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THE APPLICATION OF MULTIDIMENSIONAL POVERTY MAPS TO HIGH-INCOME COUNTRIES: A PROJECT PROPOSAL FOR ALLEN COUNTY, INDIANA, USA

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Abstract:

In high-income countries poverty maps are typically applied to represent concentrations of poor populations according to a single demographic variable, such as race. Notwithstanding, in low to mid-income countries these maps are used to maximum effect in that they represent different gradations of adverse living conditions understood as unmet basic needs. Our aim in this paper is to offer a model for the study of multidimensional poverty in high-income countries –Allen County, Indiana– that is able to capture the ways in which problems of need in housing, education, health, employment, nutrition, and environmental safety combine to produce households with joint disadvantages. We believe that multidimensional poverty maps constitute a superior way to grasp the needs of populations than single variable maps or poverty line methods. Data gathering will proceed by mailing a questionnaire to a sample of 3500 households in Allen County. Data will be processed through the application of cluster analysis and GIS mapping techniques. The presentation of these detailed estimates in the form of maps is a powerful communication tool that is readily understandable by a wide audience; further, mapping creates an important opportunity for different actors to join in the public debate on poverty.

Key words: High-income countries, multidimensional poverty maps, basic unmet needs, GIS mapping.

My first attempt was to enumerate the mass of the people of London in classes according to degrees of poverty or comfort and to indicate the conditions of life in each class. In connection with this attempt I mapped out the streets in colours and endeavoured to show by sample descriptions the kind of persons dwelling therein, their habits and the manner of their lives (Charles Booth).

INTRODUCTION

The present project inscribes itself within a long tradition of poverty studies: those initiated by Charles Booth in England during the latter part of the XIX and early part of the XX centuries. Booth (2012) administered household surveys in the poorest areas of East London whereby he gathered a great deal of information regarding issues such as the occupation and income of the city's population. Booth's work is an early example of social cartography, whereby each street is colored to indicate the income and social class of its inhabitants[1].

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[1] On-line free access to Booth's maps in http://booth.lse.ac.uk

Booth's (2012) maps were limited in that they only showed the spatial distribution of occupation and income in the city of London. Yet, in spite of these confines, Booth's efforts went beyond the mere estimation of poverty thresholds, and hence constitute a definite and valuable move towards the multidimensional study of poverty.

Today, poverty maps are not simply graphic representations of where the poor live: in their most complex versions they reveal the multifaceted ways in which different adverse living conditions interact with each other, thus identifying specific needs and problems in different communities and/or neighborhoods.

The present project aims to spatially map the gradations of adverse living conditions understood as unmet basic needs, as these present themselves in Allen County, Indiana. We intend to realize this project through the application of advanced statistical analysis and GIS software packages. The project aims to gather information regarding five basic dimensions of need: housing, education, income and employment, nutrition and health, and environmental safety.

For each one of these areas we will identify a number of indicators, and collect the related data through the administration of a mailed household survey. Cluster analysis will reveal the manner in which unmet needs group together.

1. THE POVERTY LINE: THE U.S. AND THE STATE OF INDIANA

The poverty line is a measure of the amount of money society believes is necessary for a person to live at a minimum level of subsistence or at a level consistent with a socially decent standard of living.

Once we have an aggregate consumption indicator for each household, we need to judge whether the amount defines the members of the household as poor. We calculate a poverty line, the threshold below which individuals and households are considered poor and above which they are considered non-poor.

A poverty measure is mostly used in three different ways: first, as a tool for looking into the extent and character of poverty; second, as a tool in the analysis of policy decisions; and third, as a reference point around which to form judgments on the cash benefit level of various programs.

Poverty lines can be estimated following two different methodologies:

- Absolute poverty line: when the line is defined in absolute terms, as the minimum cost of a reference living standard.

- Relative poverty line: when the line is defined relative to some measure of welfare for the entire population (distribution).

The absolute poverty line is set as an absolute level below which consumption is considered to be too low to meet the minimum welfare level acceptable. Absolute poverty lines are typically used in low or middle-income countries. In these countries, where some groups may be unable to reach minimum standards, an absolute poverty line is usually preferred to identify those in “absolute” need of interventions.

For instance, the absolute poverty line could provide relevant information in the case of Vietnam, where 27% of the population is poor, but would be of little use in the U.S or Britain. Yet, the absolute poverty line can be used for within country comparative analysis.

In practice, the cost of a basic food basket (or Economy Food Plan) necessary to attain the minimum energy intake is calculated. An allowance for non-food expenditure is then added. In Latin American Countries the trend is to multiply the cost of the food basket by two: the resulting cash amount will be the poverty threshold (De Venanzi, 1996). However, in the U.S, since families tend to spend a third of their after-tax income on food, the poverty level was set three times the cost of a nutritional but low cost diet for each person in the household (Meyer and Sullivan, 2012). For its part, the relative poverty line is set in relation to the overall distribution of income or consumption in a country/region of reference. Example: set the poverty line at 50 per cent of the mean consumption in the country, or at 50 per cent of the median consumption. As countries become better off, they have a tendency to revise the poverty line upwards. Relative lines are typically used in high-income countries, except in the USA.

Below we present a more detailed account of the way in which the U.S Department of Health and Human Services estimates the poverty line. The U.S. Census Bureau updates the poverty thresholds each year.

The budget includes: earnings, unemployment compensation, workers' compensation, Social Security, Supplemental Security Income, public assistance, veterans' payments, survivor benefits, pension or retirement income, interest, dividend, rents, royalties, income from estates, trusts, educational assistance, alimony, child support, assistance from outside the household, and other miscellaneous sources. Noncash benefits (such as food stamps and house subsidies) do not count. Income is before tax income. If a person lives with a family, the income of all family members is added (non-relatives, such as housemates, do not count).

Following are the 2014 poverty guidelines for the 48 contiguous states and DC[2]:

- $11,770 for individuals
- $15,930 for a family of 2
- $20,090 for a family of 3
- $24,250 for a family of 4
- $28,410 for a family of 5
- $32,570 for a family of 6
- $36,730 for a family of 7
- $40,890 for a family of 8

Programs using these guidelines fully or partially in determining eligibility include: Head Start, the Supplemental Nutrition Assistance Program (SNAP), the National School Lunch Program, the Low-Income Home Energy Assistance Program, and the Children's Health Insurance Program. Note that, in general, cash public assistance programs (Temporary Assistance for Needy Families and Supplemental Security Income) do not use the poverty guidelines in determining eligibility. The Earned Income Tax Credit program also does not use the poverty guidelines to determine eligibility.

The Johnson Administration adoption of a measure of poverty has lost much of its meaning and usefulness over time. In response to this criticism, the US Census Bureau released a secondary estimate: The Supplemental Poverty Measure (SPM). The SPM defines resources to count not just cash income, but also food stamps, tax credits, and other government benefits. It subtracts costs such as tax liabilities, childcare, and out-of-pocket medical expenses. It also has different poverty thresholds for renters and homeowners, and adjusts thresholds in response to regional variations in the cost of living (Meyer and Sullivan 2012). The new measure also serves as an additional indicator of well-being and provides a deeper understanding of economic conditions and policy effects (U.S. Census Bureau, 2014).

Nevertheless, the official poverty line is not to be replaced by the Supplemental Poverty Measure, for the official measure is sometimes identified in legislation regarding program eligibility and funding distribution. The SPM is simply designed to provide information on aggregate levels of economic need at a national level or within large subpopulations or areas and, as such, the SPM

[2] U.S Source Department of Health and Human Services.

will be an additional macroeconomic statistic providing further understanding of economic conditions and trends (Census Bureau, 2014).

Table 1 shows the differences between the items included in the official and the supplemental measures of poverty (see also Short, 2014; 2015).

Table 1. Poverty measure concepts: Official and supplemental

	Official Poverty Measure	*Supplemental Poverty Measure*
Measuring Units	Families and unrelated individuals	All related individuals who live at the same address, and any co-resident unrelated children who are cared for by the family and any cohabiters and their relatives
Poverty Threshold	Three times the cost of a minimum food diet in 1963	The mean of the 30th to 36th percentile of expenditures on food, clothing, shelter, and utilities (FCSU) of consumer units with exactly two children multiplied by 1.2
Threshold Adjustment	Vary by family size, composition, and age of householder	Geographic adjustment for differences in housing costs by tenure and a three-parameter equivalence scale for family size and composition
Updating Thresholds	Consumer price index	Five-year moving average of expenditures on FCSU
Resource Measure	Gross before-tax cash income	Sum of cash income, plus non-cash benefits that families can use to meet their FCSU needs, minus taxes, minus work expenses, minus out-of-pocket medical expenses, minus and child support paid to another household

Source: US Census Bureau, 2014.

For its part, table 2 shows the poverty measures produced by each one of the methods outlined above.

Table 2. Two adult, two child poverty thresholds: 2012 and 2013
(in dollars)

Measure	*2012*	*Standard Error X*	*2013*	*Standard Error X*
Official Poverty Measure	23,283		23,624	
Supplemental Poverty Measure				
Owners with a mortgage	25,784	368	25,639	289
Owners without a mortgage	21,400	233	21,397	337
Renters	25,105	398	25,144	400

Source: Bureau of Labor Statistics, 2014.

The United Way of Allen County-Indiana estimated an alternative measure it calls the ALICE Threshold. The ALICE Threshold is the average level of income that a household needs to afford the basics defined by the Household Survival Budget for each county in Indiana. This threshold represents a realistic measure for income inadequacy in Indiana that takes into account the current cost of basic necessities and geographic variation. The Household Survival Budget calculates the actual costs of basic necessities (housing, child care, food, health care, and transportation) in Indiana, adjusted for different counties and household types.

The rationale of producing an alternative poverty line is linked to the fact that (United Way, 2014: 1):

> the official U.S. poverty rate, which was developed in 1965, has not been updated since 1974, and is not adjusted to reflect cost of living differences across the USA

Also, the official poverty rate does not tell us anything about the financial stability of families. According to United Way (2014), the official poverty measure is so understated that many government and nonprofit agencies use multiples of the Federal Poverty Line (FPL) to determine eligibility for assistance programs. For example, eligibility for SNAP (formerly Food Stamps) in Indiana is 130 per cent of the FPL, and the Indiana Energy Assistance Program (EAP) uses 150 per cent as a threshold. Even Medicaid and the Children's Health Insurance Program (CHIP) use multiples of the FPL to determine eligibility across the country (United Way, 2014).

United Way (2014) also estimates a Stability Budget. This measure is greater than the Household Survival measure and reflects the cost for household necessities at a modest but sustainable level. It adds a savings category, and is adjusted for different counties and household types. The Stability Budget allows for family self-sufficiency.

The particular focus of the Report compiled by United Way (2014) is those families, ALICE families, with income above the federal poverty line, but below the basic cost of living. United Way estimates that these families' income is 23 percent short of the income needed to reach the ALICE threshold. However, the United Way Report presents standard-of-living figures for all kinds of households in Indiana.

Table 3. Allen County (Indiana) survival budget* and stability budget** for a single adult and a married couple (in us dollars)

	Single adult		*Married couple*	
	Survival budget	*Stability budget*	*Survival budget*	*Stability budget*
Housing	477	648	507	699
Food	170	318	354	647
Transportation	341	330	681	660
Healthcare	130	226	259	504
Miscellaneous	130	152	354	251
Savings	0	152	0	251
Tax	180	215	229	259
Monthly Total	1,427	2,041	2,113	3,271
Annual Total	17,126	24,494	25,352	39,251

Source: United Way (2014). Indiana Study of Financial Hardship.

∗The survival budget is based: Two BR apartment; home-based childcare; Thrifty food plan; two vehicles; Uninsured out-of-pocket money; no savings. ∗∗The Stability Budget is based on: Median home cost; Licensed childcare; Moderate food plan; Two vehicles; Employer health plan; Savings

Measures of poverty based on the poverty line are relatively straightforward and simple to use[3]. Some experts argue, however, that such measures are simplistic and do not capture the multidimensional complex nature of poverty. A common alternative measure to an absolute measure of poverty is a relative measure of poverty. Relative-income measures of poverty are characterized by comparing one income or standard of living to the living standard of a reference group, commonly the mean or median national income of a similarly structured household (World Bank, 2007).

2. POVERTY MAPS

Small area estimation poverty maps with highly specific geographic data that has been disaggregated are frequently used in poverty studies (World Bank, 2007).

[3] However, estimating the cost of a food basket can be a quite complex task. See for instance: Citro C. and R. Michael (Editors) (1995). Measuring Poverty: A New Approach, chapter 3: Adjusting Poverty Thresholds. National Academy Press, Washington DC.

Poverty maps rank areas from poorest to richest based on poverty estimations, although one needs to bear in mind that the estimates may have a corresponding standard error. Poverty maps may likewise be an important tool for decentralized governments whereby local authorities can identify the poorest districts, townships, or neighborhoods.

Detailed data representing a multitude of poverty estimates from communities (towns, villages, etc.) presented on maps are visually appealing and understandable by most people. When the data are presented in a map that contains a lot of data in just one page, it enhances the inter-item relationships among data by showing the spatial relationships among the variables across geographic locations, a significant and unique representation of the data compared to tabular data format (World Bank, 2007).

Targeting antipoverty spending accurately is a sizeable motivation for the development of these poverty-mapping techniques. Areas with the highest poverty rates and the greatest number of poor people (not always the same occurrence), are identified using these maps. Therefore, policies and programs would be able to make more effective use of limited resources. Poverty maps have a much wider impact than simply being a valuable tool for targeting programs. The maps have also informed the planning process at the subnational level. Poverty patterns revealed by maps may support the regional planning efforts that consider poverty in a particular areas and in neighboring areas and assess how these areas may be economically linked (World Bank, 2007).

Poverty level estimations for smaller areas require combining detailed household survey data with comprehensive coverage of a national census. Similarly, poverty maps provide another tool to examine the geographical determinants of poverty. Poverty maps can be combined with other spatial data including natural geography and climate (for example, elevation, rainfall, and temperatures), and infrastructure (such as, roads, railways, and markets) and thereby visually display poverty levels and various other types of data in a geographic area (World Bank, 2007).

The desire for more accurate targeting has been one of the motivating factors for engaging in small area estimation analyses. However, poverty maps have influenced policy in some unexpected ways. These impacts include (World Bank, 2007).

- A deeper understanding of poverty in a country;

- A radical shift in the dialogue on poverty, including the motivation for new strategies and approaches;

- The elaboration of the operational details of specific programs;

- Increased accountability among governments; and, last but not least,

- The development of capacity and interest in evidence-based policy making

Small area estimation poverty maps create an opportunity for social awareness of poverty issues by displaying very detailed information in particular geographic areas. Poverty dialogue relying on small area estimation poverty maps inherently include the discussion of the visually displayed heterogeneity of poverty and visual imagery of poverty in areas less likely to surface when relying on the percentage of the population below the poverty line, for example, poverty located in otherwise upscale neighborhoods. Small area estimation poverty maps may also provide visual imagery to support previously suspected patterns of poverty in a given geographic area, even if less well documented (World Bank, 2007).

Once there is a group in a country that is able to apply the small area estimation methodology, it then becomes possible, with guidance from experts in this methodology, to produce small area estimations for other indicators besides poverty, such as nutrition or HIV/AIDS prevalence. It also becomes possible to adapt the method to undertake small group estimations for non-geographical disaggregation of poverty. Many important population subgroups are statistically invisible in typical household surveys because they constitute a relatively small percentage of the population. Common examples of such subgroups are the disabled, orphans, or certain occupational classifications. Analyzing the poverty status of these subgroups separately may be useful for planning purposes in various ministries.

Producing poverty maps may be technically complicated, however, they are useful in creating a better understanding of unmet basic needs by a broad audience. The maps, therefore, work to create a venue for more stakeholders to participate in the dialogue about the determinants of poverty, policy implication, and the consequences of poverty. Moreover, small area estimation poverty maps are of great interest to local leaders and activists (World Bank, 2007).

Poverty maps often elicit a wider debate regarding the definition of poverty. A platform for comprehensive discussions on poverty measures and a particular national definition often occur as a result of the amplification of the maps. There are several examples where agreement in ranking of households is inconsistent across regions. The appropriate cut-off value that identifies the poor from the non-poor is commonly disputed. Hence, poverty maps are valuable instruments for fostering debate and analysis of a. What it means to be poor; b. How to adequately and appropriately measure poverty; and c. A number of perspectives on

measures which may enhance the understanding of poverty. Poverty maps, while reflecting the complexities of poverty measurement, have often produced agreement on official measures of well-being and poverty thresholds, (World Bank, 2007).

In conclusion, the most common motivations for estimating highly disaggregated poverty indicators and producing associated poverty maps are: a. Opening new dialogues on poverty; b. Designing interventions tailored to local needs, and c. Promoting evidence-based decision making.

3. POVERTY MAPS AND THE VALUE OF GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Integrating the small area estimates with geo-referenced information has allowed countries to analyze social programs, resource allocations and efficiencies. Using GIS, data also allows for the location and the characteristics of points of service and networks. Yet, challenges arise when attempting to gain significant discernment on the spatial correlates of poverty using most aggregate poverty maps. Historically, the poverty data were at a much lower resolution than other spatial data, creating errors in GIS analyses. The increased accuracy of GIS techniques allows for the integration of different units of analysis, which provides unique opportunities for examining, understanding, and addressing the realities of poverty. Indeed, many countries have been able to acquire a deeper understanding of poverty and its determinants by combining data from different sources and levels of analyses. As governments increase their understanding of the interrelations between these units they may consider adopting alternative approaches to fight poverty. In Sri Lanka, for instance, GIS analyses have been able to target more geographical isolated areas for which the government has designed special policies. It is important to note that GIS analyses do not establish causal relationships among variables. Their objective is to highlight the clustering of indicators to study further (World Bank, 2007).

GIS analyses are ideal for studying phenomena that exhibit spatial patterns. This is because GIS software incorporates detailed poverty data together with poverty correlates to create visually combined maps. The benefits of GIS analysis may be applied to spillover effects (when an intervention has effects beyond its immediate area), diffusion patterns (when knowledge, techniques, or practices are passed from one area to neighboring areas), other factors related to proximity and spatial interaction. Infrastructure, education, topography, and health data are some examples of data that may be integrated with small area poverty data through the use of GIS analysis. Additionally, a GIS analysis also allows of multiple item correlations even when several factors are included on maps. A primary feature of GIS analysis is the merged information of multi-level data, such as

district level poverty estimates and weather data that follow "natural" patterns rather than political or administrative boundaries, physically represented on maps (World Bank, 2007).

For instance, a GIS may include data on:

- Points of service delivery such as schools, health centers, or boreholes.
- Networks of infrastructure such as roads, electricity, or telecommunications.
- Areas of administration or livelihood such as enumeration areas, districts, or communities.
- The environmental situation of neighborhoods and townships.

For each of these types of data and situations, the GIS can include data on location (geographical coordinates) and may include data on the status of the item (such as the quality of a health center, the number of teachers in a school, the condition of a road, and so on).

If the poverty maps are available for more than one point in time, it becomes possible to examine temporal changes in poverty at a level that heretofore was not possible. In addition to exploring changes in poverty over the given time period, one may also examine how these changes and changes in other variables during the same time period are correlated. For inter-temporal comparisons to be useful, it is critical that the welfare measures and poverty thresholds are consistent over time.

4. MULTIDIMENSIONAL APPROACHES TO POVERTY: IDENTIFYING HOUSEHOLDS WITH JOINT DISADVANTAGES

By including and weighting a diverse set of social indicators that go beyond well beyond income, multidimensional approaches to poverty allow for a comprehensive and far reaching understanding of the social condition of a population. Multidimensional methods for measuring poverty are also known as indirect or relative methods. These *indirect methods* have been implemented with measures of *relative deprivation* in Europe, measures of hardship in the U.S, and official measures of Unsatisfied Basic Needs in Latin America. It was developed seeking to overcome a number of limitations negatively affecting the traditional poverty line method:

- First, the poverty line level of income does not guarantee that a person will meet his or her minimum needs;

- Second, different people may face different prices, reducing the accuracy of the poverty line;
- Third, the ability to convert a given amount of income into certain *functionings* varies across age, gender, health, location, climate and conditions such as disability – i.e. people's conversion factors differ.
- Fourth, participatory studies indicate that people who experience poverty describe their state as comprising deprivations in addition to low income.

The indirect method aims to provide a multidimensional view of the realities of poverty. Its first key message is that we need to address the deprivations that trap people in poverty together. This is because by being interconnected, acceleration in one goal often speeds up progress in others (OPHI, 2010).

One of the main advocates for the implementation of multidimensional measures of poverty is Amartya Sen, Nobel Laureate in Economics whose work underpins the concept and has argued powerfully for the need to take a multidimensional approach to poverty as well as development: "Human lives are battered and diminished in all kinds of different ways, and the first task… is to acknowledge that deprivations of very different kinds have to be accommodated within a general overarching framework" (Sen, 2000).

We can identify two approaches to the manner in which the indirect method is employed. The first is a combination of direct and indirect methods. A number of unmet basic needs are weighted and then a single index is produced which points to different levels of poverty. The work of the *Oxford Poverty & Human Development Initiative* (OPIH, 2010) illustrates this approach. According to this organization, no one indicator alone can capture the multiple aspects that constitute poverty. Multidimensional poverty is made up of several factors that constitute poor people's experience of deprivation-such as poor health, lack of education, inadequate living standard, lack of income, disempowerment, poor quality of work and threat from violence. Thus, a multidimensional measure can incorporate a range of indicators to capture the complexity of poverty and better inform policies to relieve it (OPIH, 2015).

The Global Multidimensional Poverty Index (MPI) is an index of acute multidimensional poverty. It reflects deprivations in very rudimentary services and core human *functionings* for people across 104 countries. Although somewhat constrained by data limitations, the MPI reveals a different pattern of poverty than income poverty, as it illuminates a different set of deprivations.

The MPI comprises three dimensions: health, education, and standard of living. These dimensions give way to ten social indicators:

- First dimension.
  Health. Indicators: Nutrition and child mortality
- Second dimension.
  Education. Indicators: Years of schooling and school attendance
- Third dimension.
  Living standard. Indicators: Cooking Fuel, sanitation, running water, electricity, flooring, and assets.

Poor households are identified and an aggregate measure constructed using the methodology proposed by Alkire and Foster (2007, 2009). Each dimension is equally weighted; each indicator within a dimension is also equally weighted.

In sum, indirect or relative methods for measuring poverty tend to disclose quite distinct poverty structures (or compositions) between areas of the same country or even between relatively close communities and localities. Additionally, the MPI can be unfolded to show different patterns of interlocking deprivations. By using the OPHI method we can ultimately know:

- How people are poor (which deprivations strike people at the same time)
- Where the poorest people live – by region or social group
- The intensity of the deprivations experienced by those living in poverty.

In addition to measuring poverty and wellbeing, OPHI's method can be adapted to target services and conditional cash transfers or to monitor the performance of social programs.

A similar approach to measuring multidimensional poverty is used by the United Nations Development Program (UNDP). According to the United Nations, development, like poverty is multidimensional-but this is traditionally ignored by money metric measures of poverty.

The UNDP Multidimensional Poverty Index (MPI) was published for the first time in 2010; it complements monetary measures of poverty by considering overlapping deprivations suffered by people simultaneously. The index identifies deprivations across the same three dimensions as the Human Development Index[4]

[4] The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. The health dimension is assessed by life expectancy at birth component of the HDI is calculated using a minimum value of 20 years and maximum value of 85 years. The education component of the HDI is measured by mean of

and shows the number of people who are multi-dimensionally poor (suffering deprivations in 33 per cent of weighted indicators) and the number of deprivations with which poor households typically have to contend with. The Index can be deconstructed by region, ethnicity and other groupings as well as by dimension, making it an apt tool for policymakers (PNUD, 2013; UNDP, 2014).

- Education: Children's years of schooling
- Health: Malnourishment and infant child mortality rate
- Standard of living: access to electricity, sanitary infrastructure, access to running water, quality of flooring (dirt vs. cement or other solid material), access to cooking fuel, possessions such as means of transport, refrigerator, radio, telephone and television set.

Households are classified as poor or non-poor according to the number of unmet basic needs.

The most comprehensive multidimensional method for measuring poverty to date is that developed by the Economic Commission on Latin America and the Caribbean ECLAC, a United Nations agency, and released in their report titled Social Panorama of Latin America 2014 (UNDP, 2014).

The method includes thirteen indicators of poverty grouped in five dimensions: housing, basic services, living standards, education, and employment and social protection. Results from the application of this method revealed that that approximately 28 per cent of the Latin American population lives in multidimensional poverty, with highest levels in Nicaragua, Honduras and Guatemala, and lowest levels in Chile, Argentina, and Uruguay.

The governments of Mexico, Colombia, and Chile have already adopted official national multidimensional poverty measures –incorporating dimensions of poverty that are relevant to their countries– enabling them to design effective poverty-reduction programs. Many other countries are now lining up to fight poverty nationally, using multidimensional poverty measures as a tool to align management and policy; table 4 below shows the various dimensions included in the ECLAC method.

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years of schooling for adults aged 25 years and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita.

Table 4. Multidimensional poverty index - urban areas

Dimensions	*Deprivation Indicator*
Dwelling	
Makeshift building materials	Dirt floor, waste material
Overcrowding	Three or more people per room
Insecure housing tenure	Living as squatters, living in borrowed or ceded housing
Basic services	
Lack of access to improved water sources	Households obtaining water from unprotected wells, tanker truck, bottled water, river, and rainwater
Lack of improved sanitation	Waste not connecter to sewer, shared toilet, and no sanitation
Lack of source of energy	No electricity, or using firewood, coal, or waste for cooking
Living standard	
Insufficient resources	Households with insufficient per-capita income to meet food and non-food needs
Lack of durable goods	Household without: vehicle, refrigerator, and washing machine
Education	
Non-attendance at school	Household has at least one child (6 to 17 years old) who does not attend school
Schooling gap	Household with at least one child or adolescent who is two years or more behind schooling grade for age
Low educational attainment	House has: nobody aged 20 years old or above with minimum level of schooling, Persons 20 to 59 years of age with no complete secondary education, and persons aged 60 and above with no completed primary education
Employment and social protection	
Unemployment	Household has at least one person aged 15 to 65 in the following situation: Unemployed, employed without pay, or discouraged worker
Lack of social protection	Household where no one contributes toward a co-payment health insurance, no one is affiliated to social security system, and no one has income from a pension or contributory-based retirement scheme

Source: ECLAC (2014). *Social Panorama of Latin America*. Santiago de Chile.

Even though the ECLAC method is generally employed to understand the complexity of poverty in Latin American countries, a review of the categories of need typically included in these studies can provide some insight regarding the selection of poverty conditions to be encompassed in our own project. This implies looking into the categories of need used in such projects –such as education, housing and others– yet identifying the actual ways in which these living standard shortcomings are likely to show in highly developed countries such as the USA the following section of this project will deal with this critical issue.

5. AN ALTERNATIVE MULTIDIMENSIONAL METHOD APPROACH TO POVERTY: CLUSTER ANALYSIS THROUGH GIS MAPPING TECHNIQUES

As was stated at the beginning of this proposal the present research does not aim to produce a new measure of poverty, or to simply show geographical areas with different concentrations of poverty, usually according to race or ethnicity. Instead, it purports to map patterns and combinations of unmet basic needs as these occur in the various areas of Allen County. We aim to produce a visual representation of the complex ways in which different adverse living conditions interact thus, creating specific needs and problems in different communities and/or neighborhoods of the county.

It is expected that the knowledge obtained through the application of this methodology will be instrumental in helping direct or redirect public and private resources to alleviate poverty in a more efficient and targeted manner. In short, we aim at producing knowledge relevant for the social policy planning activity of the city.

The application of cluster analysis to our data will allow us to organize observed data (social indicators) into meaningful structures. As cluster techniques simply discover structures in data without explaining why they do exist, they allow for further experimentation of cause-and-effect relationships between the indicators included in the study.

In the next section of this paper we proceed to identify the dimensions of poverty and the types of indicators to be included in the household survey. As seen earlier, multidimensional studies of poverty include indicators regarding social dimensions such as housing, health, employment, income, possession of material goods, and education. However, the methods reviewed in the previous sections of this project mostly refer to living conditions of populations as they present themselves in developing countries. This means that we have to identify alternative indicators for such dimensions, which are able to produce meaningful

information concerning the living conditions of populations in an advanced economy such as exists in the USA.

6. DIMENSIONS OF NEED AND SOCIAL INDICATORS TO BE INCLUDED IN THE STUDY

Housing

Housing is a primary and fundamental human need. We aim to understand the housing patterns in Allen County, Indiana. We not only include typical measures of housing, (i.e., type of housing, rent or own, etc.), but also include expanded measures of housing. Going beyond the typical measures of housing provides insight into the quality of housing characteristics that allow for comparison with international patterns of housing that are not usually asked of US residents. Including these expanded items allows us to understand if people have functional restroom facilities, dirt floors, working utilities such as water and electric, and a heat source. These types of housing questions are not uncommon in other countries. However, they are seldom asked of residents in the US possibly creating the presumption that very poor housing conditions do not exist. When we ask the questions, we may find that some population in the US has housing that mirrors economically deprived countries.

One aspect of the environment is the ratio of people per bedroom in the household. By considering the ratio of people per bedroom, a clearer picture of basic needs may emerge. Generally, more than three people in a bedroom are considered to be cases of overcrowding. Overcrowding in a household is associated unmet basic needs and poses other risks to members of the household.

Overall, our goal is to fully understand the housing patterns and characteristics Allen County, including whether very poor housing conditions exist. To fully assess housing patterns we ask respondents the following housing indicators. We ask respondents to indicate their living situation (for example, apartment rental, single family, apartment rental, multiple family, own my home, rent a home, currently homeless, living in shelter, currently homeless: living with friends, currently homeless, living outdoors, currently homeless: living with family, living in a hotel / motel, multiple family home, squatters, or transitional housing). We inquire about the square feet of living space, the type of and availability of air conditioning and heat sources (for example, wood heat, geothermal heat, electric heat, propane heat, no heat, or natural gas), number of bedrooms, number of people in the household, type of flooring (such as, wood, carpet, dirt, no floor covering, etc.) and type of water (for example, city / county water, no running

water, private well, other, or unsure). We also inquire about the type of waste system used (for example, septic system with filter bed, septic system with tanks, city or county waste system, no waste system, unsure, or other). Additionally, we ask about the type of cooking fuel most often used in the household (for example, natural gas stove / oven, hot plate, electric stove / oven, wood, no stove / oven / or other cooking appliances, or propane stove / oven). We assess the functionality of restroom facilities and utilities such as water and electric, and heat source.

In relation to housing and utilities we also ask how many times respondents needed assistance to pay for housing and utilities and from where they received the support for their housing and utility needs. We also ask how many of the following items are in the household: television, computer, refrigerator, car / truck / van, and standalone freezer. Finally, we use zip codes from respondents to use in mapping geographic location in Allen County.

Transportation

Because transportation is highly related to meeting basic needs, we ask a few questions about transportation. We ask about the usual form of transportation (for example, own car / truck / van, bicycle, a borrowed car / truck / van, bus, relative, walking, friend, horse, or taxi) and if the form of transportation is reliable.

Education

We previously highlighted the differences in education measures typically used in developing countries (see table 4.) In developing countries a youth going to school is a “success”. We include primary and secondary measures of education often used in poverty studies in developing countries, but also include measures beyond primary and secondary indicators of education attainment. We include on typical indicators of education used in poverty studies in the US. These indicators include highest level of education completed and which educational categories people present in the household have (i.e. graduate/professional school, college, high school, elementary, kindergarten, preschool, and less than three years old). It is important to consider the role of education to understand patterns of unmet basic needs in Allen County, Indiana. Generally, lower education levels are associated with higher risk of unmet basic needs. However, in Fort Wayne, Indiana there is a sizeable group of Burmese refugees and other similarly situated people. Refugees hold a special category regarding education because many of their degrees may not be recognized or useable in a host country.

Thus, a percentage of the population may have higher risks of unmet basic needs regardless of education attainment.

The indicators of education are twofold. We ask the highest level of education completed (such as, less than high school, high school / GED, some college, 2-year college degree, 4-year college degree, masters degree, doctoral degree, or professional degree (JD, MD). We also consider the educational categories that children have (such as, less than 3 years old, nursery school or preschool, kindergarten, elementary: grades 1-4, elementary: grades 5-8, high school: grades 9-12, college: undergraduate, or graduate or professional school). We also ask if children attend school.

Health

We include health as a key focus variable following the "probabilistic cascade" as presented by Bartley (1999). This notion of probabilistic cascade captures the essence of the immediate and ongoing cumulative negative or positive effects of social class on factors such as health (Blane, 1999). Social determinants of health are considered as these play a major role in access to health care, quality of care, and overall health. So, here, while we measure health independent of other variables, we concur that health is complicated, compromised, or strengthened by social indicators of health, such as having higher education levels. But, to assess health, we rely on a health needs assessment scale and a food security scales as each contribute to overall health. The health needs assessment scale asks about individual health in the prior year by specifically asking about types of illnesses and access to healthcare. We ask respondents if they have medical insurance, an ongoing medical provider, access to needed medications, distance traveled to obtain medical care and treatment, affordability of medical care and treatment, obstacles to health care, and about their overall health status. We continue to understand health through understanding food security.

To assess food security we use a common food security scale developed and used by the USDA (see Coleman et all, 2013*)* and we also ask additional food-related questions. We ask how many times in the last year adult(s) ever cut the size of meals or skipped meals, they ate less than they felt they should, if they were hungry but didn't eat because they couldn't afford it, if they've lost weight, if they have not eaten for a whole day, if they've cut the size of children's meals, if the children have been hungry, if the children have skipped meals, and if the children have not eaten for a whole day. To garner more insight we use the following indicators of food security. We inquire how many times in the past year they worried food would run out before they got money to buy more, they bought

food that didn't last and they didn't have the money to get more, they couldn't afford to eat balanced meals, they relied on few kinds of low-cost food to feed children, they couldn't feed the children balanced meals, and their children were not eating enough. We use additional indicators of access to food by asking the following questions: how many times in the last week have you purchased groceries, where respondents typically obtain their food (for example, grocery store, farmers' market, food pantry / food bank, church, gas station, garden, restaurant / fast food), how far they travel to purchase food, if they received SNAP or WIC benefits in the previous 30 days, if anyone receives free or reduced-price lunch benefits, and if they have received emergency food from a food pantry in the previous year).

Income

Similar to education, prior research on poverty in developing countries rely on income measures that assess meeting food and non-food needs (see table 4). The current includes income measures similar to research on poverty in developing countries but goes beyond the measure of income. We also incorporate typical indicators of income frequently used in US poverty studies. These additional indicators of income include annual income range, total combined household income, and how many people are dependent upon the household income. We ask what are all sources of income in the household.

We also ask how respondents manage emergency financial situations. We ask what respondents do in order to meet expenses (for example, seek permanent employment, seek temporary employment, (if already employed do they seek more hours either at their current job or by adding an additional employer), try to reduce expenses, seek free food sources at food banks, seek government assistance by applying for programs such as food stamps, housing assistance, TANF (temporary assistance for needy families) etc., apply for emergency assistance from the Township Trustee, seek monetary or housing assistance etc. from a non-governmental organization, such as a church etc., take out student loan money, put expenses on a credit card, seek a loan from a family member or friend, seek a gift of money or other items such as food from a family member or friend, move in with a family member or friend, other and don’t know).

Employment

We rely on typical indicators of employment by asking if the respondent is employed, and if so, in what industry (for example, forestry, fishing, hunting or agriculture support, work from home, mining, utilities, construction, manufactur-

ing, wholesale trade, retail trade, transportation or warehousing, information, finance or insurance, real estate or rental and leasing, professional, scientific or technical services, management of companies or enterprises, administrative, support, waste management or remediation services, educational services, health care or social assistance, arts, entertainment or recreation, accommodation or food services, other services (except public administration), or unclassified establishments) and who in the household is unemployed.

Environment

Key to the current study is the inclusion of environment measures. Prior studies of poverty in developing countries tend not to include environment measures (see table 4). Participants will be asked questions about their perceptions of safety and risks pertaining to their environment. It is important to include measures of perception of safety and risk of their environment as a pattern of clustering may emerge during mapping of basic unmet needs. We aim to understand two branches of environmental conditions: a. Environmental issues within the home and physical setting of the home, and b. Environmental issues beyond the home, such as neighborhood / community / and work settings. The first series of environmental questions relate directly to the home. We will ask questions regarding the overall safety of the home environment, such as lead paint exposure. We will also ask about the known and perceived risks in the neighborhood (such as crime victimization/fear of crime, exposure to toxins, etc.) and in the broader community, such as adequacy and safety their water, and what perceived and known toxins they have been exposed to in their places of employment. We will also apply environmental issues that have been previously documented in the townships of respondents to all mapping analyses.

Leisure

Traditional poverty maps on developing countries do not include indicators of leisure (see table 4). Here, we rely on a commonly used leisure scale in US based research. The scale is comprised of several questions. The questions ask about motivation for engaging in leisure activities, in what activities they participate, and how often and why they participate in these activities. It is important to consider how people spend their leisure time in Allen County. Mapping leisure activities with housing, education, income, health and employment may reveal patterns of clustering wherein people who lack basic needs are more or less engaged in healthy leisure activities.

Demographics

Because the analysis will consider demographic characteristics, we ask several questions to garner demographic data (for example, with which gender do you identify, age, race, age of children in the home, family structure, and language spoken in the home).

CONCLUSIONS

In summary, this study aims to understand poverty at the local level by conducting a household survey of a representative sample of Allen County, Indiana residents. The key contribution of the study is to map basic needs in the community with additional social, environmental and health factors. This mapping technique may display particular geographic areas with the most unmet basic needs. Policy implications include the ability to provide targeted services by NGO's and health care providers and food suppliers in the areas with the greatest unmet basic needs.

The primary contribution of this project is to reformulate poverty maps to make them applicable to high-income countries. By incorporating multi-level data derived from the household survey and the inclusion and overlay of additional data at the state, county, and local areas, more informed, insightful visual displays of poverty in Allen County, Indiana will emerge. This visual GIS map of local poverty may reveal areas of poverty not otherwise expected, such as poverty found in wealthier areas, poverty in areas with high concentrations of refugees, and poverty concentrations throughout the county. By applying a definition of poverty commonly used in low-income countries as well as poverty measures typically used in high-income countries, a new discourse on poverty may result.

The policy implications of this study are paramount. Practitioners throughout the county may take the maps and use them for discourse on life in poverty, how to resolve poverty, and other social services distributions in particular local areas.

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