Multidimensional Poverty and Inequality in the Post-Transitional, Rapidly Urbanizing Context of Ulaanbaatar, Mongolia

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Introduction

Mongolia has been successful in navigating a simultaneous political and economic transition over the past two decades and has emerged as one of East Asia's fastest growing economies. Such economic growth contributed to nearly halving the national poverty line between 2002 and 2008 and the transition to market economy has been accompanied by rapid urbanization, with rural-urban migration streams dominated by moves to the capital city of Ulaanbaatar whose population doubled between 2001 and 2011 and is now home to over 40% of the country's total population of 2.6 million. At the same time, job creation in the country's mining dominated economy has been slow and not well aligned with the demographic profile and skill set of the urbanizing population. Urban growth of Ulaanbaatar too has been haphazard. Lack of proper land management and urban planning have led to considerable urban sprawl dominated by large unplanned, low-density "ger areas" (as shown in Figure 1). Such expansion of the city in ger areas, especially in the fringes where numerous poorer residents live on hilly terrains, has resulted in one of the most critical developmental challenges of service delivery and urban poverty facing Ulaanbaatar today. Urban poor face multiple deprivations of income poverty accompanied by a severe lack in access to basic services such as water, sanitation, solid waste, schools, health centers and public transportation. In contrast, the apartment dwellers and residents of the downtown areas enjoy easy access to most of these services and infrastructure with fewer pockets of poverty. The multidimensionality of urban poverty in these ger areas is stark and is well-known to policy makers and researchers, though mostly documented using qualitative methods. This paper attempts to quantify the unambiguously multidimensional nature of urban poverty in Ulaanbaatar using the Alkire-Foster methodology, decomposes *the index generated to understand the contributions of each of the constituent dimensions and finally, compares multidimensional poverty to purely income poverty using a transitional probabilities matrix to assess how sensitive are estimates of income poverty in Ulaanbaatar when you take into account other dimensions that are key for a dignified urban existence.*

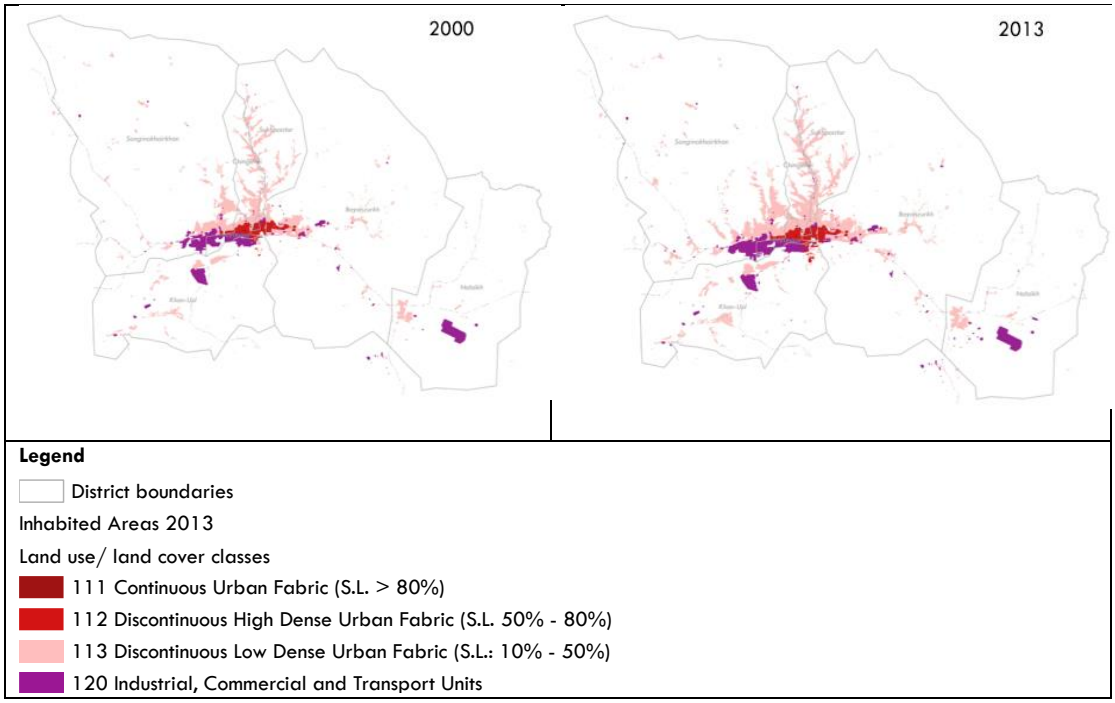
In the next section, I discuss the context of urban poverty and urban expansion in Ulaanbaatar to situate the analyses and the findings, concluding with the specific questions answered by this paper. This is followed by discussions of data and methods used, results from the analyses and key conclusions based on the results. The last section of this paper highlights the planned and ongoing analyses that have not been included in this draft but will be included in the final paper.

Multidimensional poverty in the context of urban expansion in Ulaanbaatar

As mentioned above, the expansion of Mongolia's capital city Ulaanbaatar has been phenomenal, both in terms of population growth as well as its urban extent. Ulaanbaatar's population (housing 40% of the nation's population) rose from about half a million in 2001 to about 1.2 million in 2011, and is projected to rise to 1.7 million by 2025. Much of this population increase has been through rapid rural-urban migration in the last two decades. Besides economic growth, another reason why Ulaanbaatar has received migrants from all parts of the country is due to the increased intensity of a series of severe winter storms (called *zud*) that have destroyed considerable rural livestock and resulted

in the large out migration of low-income, low-skilled rural families into Ulaanbaatar (Kamata, 2010).

Figure 1: Increase in household density in Ulaanbaatar Area, Mongolia – 2000 and 2013



Further, employment opportunities only increased by 11 percent nationally in the last decade mainly because the mining industry, the main contributor to the growth in GPD, is not labor intensive. As of 2011, 29.85% of residents of Ulaanbaatar had incomes below poverty line (UNDP, 2011). Inequality has continued to rise, with the most recent World Bank 2014 estimates placing GINI coefficient for Ulaanbaatar at a high of 0.45. Low-skilled migrants to Ulaanbaatar have joined the ranks of urban poor by setting up traditional informal dwelling (*gers*) in vacant areas of the city, leading to an unplanned growth of "*ger* areas". Such unprecedented pace of urbanization, has brought many challenges, including unemployment, traffic congestion, air pollution, and negative environmental impacts (Kamata, 2010). Not surprisingly, the city is facing tremendous pressure to maintain and expand its service provision (especially, access to basic services and infrastructure).

In *ger* areas, basic services are very limited and often nonexistent in contrast to the apartment areas, which are much better provisioned and home to middle/high class families. Ger area residents struggle to access basic services such as water and sanitation. Provision of networked water supply and sewage systems has been a significant challenge for the city government, given the typically hilly terrains of these areas, low population densities that prevent benefits of the economies of scale in other cities and an extremely cold climate that makes it not only costly but at times practically impossible to supply these services. For example, a recent World Bank intervention to provided piped water and sewage infrastructure to pilot neighborhoods failed because the population density was too low to ensure sufficient water circulation in the system, resulting in frozen sewage in wintertime. Such conditions in ger areas have meant that urban poor in Ulaanbaatar do not only suffer from lack of jobs and income poverty but are also adversely

affected by a severe lack of back services and infrastructure. As a result, income poverty becomes a particularly incomplete measure of capturing the lack of wellbeing of urban poor in the case of Ulaanbaatar. Urban poor not only face income deprivation given the constrained job opportunities, but are also deprived in their access to dignified living conditions, access to basic services and lack of opportunities to influence life choices.

An operationalization of a view that attempts to place importance on both economic and non-economic aspects of wellbeing in the urban context can be borrowed from the literature that views poverty (and wellbeing) as essentially multidimensional (Alkire 2008; Chakravarty, and D'Ambrosio, C. 2006; Anand and Sen 1997; Bourguignon and Chakravarty 2003, to name a few). A multidimensional understanding of wellbeing is especially important when we are concerned whether the experience of poverty may be different for multiple social groups within a population, such as *ger* area residents versus other urban residents. If this is the case, then there is a need to better understand how various dimensions of wellbeing and social exclusion function as collective structures of constraints on individuals.

To this end, the analysis presented in this paper explores the nature and composition of wellbeing for residents of Ulaanbaatar by taking into account both economic dimensions as well as the capability-enhancing opportunities, which includes public service provision such as sanitation and water infrastructure. For example, access to clean water has been known to reduce the burden of disease in the cities of developing countries, with substantial declines in child mortality (World Bank and IMF, 2013). Improved sanitation has not only been found to decrease child mortality in urban poor settlements, but provision of sanitation facilities such as toilets in schools of low-income areas has also been shown to increase educational enrollment rates for adolescent girls (World Bank and IMF, 2013; Kyobutungi et al. 2008). Understanding the components of urban livability and identifying the profile of deprivations faced by urban poor in addition to income poverty is particularly relevant from a sound social and economic policy design perspective.

This paper will first describe the data and methods utilized in the multidimensional poverty analysis within the rapidly urbanizing context of Ulaanbaatar, followed by the results and finally the conclusions arising from these results. Specifically the results provide insight into the following questions:

1. *What is the multidimensional poverty profile for the residents of Ulaanbaatar?*
    a. How do deprivation ratios of the single-indicator headcount (i.e. for those who are unidimensionally deprived) compare with those who are deprived in the same indicator when a minimum multidimensional cut-off point is established, assuming equal weights for all dimensions?
    b. How does multidimensional poverty change when we vary cut-off levels?
    c. How does multidimensional poverty differ if we use individual indicators or group them into dimensions, assuming equal weights?

2. *What is the contribution of each of the constituent dimensions to overall multidimensional poverty in Ulaanbaatar?*

3. *How sensitive are estimates of income poverty in Ulaanbaatar when you take into account other dimensions that define individual wellbeing? In other words, what are the conditional probabilities of being multidimensional poor by income poverty status?*

While the analyses for this set of questions is presented in this draft paper, the final version of this paper will extend the analyses to included an analysis of multidimensional

inequality though the use of the modified Grade of Membership (GOM) approach and its comparison with income inequality, qualitative assessment of dimensional weights using insights from focus group discussions and separate analyses of multidimensional poverty and inequality for sub-groups within Ulaanbaatar population (namely, Ger Dwellers versus Non-Ger Dwellers) given the disproportionate levels of inequality in basic services faced by Ger area residents. These next steps are discussed in detail in the last section of this document.

Data and Methods:

The data for this study comes from the Urban Inequality and Service Delivery Survey (UISDS) carried out in Ulaanbaatar by the World Bank. The overall study, of which the survey is one part aims to create a systematic socio-economic profile of urban poor in UB, better understand their living conditions, identify gaps in service provision, identify the mechanisms that perpetuate vulnerability of urban poor, and assess existing policies and programs aimed at urban poverty reduction. The full scope of the study applies a mixed-methods approach, with a combination of qualitative, survey and spatial components.

This is the first survey utilizing a stratified random sampling design and representative at the city level that had covered total 3,000 households (with10,909 household members). Development of strata was based on the categorization of sub-district administrative bodies (khoroos, similar to wards within districts) as 'more than 50% of households in ger (traditional) dwellings (Strata I = Ger Area Strata), versus khoroos with 'more than 50% of households in apartments' (Strata II= Apartment Area Strata). Such classification was based on the 2013 Household Registry Data provided by the National Statistics Office, who also provided information on total households and total population in each khoroo that was utilized in the final sample weighting. Each stratum was divided into Primary Sampling Units (PSUs) and a simple random sample of PSUs drawn from each stratum, with an oversampling of the Ger area strata. Household listing was carried out within each sampled PSU, following which a random sample of 10 households was drawn from each PSU to generate a sample of 3000 where 2000 were from Ger areas and 1000 from non-Ger strata. The survey team interviewed the primary earner or his/her spouse in the households but regardless of the respondent, employment data was always collected for the primary earner.

Dimensions:

Transforming income variable for capturing the economic dimension of poverty:

The key economic aspect of wellbeing was captured by household income in the survey data. However, the income information collected in the survey was provided in a categorical form and had to be converted to a continuous measure, such that each household could be assigned a specific value before applying the first cutoff to determine deprivation in this dimension. An innovative method was applied to transform it into a continuous variable in order to generate simulated income for each person. To transform the income classifications into continuous variables, preserving the same cumulative probability distribution, we used the Probability Integral Transform Theorem (Angus, 1994). This was done by carrying out a linear interpolation of the income classifications from the survey based on the simulated distribution generated by the theorem for that original (survey) variable. The respondents' income was continuously approximated by means of a common simulated uniform distribution. Intuitively, we are assuming that observed variables that are highly correlated retain the same degree of correlation in their simulated form. The new continuous variables were applied to a Seemingly Unrelated Regression model, and then compared to Generalized Ordinal Regression model using the observed ordinal variables. Graphing showed very close fit of the

simulated and original cumulative distributions, giving is confidence in out finings.

Once this measure of simulated income was ready, we used it as an indicator within the 'Asset and Money" dimension capturing the economic aspect of poverty, along with another indicator developed by a simple index of household assets.

Other dimensions:
Beyond the economic dimension of Assets & Money described above, we used seven other dimensions namely, Accessibility, Accommodation, Education, Employment, Solid Waste, Water & Sanitation, Community Quality. These dimensions attempted to capture the multidimensional aspects of urban poverty and urban livability. As mentioned before, 20 indicators from the survey data were grouped across these seven dimensions. For example, "*Water & Sanitation*" dimension was composed of four individual indicators (1) Type of water supply accessible to the household; (2) Distance from drinking water; (3) Toilet type, (4) Number of household sharing a toilet. Similarly "*Solid Waste*" is composed of (1) Method of waste disposal, and (2) frequency of garbage collection; and "*Accommodation*" consisting of (1) Dwelling Type (ger or non-ger) and (2) Security of tenure, etc.

Methodology:
The Alkire-Foster methodology (AF method, hereon) identifies the poor population using a "dual cutoff" method. First, a cutoff is applied to each dimension, below which or within which, a person is considered deprived within that dimension. In this paper, we carried out the analyses with (1) each of the 22 indicators (i.e. survey variables) was considered a separate dimension, henceforth referred to as indicator-dimension and (2) nine dimensions created by logically grouping 22 indicators by the overall dimension they captured. The majority of results in the section below are presented for the overall dimensions, and where necessary, results from indicator dimensions are mentioned. The application a first cutoff allowed us to identify those individuals who were deprived in each of the dimensions to get a dimension specific deprivation for each individual in the data.

Following this step, a second cutoff is applied to specify the breadth of deprivations i.e. how many dimensions should a person be deprived on to be considered poor? This allows us to specify an identification function that assigns a value of 1 if a person is poor, or 0 otherwise, thus generating a binary variable for poverty and allowing for the calculation of the proportion of multidimensional poor in the sample. Here, the second cutoff was applied in terms of percentage of the indicators on which a person should be poor to be considered poor. We explore a series of percentage levels ranging from 10% of indicators to 90%. As will be shown in results, we focus on a 30% cut-off point, implying that for a person to be considered deprived in any indicator, he/she has to be deprived in at least 30% of the 22 indicators used to construct our Alkire-Foster measure.

The AF method also allows for the specification of weights for each of the dimensions. However, for this preliminary analysis we have assigned equal weights for all the dimensions, as mentioned earlier. We return to this question of weighting schemes in the conclusion and argue for utilization of qualitative approaches to generate weights, an extension we hope or demonstrate in the final paper.

Results:

Describing deprivation ratios

We start by describing deprivation ratios, comparing the single-indicator headcount for those who are unidimensionally deprived compared to those who are deprived in the same indicator when a minimum multidimensional cut-off point is established. As previously explained, we use a 30% cut-off point. Table 1 suggests that raw deprivation is highest for indicators related to water and sanitation, followed by solid waste and financial resources. If we consider indicator "access to sanitation", 58% of individuals in Ulaanbaatar would be deprived. For those who are deprived in at least 7 indicators (k=30% of 22), sanitation deprivation would still be considered very high (47% of deprived individuals).

Table 1: Raw and Censored Depravation Ratios

Dimension	Indicator	Deprivation Line	Raw Mean	Censored Mean
Accessibility	Deprived in access to close bus stop	More than 15 minutes of distance	0.17	0.14
	Deprived in fast access to workplace	More than 60 minutes of distance	0.14	0.09
Accomodation	Deprived in secure tenure	Renter	0.05	0.05
	Deprived in proper accomodation	Ger	0.26	0.25
Assets & Money	Deprived in household assets	Scale average	0.43	0.38
	Deprived in per capita household income	118,668 Mongolian Tughriks	0.33	0.24
Education	Deprived in school attendance of youth	No attendance of 6-7 y.o. children	0.01	0.01
	Deprived in access to internet	No access	0.44	0.32
	Deprived in education	Up to middle school	0.12	0.10
Employment	Deprived in employment	Average unemployment share	0.38	0.25
	Deprived in secure employment	Informal sector	0.21	0.12
	Deprived in regular employment	Part-time (<11 months)	0.28	0.17
Solid Waste	Deprived in access to garbage collection service	No access	0.28	0.06
	Deprived in regular garbage collection service	Not collected + irregular + doesn´t know	0.47	0.34
Water/Sanitation	Deprived in water supply	No centralized water supply	0.57	0.46
	Deprived in close water source	Not on plot / in house	0.57	0.46
	Deprived in access to sanitation	No flush toilet with central sewage discharge	0.58	0.47
	Deprived in sole access to toilet	Toilet shared by more than 1 household	0.39	0.31
Community Quality	Deprived in Community Employment	Major problem	0.59	0.33
	Deprived in Absence of Wife Beating in Community	Major problem	0.07	0.04
	Deprived in Absence of Alcoholism in Community	Major problem	0.50	0.26
	Deprived in Community Safety	Major problem	0.23	0.13

The average percentage of multidimensional poor for a 30% cut-off is 49% if equal weights for dimensions are considered. The level of multidimensional poverty rises to 55% of Ulaanbaatar residents if we assign equal weights to indicators (not shown here). This difference is explained by the varied importance of each selected indicator to unidmensional deprivation, as shown in the raw headcount ratios (Table 1). In the first case (equal weights to dimensions), each indicator within a dimension that comprises more indicators would be assigned a smaller final weight. If the level of deprivation for that indicator is very high, its importance and contribution to the final estimate of multidimensional poverty is being reduced in the equal dimensional weight scenario.

Multidimensional poverty by varying cut-off levels

Table 2 presents varying levels of multidimensional poverty by varying cut-off levels. As expected, increase in cut-off points reduces the level of multidimensional poor, since it becomes more difficult to find individuals with increasing number of simultaneous deprivations. For instance, if we use a 10% cut-off, 92% of the population is considered poor. If cut-off were raised to 50%, the proportion of multidimensional poor would decline to only 13%. Being multidimensional poor is already a more informative measure than unidimensional poverty. However, multidimensional poverty intensity has also to be addressed. Thus, the deprivation share (A) represents the intensity with which multidimensional poverty is experienced by a certain population. As expected, increase

in cut-offs would raise deprivation intensity, since the ones considered poor must experience more simultaneous deprivation. The Alkire-Foster multidimensional poverty index (M0) is the censored headcount (H) weighted by deprivation intensity (A). For a 30% cut-off, 21% of Ulaanbaatar residents are considered poor.

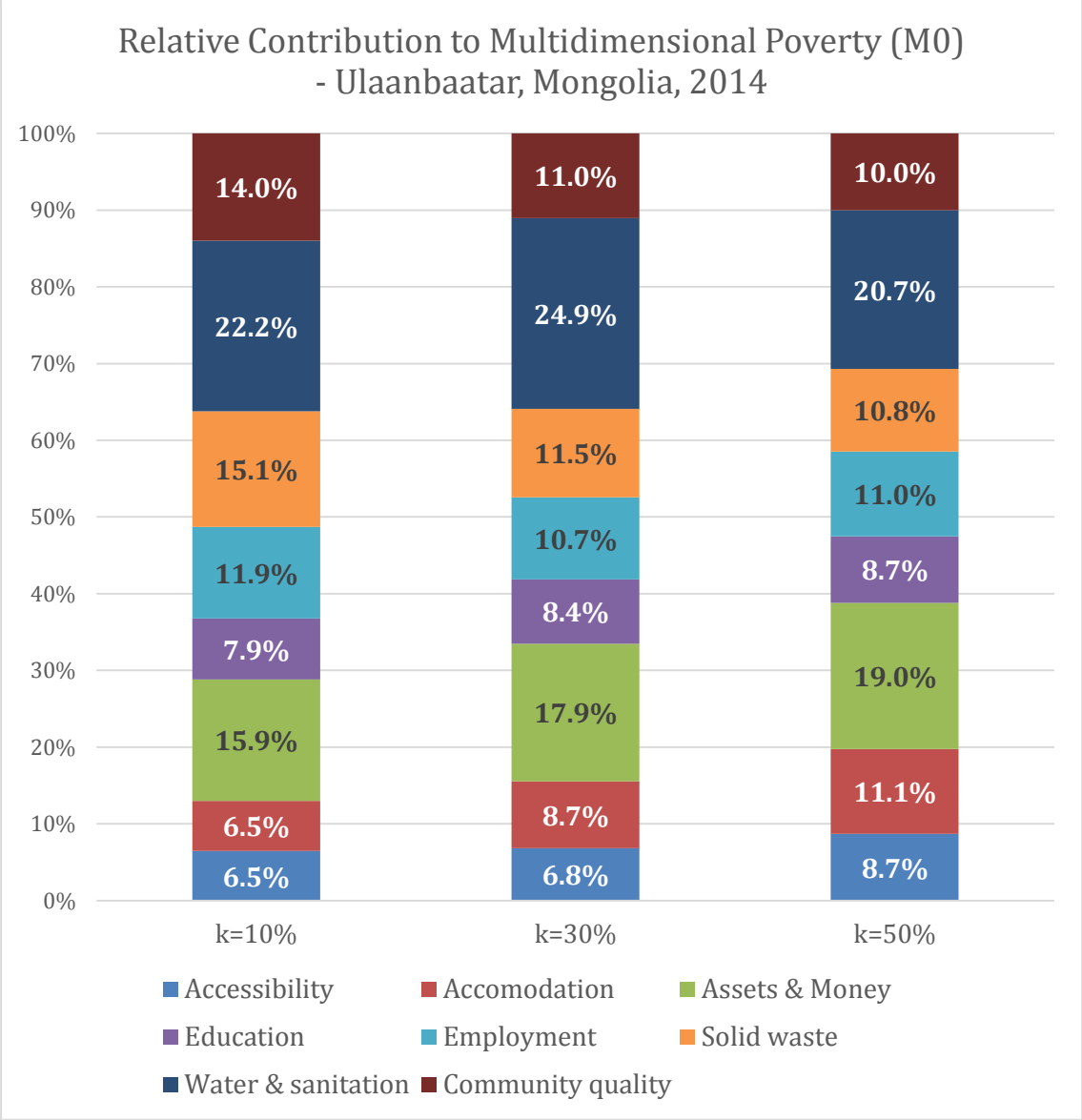
Table 2: Estimated Multidimensional Poverty with Equal Dimensional Weighting

Cut-off % (k)	Observations		Censored Headcount (H)	Deprivation Share (A)	Multidimensional Poverty (M0)
	H, M0	A			
10	2983	2778	0.92	0.32	0.30
20	2983	2170	0.67	0.39	0.26
30	2983	1620	0.49	0.44	0.21
40	2983	958	0.29	0.50	0.14
50	2983	410	0.13	0.56	0.07
60	2983	87	0.03	0.65	0.02
70	2983	8	0.00	0.74	0.00
80	2983	1	0.00	0.81	0.00
90	2983	0	0.00	-	0.00
100	2983	0	0.00	-	0.00

Dimensional contributions to overall multidimensional poverty score

However, despite its simplicity and easy to interpret, the aggregate level measure, M0, is not sufficient as it does not explain the contribution of each dimension or indicator to the estimated level of multidimensional deprivation. Figure 2 shows the decomposition of M0 into dimensional contribution share. As can be seen, for k=30% water and sanitation responds to 25% of multidimensional poverty in the city. If all deprivation in this dimension were eliminated, M0 would decline from 0.21 to 0.16. That is, 5% of the deprived population in Ulaanbaatar would leave deprivation.

Figure 2: Relative Dimensional Contributions to Multidimensional Poverty



Conditional probabilities multidimensional poverty by income poverty status

Finally, another interesting way to see the contribution of non-income dimensions to deprivation is to estimate conditional probabilities of being multidimensional poor by income poverty status. Table 3 shows that 37.5% of individuals considered as non-poor for income are actually multidimensionally deprived (i.e. deprived in dimensions other than income in this case). This conditional probability is even higher when equal weights to indicators are used (45.2%). In addition, 29% of income-poor individuals would not be considered multidimensional poor for a 30% cut-off, since those are the individuals who experience deprivation in less than 7 indicators. 71% of the sample is both income and multidimensional poor.

Table 3: Transitional matrix of conditional probabilities of being multidimensional poor by income poverty status

Equal weights to Dimensions				Equal weights to Indicators			
Income (P_0)	Multidimensional (H)			Income (P_0)	Multidimensional (H)		
	Non-poor	Poor	Total		Non-poor	Poor	Total
k = 10%				***k = 10%***			
Non-poor	11.8	**88.3**	100.0	Non-poor	15.2	**84.8**	100.0
Poor	**1.4**	98.7	100.0	Poor	**2.7**	97.3	100.0
k = 30%				***k = 30%***			
Non-poor	62.5	**37.5**	100.0	Non-poor	54.8	**45.2**	100.0
Poor	**29.0**	71.0	100.0	Poor	**26.6**	73.5	100.0
k = 50%				***k = 50%***			
Non-poor	95.6	**4.4**	100.0	Non-poor	89.3	**10.7**	100.0
Poor	**70.5**	29.5	100.0	Poor	**61.0**	39.0	100.0
Source: Mongolia Dataset (World Bank)							

Conclusion

The results presented in this paper highlight that income or money-metric poverty measures only capture part of the story of urban livability and wellbeing of residents of Ulaanbaatar. While income poverty captures constraints of individuals' budget sets, multidimensional poverty highlights what is actually experienced. These findings are particularly relevant for policy makers in the context of Ulaanbaatar, as they highlight important dimensions that require state action to improve the lives of urban poor, such as increased capital investments in water and sanitation that explains 20-25% of the overall deprivation, depending on the cut-off selected (Figure 1).

More importantly, the use of multiple dimensions of consumption (food and non-food) and living standard allows us to identify more poor than one would on solely the income dimension. For example, in Table 3, 37.5% of those who were multidimensional poor were not captured at all as income poor. It is possible that these people might be just above the poverty line and as such missed by the income poverty measure but equally vulnerable as those below the poverty line in their experience of multiple depravations. Further, as highlighted by the results of Table 3, the probability of multidimensional poverty among the income-poor in Ulaanbaatar is high enough to request the attention of city administration to pay attention to the non-financial deprivations.

Next steps:

The analysis in this paper has presented preliminary findings from the analyses carried out so far. The analyses will be further developed in the final version to include the following:

- Multidimensional poverty profile for the residents of Ulaanbaatar when dimensional weights are applied. The aid of qualitative methods will be used to determine dimensional weights in this case. The mixed methods design of this project allowed us to introduce a module during the qualitative stage (following the survey data analysis), where we asked the participants to rank the key indicators of the deprivation or multidimensional poverty that we gleaned from the survey by asking their opinion on which indicators would they consider most important and which as least important if an effort for poverty reduction was undertaken. In addition to the ranking, the participants were also asked to explain the reasons for their choices. The transcripts from the focus groups are currently being analyzed. We will attempt to use these findings to come up with a weighting scheme our indicators and dimensions to capture the perceptions of those who are most likely to be affected by public interventions on poverty and inequality.

- An exploration of the missing dimensions of poverty that may not be captured by objective measures within survey data, for example highlighting the localized notions of poverty. For example, one of the recurring themes in the focus group discussions carried out with urban poor in Ulaanbaatar was the poverty of social networks signaled by increasing indifference of neighbors and the poverty of
- Separate analyses for residents living in traditional Ger dwelling structures versus those living in apartments and built houses.
- Utilization of additional measures from GIS data, such as distance of each respondent household from health facility, schools etc. Access to health is an important dimension that is currently missing in the data. The data on geographic coordinates of households is currently being cleaned and will be utilized for the final paper.
- Application of modified Grade of Membership (GOM) model that is applied to a set of ordered variables in order to define the latent structure of well-being in the destination for migrant and non-migrants.
    - Specifically, utilize GOM to compare levels of inequality using multidimensional GINI index versus GINI from the income distribution of the sample

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