality – the focus of studies based on income, expenditure, or consumption data – we focus on what individual measurement reveals about gender inequality.

We find that individual measurement allows detection of individual differences, thereby revealing gender inequalities rendered invisible by the household measures, and that this visibility persists across the three dimensions from the aggregate dimension level (multiple indicators), down to individual indicators (with different patterns across the indicators). These findings have significant implications for identifying the link between differing circumstances within households and overall societal inequalities.

These findings have significant implications for unpacking links between inequality inside households and overall societal inequalities.

*Working paper only - please contact the authors before citing*

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## I. Introduction

Currently, our understanding of poverty and inequality is derived from household measurement, but used to make inferences about individuals. Without understanding inequalities that exist within households, policy and programming targeted toward poor households may not be reaching poor people. Due to data limitations, attempts to ‘individualise’ poverty measurement from household aggregates to individuals within the household will at best produce largely homogenous individual estimates; at worst, taking these inference too far will lead to spurious conclusions conflating household characteristics with individual characteristics (for example, concluding an association between age and poverty when there are simply more children living in poor households).

Where data are available, the additional insights from individual-level measurement are clear. The World Bank’s *Poverty and Shared Prosperity Report 2018* features individual analysis of nutrition and education indicators, and finds gender differences are amplified compared to existing household-level estimates. The individual measurement presented in the report also allows for additional explanatory variables predicting nutrition and education outcomes, such as widowhood. Analysing consumption data collected via an intrahousehold sampling methodology, De Vreyer and Lambert (2018) find that household-level consumption surveys with household heads *underestimate* actual household consumption by 15% to 20 % in Senegal, and that inequality estimates are also lower, according to comparisons using the Gini index. They find that more than 9% of non-poor households contain at least one poor cell (‘cell’ is used to reference one or more people in the household acting as independent consumption units in analysis). There are also non-poor cells in poor households. These studies, premised on individual and intrahousehold sampling, begin to expand what is possible in the analysis of poverty and inequality. However, too few studies have the data available to begin to examine the extent to which individual and intrahousehold measurement can contribute to understanding inequalities in all its forms, including gender inequality.

In this paper we use data collected from the Individual Deprivation Measure (IDM) survey conducted in poverty hotspots in Fiji in 2015-16 to explore different degrees of visibility of poverty and gender inequality, depending on the level of analysis. We construct and compare three measures of poverty from the same dataset: 1) a household-level binary measure of poverty, 2) a household-level scalar measure of poverty, and 3) an individual-level scalar measure of poverty.

Fiji is a middle-income Pacific Island country with a population of around 900,000 people<sup>1</sup>. Although trends in existing poverty indicators show overall improvement, poverty remains an important concern in Fiji. Currently, poverty data in Fiji is derived from household income and expenditure data, collected via periodic Household Income and Expenditure Surveys. Measures of poverty based on existing household data assume all members of a household suffer the same profile of deprivation. This fails to account for gendered responsibilities and gendered inequalities within the household that can significantly impact on needs for, access to, and control over, resources. This in turn impacts overall inequality estimates and means accurate disaggregation of data is impossible. These are known limitations of household level poverty measures and a consequence of limited funding available for the collection of new data. However, very little is known about the extent of the inaccuracy and error that is incurred when using household data to quantify inequality of individuals.

The aim of this study is to investigate the difference between estimates of deprived men and women and the association between sex and deprivation using three different measures based on data collected via the Fiji Individual Deprivation Measure (IDM) study.

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<sup>1</sup> Fiji’s total population according to the 2017 Census conducted by the Fiji Bureau of Statistics is 884, 887.

## II. Method

### a. Data

The Fiji IDM study was conducted in 2015–16 by IWDA working with the Fiji Bureau of Statistics, funded by the Australian Government.

The sampling strategy used in Fiji targeted poverty hotspots and used a stratified, multistage, cluster design. Tikina (areas) with high poverty incidence and prevalence were identified from the World Bank Poverty Mapping study from each of the provinces in Fiji (1). Next, a two-stage sampling strategy was used; the sampling frame was divided into fifteen strata, each representing a different Tikina. Within each Tikina, Enumeration Areas (EAs) were selected using probability proportional to size based on the total number of households. Within each EA, a fixed number of fifteen households (HHs) were selected using systematic random sampling. This generated the sample size of 1125 households, 75 from each of the 15 selected Tikina.

Field supervisors and enumerators conducted surveys with participants one-on-one at participants' households, with men interviewing male participants, women interviewing female participants. The IDM instrument combines an individual survey answered by all adults (in Fiji, 18+) and a household survey answered by one primary respondent in each household who is knowledgeable about the household.<sup>2</sup>

### b. Measures of deprivation

#### i. Household level binary measure of poverty

Using a similar methodology to that of the Multidimensional Poverty Index (MPI), IDM data was used to construct a household-level binary measure of poverty (HHBM), capturing deprivation in three dimensions of human life – education, health, and standard of living - at the household level (2). The IDM Fiji study measured deprivation in relation to education and health in a slightly different way to that used by the MPI. Thus, the methodology used to construct the HHBM varied slightly to that of the MPI (Table 1). Like the MPI, the HHBM uses a binary approach for each indicator in which a household is considered deprived if they fall below a given threshold. If a household is deprived in at least one third of the weighted indicators it, and all its members, are considered poor.

Table 1 Dimensions and indicators of the household-level binary measure of poverty and the household-level scalar measure of poverty.

Dimension	Indicator	Deprived if...	Weight
<b>Health</b>	Nutrition	Any adult in the household reported that, in the four weeks preceding the survey, there was no food for them to eat because of a lack of resources to get food or they went to sleep at night hungry because there was not enough food.	1/6
	Child mortality	Any child member of the household who was alive at birth died before his/her fifth birthday.	1/6
<b>Education</b>	Years of schooling	No adult household member has completed six years of schooling.	1/3
<b>Standard of living</b>	Electricity	The household has no electricity.	1/18
	Sanitation	The household does not have access to improved sanitation (according to Sustainable Development Goal guidelines), or it is improved but shared with other households.	1/18
	Drinking water	The household does not have access to an improved source of drinking water (according to Sustainable Development Goal guidelines), or safe drinking water is at least a 30-minute walk from home, roundtrip.	1/18

<sup>2</sup> The IDM survey used in Fiji was part of a previous phase of IDM work. As part of the current IDM program (**Error! Reference source not found.**) revisions have been made to the survey and dimension scoring. See Alkire and Jahan (2018) for further information.

Dimension	Indicator	Deprived if...	Weight
	Housing	At least one of the household's three dwelling elements—floor, walls or roof—is made of inadequate materials—that is, the floor is made of natural materials and/or the walls and/or the roof are made of natural or rudimentary materials.	1/18
	Cooking fuel	The household cooks with dung, wood, charcoal or crop residue.	1/18
	Assets	The household does not own a car or truck and does not own more than one of the following assets: radio, television, telephone, computer, tractor, bicycle, motorbike or refrigerator	1/18

ii. Household level scalar measure of poverty

The household level scalar measure of poverty (HHSM) considers deprivation in the same way and for the same dimensions and indicators as outlined in Table 1. Instead of describing individuals as poor or not poor, the HHSM describes poverty on a four-point scale depending on the proportion of weighted indicators in which a household is considered deprived. Those households deprived in less than one fifth of weighted indicators are considered not poor, those deprived in at least one fifth but less than one third are considered vulnerable to poverty, those deprived in at least one third are considered poor and those deprived in at least one half are considered to be severely poor.

iii. Individual level scalar measure of poverty

The individual-level scalar measure of deprivation quantifies deprivation in relation to particular dimensions. This methodology was developed for the Individual Deprivation Measure which is constructed from fifteen dimensions of life<sup>3</sup>. For the purpose of this study, and as a comparison to some indicators described in Table 1, only four IDM dimensions (food, education, water and health) are used here. A score is allocated to each individual for each dimension by taking the weighted mean of all normalised (min-max normalisation) indicator scores within a dimension. The details of quantifying deprivation in relation to these dimensions is described in Table 2.

Table 2 Scoring methodology of the food, water, education and health dimensions of the Individual Deprivation Measure.

Dimension	Theme	Indicator	Scenario	Score	Weight	
<b>Food</b>	Food security	Any hunger	In the past four weeks, the individual experienced having no food to eat because of a lack of resources. This happened...	Frequently	0	1/3
				Sometimes	1	
				Rarely	2	
				Never	3	
	Sleep hunger	In the past four weeks, the individual went to sleep hungry because there was not enough food. This happened...	Frequently	0	1/3	
			Sometimes	1		
			Rarely	2		
			Never	3		
	Full day hunger	In the past four weeks, the individual went a whole day and night without eating because there was not enough food. This happened...	Frequently	0	1/3	
Sometimes			1			
Rarely			2			
Never			3			
<b>Water</b>	Sufficiency	Frequency of sufficient water	The individual had enough water to meet all personal needs	Never	0	1/2
				Rarely	1	
				Sometimes	2	
				Often	3	

<sup>3</sup> See Hunt et al, 2017

Dimension	Theme	Indicator	Scenario	Score	Weight	
			(drinking, washing, cooking, etc.) This happened...	Always	4	
	Quality	Source and treatment	The household's main source of drinking water is from a unprotected surface water or well and is ...	Untreated Inadequately treated Adequately treated	0 1 2	1/2
			The household's main source of drinking water is from a protected well or private vendor and is ...	Untreated Inadequately treated Adequately treated	1 2 3	
			The household's main source of drinking water is piped to the household or a public tap.		4	
<b>Education</b>	Attainment	Highest educational attainment	The highest level of schooling the individual completed was ...	0 years 1 – 5 years 6 – 9 years 10+ years	0 1 2 3	1/2
	Quality	Reading	The individual completed a maximum of 5 years of schooling and is...	Unable to read Partly able to read Fully able to read	0 1 2	1/6
		Writing	The individual completed a maximum of 5 years of schooling and is...	Unable to write Able to write legibly Able to write well	0 1 2	1/6
		Numeracy	The individual completed a maximum of 5 years of schooling and is...	Unable to do basic arithmetic Able to do basic arithmetic with some error Fully able to do basic arithmetic	0 1 2	1/6
<b>Health</b>	Health status	Illness/injury Exposure to fumes	The individual rated their health problems due to exposure to fumes from cooking/heating as ...	Severe Moderate Minor No problems/ no exposure	0 1 2 3	1/4 1/4
	Health care	Health care				1/2

### c. Statistical methods

Demographic differences between men and women in the IDM Fiji sample were described using percentages.

Contingency tables and Pearson's Chi Square tests were used to describe the distribution of men and women by their experience of poverty and to test for any evidence of an association between sex and poverty or deprivation with a significance level of 0.05.

To explore the sensitivity of different measures of deprivation and their ability to identify any existing gender inequalities, the distribution of men and women categorised from comparable indicators (Table 1) and dimensions (Table 2) were compared. Namely, the number of men and women identified as deprived in:

- i. Nutrition (Table 1) from household and individual level data were compared to those identified using the IDM food dimension,
- ii. Schooling (Table 1) from household and individual level data were compared to those identified using the IDM education dimension,
- iii. Water (Table 1) from household level data were compared to those using the IDM water dimension,
- iv. Cooking fuel (Table 1) from household level data were compared to those using the cooking fuel indicator from the IDM health dimension.

Where gender differences were observed using Pearson's Chi Square tests, direction of inequality was determined using Cumulative Link Mixed Models (CLMM) with sex as the fixed effect and household as the random effect. CLMM accounts for the correlation in the data due to sampling multiple individuals from one household.

## III. Results

### a. Household-level poverty estimates

The distribution of age, sector and ethnicity were similar among men and women (Table 3). Slightly fewer women than men completed the short household-level survey and men were notably more often the child of the household survey respondent than women. More women were living with a disability than men.

Table 3: Demographics of study participants by sex, Fiji IDM study (2015)

	<b>Male</b> N = 1481	<b>Female</b> N = 1485
<b>Age</b>	$\mu \pm sd = 43 \pm 16$	$\mu \pm sd = 43 \pm 16$
	n (%)	n (%)
18-35	548 (38)	575 (39)
36-50	429 (29)	434 (29)
51-65	372 (25)	349 (24)
66+	132 (8.9)	126 (8.5)
<b>Sector</b>		
Urban	370 (25)	387 (26)
Rural	1040 (70)	1014 (68)
Informal	71 (4.8)	84 (5.7)
<b>Ethnicity</b>		
Fijian	748 (51)	795 (54)
Indian	711 (48)	669 (45)
Other	22 (1.5)	21 (1.4)

	Male N = 1481	Female N = 1485
<b>Relationship to primary respondent</b>		
Primary respondent	571 (39)	553 (37)
Spouse	376 (25)	423 (29)
Child	318 (22)	163 (11)
Other	216 (15)	346 (23)
<b>Living with a disability<sup>4</sup></b>		
Yes	91 (6.1)	128 (8.6)

Table 4 Number of men and women classified as poor according to a binary and scalar household measure of poverty, Fiji 2015

Measure	Men N = 1481	Women N = 1485	X <sup>2</sup> test p-value
<b>HHBM</b>			
Poor	291 (19.6)	313 (21.1)	P = 0.33
Not poor	1075 (72.6)	1053 (70.9)	
<b>HHSM</b>			
Severely poor	48 (3.3)	38 (2.7)	P = 0.437
Poor	141 (9.8)	136 (9.6)	
Vulnerable	172 (11.9)	167 (11.8)	
Not poor	1085 (75.0)	1078 (76.0)	

The household-level binary measurement of poverty classifies 19.6% of men and 21.1% of women as poor, which is not statistically significant (Table 4). Gender differences are not observable with the household-level scalar measure, with 3.3% of men and 2.7% of women categorised as severely poor and 9.8% of men and 9.6% of women categorised as poor. We move on to consider the three dimensions comprising the poverty index separately, using the same IDM data.

## b. IDM dimension estimates

### i. Food<sup>5</sup>

Three measures are presented below: a household-level nutrition indicator, reconstructed from the individual measure to be equivalent to typical household-level nutrition indicators; an individual-level nutrition indicator, coded in deprived/not deprived binary; and the IDM food dimension, comprising three indicators and assigned scalar thresholds of deprivation. The food dimension of the IDM measures experience and frequency of hunger, and is thus an extension of the nutrition indicator used in the household and individual indicator of poverty.

<sup>4</sup> Living with a disability according to the Washington Group Short Set on Functioning using disability3 threshold **Invalid source specified.**

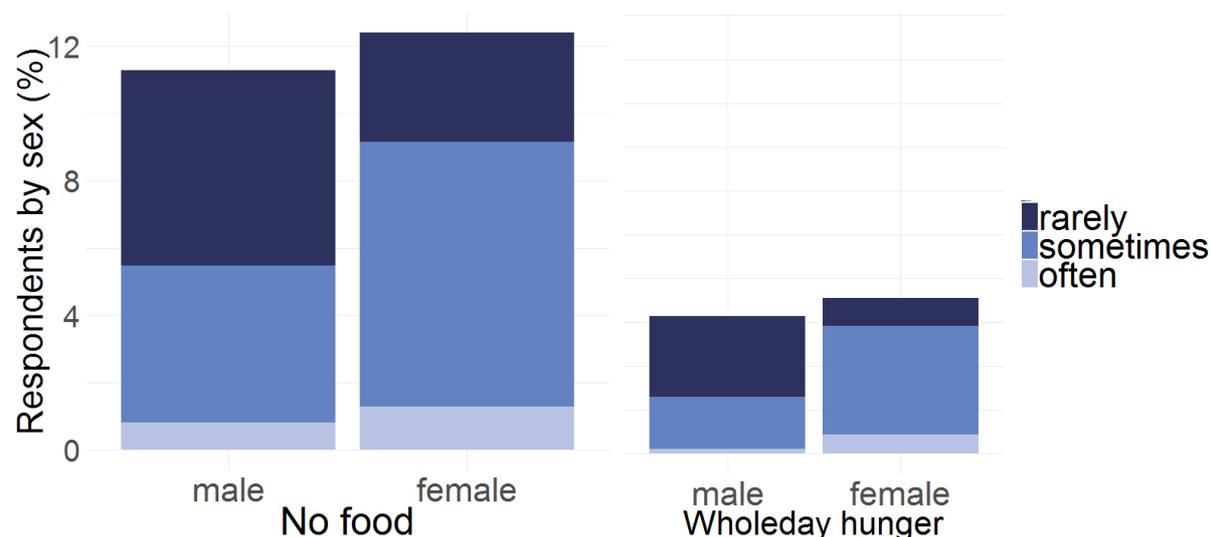
<sup>5</sup> The IDM food dimension maps onto the MPI dimension of Health (nutrition indicator); however the IDM health dimension itself measures health care access and barriers

Table 5 Number of men and women classified as deprived in nutrition or food according to a binary indicator based on household data, one based on individual data and a scalar measure of deprivation based on individual data, Fiji 2015

Measure	Men N = 1481	Women N = 1485	X <sup>2</sup> test p value	OR (95% CI)
<b>Nutrition indicator (household level)</b>			0.79	
Deprived	339 (22.9)	347 (23.4)		
<b>Nutrition indicator (individual level)</b>			0.36	
Deprived	177 (12.0)	195 (13.1)		
<b>IDM food dimension</b>			<0.01	0.56 (0.37, 0.84)
Most deprived	3 (0.2)	12 (0.8)		
Deprived	22 (1.5)	45 (3.0)		
Somewhat deprived	50 (3.4)	45 (3.0)		
Least deprived	1406 (94.9)	1383 (93.1)		

When considering the indicator of nutrition based on the household level measurement we find that there is not sufficient evidence to suggest that men and women experience deprivation in nutrition differently (Table 5) Similarly, when considering the indicator of nutrition based on the individual level measurement. However, when considering the IDM food dimension, which is based on a more granular measure of nutritional deprivation, we find evidence of an association between sex and food deprivation. When analysing these scores further we find that women were significantly more deprived than men in the IDM food dimension (OR (95% CI) = 0.56 (0.37, 0.84)). Women more frequently reported experiencing having no food to eat and going a whole day and night without eating due to a lack of resources to get food than men (Figure 1). This demonstrates clearly the importance of granular level measurement.

Figure 1 Frequency of experiencing not having enough food to eat and going a whole day and night without eating in the past 4 weeks due to a lack of resources by sex, Fiji 2015.



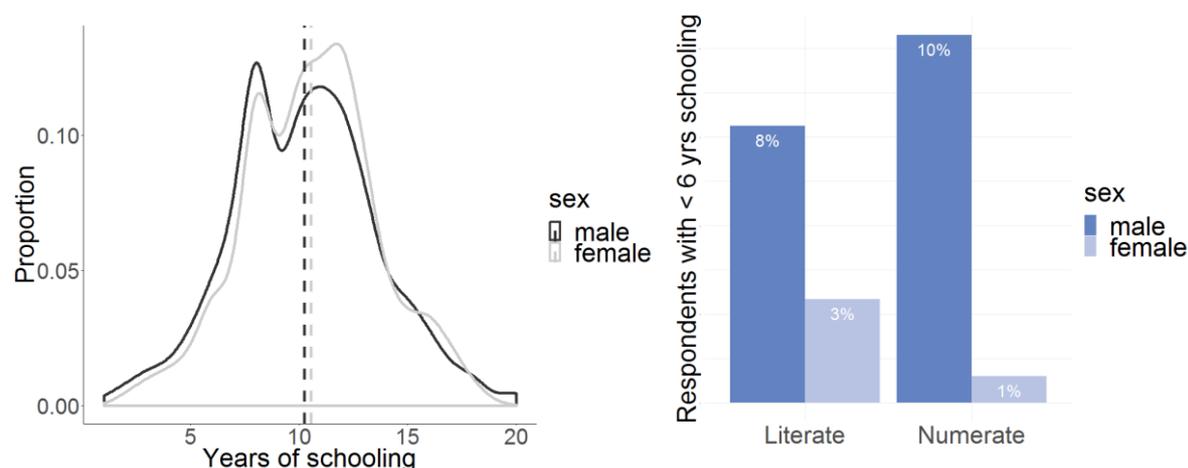
## ii. Education

Table 6 Number of men and women classified as deprived in schooling or education according to a binary indicator based on household data, one based on individual data and a scalar measure of deprivation based on individual data, Fiji 2015

Measure	Men N = 1481	Women N = 1485	p value ( $X^2$ )	OR (95% CI)
<b>Schooling indicator (household level)</b>				
Deprived	185 (13.5)	194 (14.2)	0.65	
<b>Schooling indicator (individual level)</b>				
Deprived	101 (7.0)	69 (4.9)	0.02	
<b>IDM education dimension</b>				
Most deprived	90 (6.1)	114 (7.7)	0.01	1.27 (1.10, 1.46)
Deprived	42 (2.8)	22 (1.5)		
Somewhat deprived	9 (0.6)	4 (0.3)		
Least deprived	1406 (94.9)	1383 (93.1)		

As in the food dimension, no gender differences were observable in education when simply disaggregating the household-level schooling indicator. However, we find that overall, men were more deprived than women in the education dimension, in line with trends in Fiji indicating younger women are more educated than younger men. However, women were more likely than men to be in the most deprived category for education. Although competency in literacy and numeracy was low in all respondents with less than 6 years of completed schooling, women were far less likely to be literate or numerate than men (Figure 2).

Figure 2 Density plot of completed years of formal schooling by sex with mean line and percentage of male and female respondents with less than 6 years of completed schooling that were literate and numerate, Fiji 2015.



## iii. Standard of Living

Of the indicators from the standard of living dimension of the HHBM, data on water and cooking fuel were available from the IDM Fiji data. Analysis of these indicators revealed a similar pattern to previous dimensions, in which no gender differences were observable in water or cooking fuel via disaggregation of the household-level indicators (Table 7, Table 8). However, women were significantly more deprived than men when considering individual-level information including indicators capturing sufficiency of water quantity for personal use and exposure to cooking fumes and related health problems.

Table 7 Number of men and women classified as deprived in water according to a binary indicator based on household data and a scalar measure of deprivation based on individual data, Fiji 2015

Measure	Men N = 1481	Women N = 1485	p value (X <sup>2</sup> )	OR (95% CI)
<b>Water indicator (household level)</b>				
Deprived	116 (7.8)	110 (7.4)	0.71	
<b>Water indicator (individual level)</b>				
Deprived	NA	NA		
<b>IDM water dimension</b>			<0.01	0.72 (0.59, 0.88)
Most deprived	31 (2.1)	28 (1.9)		
Deprived	121 (8.2)	109 (7.3)		
Somewhat deprived	372 (25.1)	463 (31.2)		
Least deprived	957 (64.6)	885 (59.6)		

Figure 3 Reported frequency of having sufficient water to meet needs for all personal use including drinking, washing and cooking, Fiji 2015.

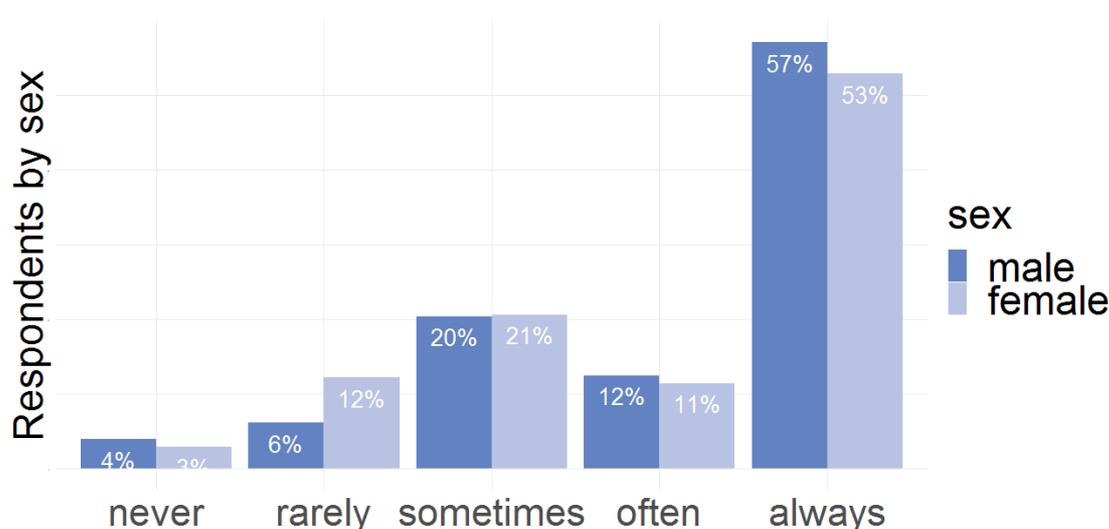


Table 8 Number of men and women classified as deprived in cooking fuel according to a binary indicator based on household data and a scalar measure of deprivation based on individual data, Fiji 2015

Measure	Men N = 1481	Women N = 1485	p value (X <sup>2</sup> )	OR (95% CI)
<b>Cooking fuel indicator (household level)</b>				
Deprived	1010 (68.2)	1006 (67.7)	0.82	
<b>Cooking fuel indicator (individual level)</b>				
Deprived	NA	NA		
<b>IDM exposure to fumes indicator</b>			<0.01	0.26 (0.21, 0.32)
Most deprived	23 (1.6)	132 (8.9)		
Deprived	89 (6.0)	240 (16.2)		
Somewhat deprived	155 (10.5)	182 (12.3)		
Least deprived	1214 (82.0)	931 (62.7)		

Women were twice as likely as men to report rarely having enough water for personal use (Figure 3). As hypothesised in Fisk and Crawford (2017), this may be due to women using water for other household member's sanitation needs, including domestic tasks. With regards to cooking fuel, women experience significantly more health problems as a result of exposure smoke from unclean cooking fuel, an example of gendered within-household roles and responsibilities producing deepened deprivation beyond the shared household level.

The examples across the dimensions above demonstrate the extent to which household-level measures overlook inequalities existing inside households relating to gender and other individual and structural inequalities. These inequalities only emerge when scrutinising individual level, scalar data.

## IV. Discussion

An increasing body of literature has emerged critiquing household-level measurement of poverty, but few studies collect the intrahousehold data necessary to quantify the impact household measurement has had on our understanding of poverty and inequality (exceptions include Klasen and Lahoti, 2016; De Vreyer and Lambert, 2018; McInerney & Fisk, 2019).

In this paper we have used individual, multidimensional data to ‘build’ both household-level binary and scalar measures, and ‘unpack’ again into individual binary and scalar measures, along three dimensions commonly used to measure multidimensional poverty: health, education, and standard of living. Rather than economic inequality – the focus of studies based on income, expenditure, or consumption data – we focus on what individual measurement can reveal about gender inequality, using the Individual Deprivation Measure.

We find that individual measurement allows detection of individual differences, and that this persists across three dimensions from the aggregate dimension level (multiple indicators), down to individual indicators (with different patterns across the indicators). That is, similar to De Vreyer and Lambert (2018), we find that ‘individualising’ our constructed ‘household’ level measures lead to *underestimates* of inequality (operationalised here in terms of gender equality) compared to actual individual-level measurement (unlike De Vreyer and Lambert, we do not compare overall rates of poverty via the different measures, as the thresholds are not directly comparable in this case). Therefore, we provide a simple example to illustrate the risk of incorrect inferences when investigating inequality between subpopulations (such as gender) when estimates are based on aggregated (household level) rather than individual (person) level data.

The work presented in this paper also indicates avenues for future research, such as moving beyond gender analyses to include other intrahousehold factors impacting deprivation such as age and disability, while accounting for shared household factors such as urban/rural locality. It may be beneficial to replicate these analyses across additional domains, and begin to quantify the extent of inequalities inside households more broadly (for example, previous work by McInerney and Fisk (2019) has shown that intrahousehold variation is largest in dimensions where gendered roles within households interact, such as Work and Voice dimensions). Finally, further investigation of thresholds for scalar identification of poverty using the IDM could be used to build overall poverty estimates and profiles of those identified as poor, which could then be compared to equivalent estimates produced by household-level measurement constructed from the same data.

In conclusion, the connection between inequality inside households and broader societal inequalities is a vastly under-researched field, and investment in data such as that produced by the IDM and other individual-level, multidimensional measures of poverty can begin to illuminate pathways for governments to reduce poverty and address the injustice of inequality.

## V. Acknowledgements

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