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Optimal Multi-Dimensional Poverty lines: The State of Poverty in Iraq

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Abstract. Poverty estimation based on calories intake is unrealistic. The established concept of multidimensional poverty has methodological weaknesses in the treatment of different dimensions and there is disagreement in methods of combining them into a single poverty line.

This paper introduces a methodology to estimate optimal multidimensional poverty lines and uses the Iraqi household socio-economic survey data of 2012 to demonstrate the idea. The optimal poverty line for Iraq is found to be 170.5 Thousand Iraqi Dinars (TID).

1. INTRODUCTION

The notion of “Poverty” goes back to the colonial warfare of the twenties century as campaigners against the South African War (1899–1902) reported that a large number of those volunteering for the army were found unfit to serve [1]. Since then, various scholars have attempted to identify the means of describing who should be counted as poor: those whose consumption falls below social standards, those who do not have access to the barest necessities or those who do not have the means to function at socially acceptable levels.

Among the most notable and classical approaches for the estimation of poverty lines is that of Orshansky [2, 3], that is based on the amount of expenditure to secure a healthy living. Although various researchers have made improvements to this approach, in essence, it has remained the procedure on which the American poverty estimation relies on. Her measure was needs based: What costs an American housewife to provide her family with enough dietary nutritional needs for a healthy living. Other durable needs were estimated as the inverse of the proportion of the total family expenditure on food. This measure has been revised and replaced by the percentage multiplier increase for durable needs by their sampling survey estimates [4, 5]. The longstanding political unrest in Iraq has drawn attention and with support from The World Bank, poverty line estimates for 2007 and 2012 [6] have been produced based on per-capita expenditure on food and durable family needs.

The multidimensionality of poverty remains evident [7]. It has further been emphasized [8] that economic development alone cannot reduce poverty and even argue for its possible increase. It is been argued that improvements in education standards and better healthcare could be better drivers in poverty alleviation [9]. It has also been demonstrated [10] that the origins of poverty could be found in the system of governance and the types of economic policies that are in place to run governments. Nevertheless, the bottom up approach for elevating poverty remains necessary due to its global scale and its urgency [11].

Following the pioneering work of Bourguignon and Chakravarty [12] that proposed the calculation of separate poverty lines for each of the dimensions of poverty and considered a person to be poor if he or she falls below at least one of these lines [13,14]. Also, notable contributions on these lines by the Oxford Poverty and Human Development Initiative have been made [15].

While the multidimensionality of poverty has been well established, suggestions have been made to construct a single poverty line using a combination of different marginal poverty lines of the various dimensions of poverty for

comparative assessment at different levels [14, 16]. Despite the practical advantages of these approaches, subjectivity has remained a critical weakness [17, 18, 19]. The latter suggests the need for multiple sets of indices.

This paper is introducing a new approach for modeling poverty developing a single poverty line in relation to its natural multidimensional causes. The new approach is called Optimal Multi Dimensional Poverty Line (O-MPL) obtained through extending the decision tree approach that is based on Chi-Squared Interaction Detector (CHAID) to *best* cluster the population under-study based on the available demographic and socio-economic factors for each candidate guided by their per-capita income. Optimal sensitivity and specificity measures are used to arrive at the best partition line for the population into poor and non-poor.

The new methodology is applied to a household socio-economic survey that has been conducted by Kurdistan Region Statistics Office (KRSO) in partnership with the Central Statistics Office (CSO) for the Federal Government of Iraq under the supervision and financial support from the World Bank [20]. In all, household participation was kept at will and information on individuals was protected through codes making sure that data protection and ethical codes of practice are followed.

2. METHODOLOGY

Let $X_{ij}; i = 1, \dots, M; j = 1, \dots, p$ be the recorded information on p explanatory demographics and socio economic measures obtained from a sample size of M from the population concerned, within which X_k^* represents the per-capita expenditure calculated using deflated prices for inflation.

Also, let $L_n, n = 1, 2, 3, \dots, N$ be successive artificial cutting points, one of which would be expected to closely represent the relevant poverty line.

For each survey respondent, a set of dummy variables, $y_{ni}; i=1,2,\dots,M$ & $n=1,2,\dots,N$ is introduced so that:

$$y_{in} = \begin{cases} 0 & \text{if } X_{ik}^* \leq L_n \\ 1 & \text{if } X_{ik}^* > L_n \end{cases}$$

where $i=1,\dots,M$ & $n=1,\dots,N$.

For each I , a CHAID partition of data is formed by relying on the explanatory variables to best classify participants based on their per-capita expenditure being on either sides of the cutting point L_i [21]. The predictive power of the developed tree is recorded using the sensitivity SE_i and specificity SP_i as complements of type-I and type-II errors in classical statistical decision theory.

Then, the O-MPL is represented by L^* , the per capita expenditure that corresponds to $\min_{i=1,2,\dots,N}\{SE_i - SP_i\}$.

In addition, as it is accustomed in classical statistical decision theory, for the benefit of identifying a larger proportion of the poor, the poverty line can be set subjectively at a cutting point (usually higher than L^*) so that the corresponding $1 - SP_i$ secures predicting the proposed percentage of the poor. In other words, L^* can be set as an alternative poverty line [22] corresponding to a subjectively set \widehat{SP} . This would be at the cost of miscounting a small proportion of the non-poor as being poor. While L^* is the statistically optimal multidimensional poverty line, the new approach has the opportunity to provide an alternative poverty line \widehat{L} , that would be socially desirable to better support strategy developers and decision makers for poverty reduction. This will be explained further within the results section.

3. DATA

The post liberation Iraq has taken a new dimension moving from a centralized to a federal state with Kurdistan Region having its own independent legislation system. With two separate parliaments and governments, often-different socio economic policies and strategies are being followed. As a result, differences in the levels of security, socio economic and overall standards of living can be observed across the regions. Beyond these facts, both the KRSO and the CSO of the federal government have cooperatively followed a unified strategy in conducting a socio economic household survey in 2012 with support from the World Bank. The survey has included a total of 24944 participants from all the 18 governorates drawn from a balanced distribution of a total of 13834 households covering both rural and urban areas. The percentage of urban households was 74.4.

The variables considered for this analysis included per capita expenditure, governorate, age group, gender, family size, environment (urban, rural) and highest level of education achieved.

The dataset is rich enough to provide an opportunity to disaggregate the analysis based on policy formation and economic activity centers. On that basis, the following section provides O-MPL for Iraq as a whole and the rest of the governorates within it.

4. ANALYSIS

After over twenty years of the end of centralized dictatorship, Iraq is still struggling to redefine itself according to its constitution as a federal state. In that, it more often pulls back to its old style of centralization. From that point, the tendency of producing indicators at a national level is running high within the federal governments' analysts and decision makers despite the visible diversity and inhomogeneity between Kurdistan Region and the rest of the country. As a by-product, a national poverty line was estimated to be 105.5 Thousands of Iraqi Dinars (TID) using the national household survey that was conducted during 2012 [19]. Of this amount, 50.473 TID was estimated expenditure required for providing 2230 calories per person and the rest was estimated to be the cost of other durables. Even for the latter figures, a unified expenditure on food was used with different cost of durables for different regions. As indicated earlier, we rely on the same survey to demonstrate the new methodology.

5. IRAQ CHAID CLASSIFICATION TREE

A series of CHAID models were run with different per-capita expenditure (price deflated) as the lead classifier with each of the variables: gender, age group, highest educational certificate achieved, family size, governorate and the district that the participant lives in. The specificity and sensitivity profiles for different per-capita expenditure are presented in figure 1 with $L^* \approx 170.5 TID$ at which the specificity and sensitivity levels are 73.0% and 73.1% respectively.

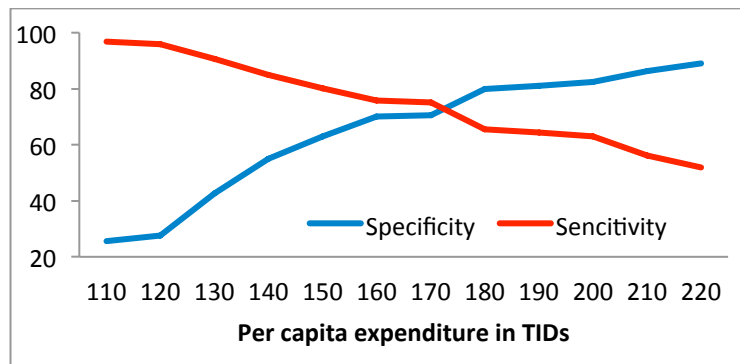


Figure 1. All Iraq Model validity profile

This implies that 48.2% of the Iraqi population is below the optimal poverty line of which 59.6% live in the rural areas.

A detailed distribution of those below the optimal poverty line both as part of Iraq and within governorates is given in Table 1 below.

Table 1. Iraq poverty levels

Governorate	In Iraq %	Within Governorate %
Erbil	4.2%	26.0%
Suleimaniya	5.4%	19.8%
Duhok	3.5%	30.8%
Baghdad	8.5%	47.8%
Kirkuk	3.1%	45.0%
Nineveh	9.9%	64.6%
Diala	6.1%	58.1%
Al-Anbar	6.2%	43.7%
Babil	3.5%	49.0%
Kerbala	3.1%	60.7%
Wasit	5.6%	53.1%
Salahuddin	6.6%	46.6%
Al-Najaf	2.2%	41.2%
Al-Qadisiya	5.5%	78.3%
Al-Muthanna	5.7%	80.4%
Thi-Qar	6.6%	74.5%
Missan	8.1%	76.0%
Basrah	6.3%	51.0%
Total	100.0%	48.2%

Despite the lack of decision-making and policy formation reliability of the above model, results clearly state the lack of homogeneity between the governorates and suggest the need for considering the development of policies at a regional level. In addition, as Kurdistan Region has its own decision center separate from the Federal Iraq, separate and independent indicators are necessary for designing, implementing and monitoring poverty reduction strategies.

In further support of policy designs, alternative poverty lines can often be considered at levels higher than the estimated O-MPL (see Figure 1). For example, while raising the poverty line from 170 to 180TID increases the predictability to over 80% of the poor, this percentage would not change much by raising it to 200TID. This explains the difference between optimal statistical decisions and policy optimal decisions that were discussed earlier.

Based on the above findings, separate optimal poverty lines will be developed for each of Kurdistan Region, Baghdad and the rest of the governorates in a separate forthcoming paper.

6. DISCUSSION

This paper provides a statistically optimal methodology for optimally estimating multidimensional poverty lines for any population given the availability of relevant and reliable data. The statistical optimality is taken to be the critical point that balances between the well known measures of specificity and sensitivity or type-one and type-two errors. The methodology can also be considered as a solution to the existing diversities in the analysis of multidimensional poverty and the subjective weighting and combining marginal poverty lines to form an aggregated line.

The methodology is simple to implement and can rely on as many dimensions as their data are available and relevant including calories intake.

The new poverty line estimate for Iraq and is naturally higher than those obtained through the use of calorie needs as the multidimensional approach has the capacity to accommodate those who are poor based on factors more than just one. Furthermore, the non-linearity nature of the predictability profiles can provide deeper understanding of the distribution of the poor within the population of concern.

7. REFERENCES

1. S. Rowntree, *Poverty: A Study of Town Life* (London, Macmillan, 1901).
2. M. Orshansky, Social Security Bulletin 28, 3-29 (1965).

3. M. Orshansky, *Monthly Labor Rev.* 92(2), 37–41 (1969).
4. P. Ruggles, *Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy*. (Washington DC: Urban Institute Press, 1990).
5. P. Saunders, J. Bradshaw and M. Hirst, *Social Policy & Administration* 36(3), 217–234 (2012).
6. World Bank Report. 2016. *Poverty in Iraq, 2012-2014*. (Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/239351468915807676/Poverty-in-Iraq-2012-2014>, 2016).
7. P. Townsend, *Oxford Economic Papers* 37, 659-668 (1985).
8. P. Cremin and M. G. Nakabugo, *International Journal of Educational Development*, 32, 499–506 (2012).
9. M. Hayes, Report of the National Forum on Development Aid on the Role of Multilateral Agencies in Development, (Irish Aid Advisory Committee, 44, Dublin, 1998).
10. D. Acemogle and J. Robinson, *Why Nations Fail: The Origins of Power, Prosperity and Poverty* (Crown Publishers, New York, 2012).
11. R. Kanbur and A. Sumner, *J. Int. Dev.* 24, 686–695. Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/jid.2861 (2012).
12. F. Bourguignon and S. Chakravarty, *Journal of Economic Inequality*, 1(1), 25–49, (2003).
13. J. Deutsch and J. Silber, *Review of Income and Wealth*, 51(1), 145–74, (2005).
14. E. Maasoumi and M. A. Lugo, *The Information Basis of Multivariate Poverty Assessments* (In Kakwani N. and Silber J., New York: Palgrave Macmillan, 2008)
15. S. Alkire S., and M. E. Santos, *Acute Multidimensional Poverty: A New Index for Developing Countries*. (OPHI Working Paper Series No38. Oxford University, Department of International Development, Oxford Poverty and Human Development Initiative, Oxford, UK, 2010).
16. S. Alkire and J. Foster, *Journal of Public Economics* 95(7), 476-487, (2011).
17. K. Decancq, *Oxford Economic Papers*, December 1st, 1-21, (2013).
18. P. K. Pattanaik, S. G. Reddy and Y. Xuz, *Oxford Economic Papers*, 64, 43–56, (2012)
19. M. Ravallion, *Journal of Economic Inequality*, 9(2), 235-48, (2011).
20. G. V. Kass, *Appl. Stats.* 29(2), 119-127, (1980).
21. C. F. Citro and R. T. Michael, *Measuring Poverty: A New Approach* (Washington DC National Academy Press, 1995).