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Retrospective Birth Weight Data in Developing Countries: Can it be Trusted?

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Extended Abstract

Introduction

The calculation of the proportion of infants born with LBW, defined as weighing below 2500g at birth, is seen as a good indicator of the health of mothers and infants in a region. Birth weight itself is one of the most important determinants of child survival (McCormick, 1985) and has been used as an indicator of an individual infants general health at birth (Millman & Cooksey, 1987). However, to calculate the proportion of infants with LBW is problematic due to the number of infants who are not weighed in some developing countries. Infants with recorded birth weights have different characteristics to those without (Da Vanzo, Habicht, & Butz, 1984; Moreno & Goldman, 1990). Any estimate of the proportion of infants with LBW using only those who do report a birth weight is therefore not representative of the full population of infants.

To compensate for the missing data a method using the mothers perception of her child's size at birth has been devised (Boerma, Weinstein, Rutstein, & Sommerfelt, 1996) and developed (Blanc & Wardlaw, 2005). Demographic and Health Surveys (DHS) ask all mothers to classify their child's size at birth into one of five categories, ranging from very small to very large. The proportion of weighed infants who are of LBW in each of these categories can then be applied to those without a birth weight to produce a more representative estimate. However, this method assumes that the birth weights that have been recorded are accurate, and that the birth weights are a homogenous entity with respect to any deviations from this accuracy. Yet minimal attention has been given to the actual accuracy of reports of birth weight in developing countries. In this study the accuracy of birth weight reports are assessed for Bolivia, Cambodia, Gabon, India, Mali and Nicaragua, and the proportion of infants with LBW estimated using different assumptions for these countries.

Results

The amount of missing data observed in the countries under analysis ranges from 11.4% in Gabon to 84.1% in Cambodia. Logistic regression studying the characteristics of infants who have a recorded birth weight indicate that those with a reported birth weight are more likely to

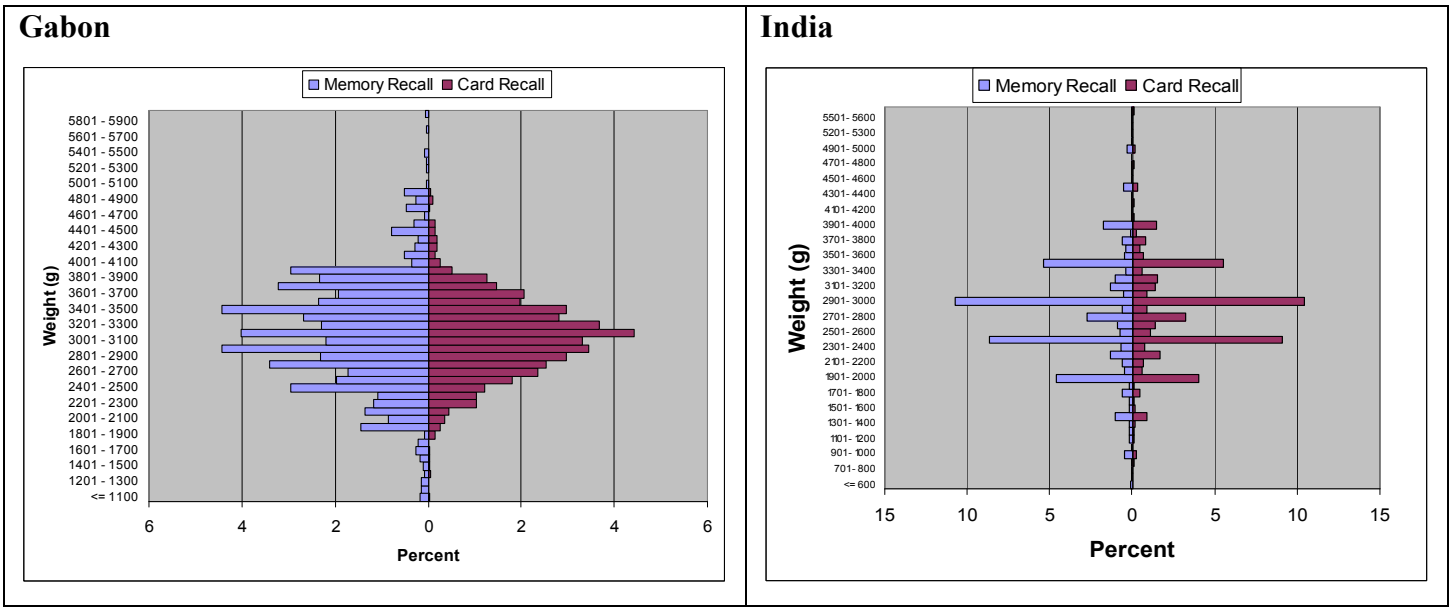
be born in a hospital, live in an urban area, are alive at the date of the interview, and that their parents have a higher level of education. These characteristics are all associated with a higher birth weight and thus simply using these weights to calculate the proportion LBW in a population is likely to underestimate the true proportion and will be further explored in the full paper.

Weights are recorded metrically in all countries except Nicaragua, where Imperial units are used by the general population, although Metric units are used within hospitals. As a result, Nicaragua will be analysed separately from the other five countries. Within these five metric countries, much heaping of birth weights is seen on specific values. Over 97% of birth weights in each country have a terminal digit of zero, with all apart from Gabon having over 85% of birth weights with the last two digits being '00'. Heaping at multiples of 500g shows great variation over the countries in the analysis, with 19% of weights heaped at these values in Gabon, while India has over 65% of values heaped on these values. Furthermore, when studying LBW it is important to study the amount of weights clustered at 2500g as these infants will not be officially classified as having LBW, even though some of these individuals will weigh less than 2500g and their weights have been rounded up. The proportion of infants in each country with reported weights of exactly 2500g ranges from 3.0% in Bolivia to 18.7% in India. Due to the units of weight used in Nicaragua, an analysis of terminal digits is not applicable. However, the percentage of weights heaped on 8oz and 500g intervals highlights much heaping, with 69.6% of weights on these intervals. There are only 0.4% of weights recorded as weighing 2500g, but there are 1.3% of values heaped at 2494g, or 5lb 8oz. Therefore there are likely to be a number of infants who are classified as having LBW yet should not be, as they weigh more than 2500g yet are stated as weighing 2494g.

The recorded weights are either taken from a health card, presented to the mother after the birth and listing the birth weight, or from the mother's memory. Weights taken from health cards may be considered as more reliable than those taken from memory. It is seen that in four of the countries in the analysis there is a difference in the mean birth weights depending on the recall method used. In Cambodia, Gabon, Mali and Nicaragua weights reported from memory are, on average, significantly heavier than those taken from a card. In Bolivia and India there is no significant difference between the weights. Also, as expected, the memory recalled data shows a large amount of heaping in all countries. Surprisingly, the card recalled data also shows much heaping in some countries, which indicates rounding by the health professional filling in the card, or during the actual weighing process. This can be easily seen in the birth weight

pyramids for India, showing much heaping for both types of recall, and Gabon, which indicates little heaping for card recalled data (Figure 1). Other countries display similar patterns.

Figure 1: Birth Weight Pyramids for Gabon and India



In general there is more heaping in memory recalled birth weights, although the difference between the percentage of weights heaped in each recall method is not large in Bolivia, Cambodia and India. If the heaping at 2500g is studied, in Cambodia and Nicaragua there is actually more heaping when the data is recalled from a card than from memory. In India, 18% of the values recorded from a card are heaped at 2500g, an extremely high proportion.

Calculating the proportion of infants with LBW is obviously sensitive to the treatment of those reported as weighing 2500g and the recall method used. Table 1 shows the proportion of infants with LBW for all infants with a recorded birth weight, for weights recalled from memory and from a health card. Also shown is the impact on the proportion with LBW caused by the heaping of data on 2500g. Estimates are produced following the UN definition of LBW (<2500g), and estimates are also shown where infants weighing exactly 2500g are additionally classified as having LBW (≤2500g).

Table1: Estimates of Percentage LBW by recall method and definition

	All Data		Memory Recalled		Card Recalled	
	<2500g	**≤2500g**	**<2500g**	**≤2500g**	**<2500g**	**≤2500g**
Bolivia	6.9	9.9	7.6	11.2	5.0	6.5
Cambodia	5.6	12.6	6.6	12.7	5.1	12.5
Gabon	12.0	15.6	13.6	18.8	10.1	11.7
India	21.9	40.5	22.5	41.9	21.2	39.2
Mali	14.2	21.6	14.8	22.5	13.2	20.1
Nicaragua	9.6	10.0	9.8	9.9	8.6	10.1

Discussion

The fact that there is heaping of birth weight is not a surprising result, as heaping has previously been observed for birth weight in developed countries (O'Sullivan, Pearce, & Parker, 2000). However, it may be thought that weights which have been recorded in a hospital onto health cards may not show as much heaping. However, this study shows that this is not the case for a number of countries, as can be clearly seen in the birth weight pyramids. Other countries have a much larger proportion heaped on the memory recalled weights than the card recalled weights. However, the reasons behind this variation in heaping on card recalled data is unknown. The fall in the amount of heaped data in Mali for those birth weights recalled from a health card indicates that heaping is not related to the amount of money spent on health or the proportion of births attended by a skilled health professional, as Mali is the lowest ranked country on both of these measures for the countries in this analysis (UNDP, 2003).

The difference that the heaping and method of recall has on the percentage of infants with LBW is large. In India, the range of estimates of the percentage with LBW is from 21.2% to 41.9%, and even Gabon, with the smallest amount of heaping, ranges from 10.1% to 18.8%. Nicaragua has a much smaller range due to the few weights heaped on 2500g, due to the Imperial weight measurements used. However, as weights are heaped at 5lb 8oz, just below the LBW threshold, the estimates produced may overestimate the proportion with LBW.

These estimates produced are only representative of infants who have a recorded birth weight, who are a privileged section of the population, and thus cannot be taken as the true proportion in each country. Further methods, such as those developed by Boerma *et al.* (1996), are needed in order to obtain a representative estimate. However, this study has shown that these methods are sensitive to heaping and the method of recall, and further work is required so that a consistent method of managing data heaped at 2500g is applied to all estimates of LBW.

Blanc, A., & Wardlaw, T. (2005). Monitoring low birth weight: an evaluation of international estimates and an updated estimation procedure. *Bulletin of the World Health Organisation*, 83(3), 178-185.

Boerma, J.T., Weinstein, K.I., Rutstein, S.O., & Sommerfelt, A.E. (1996). Data on birth weight in developing countries: can surveys help? *Bulletin of the World Health Organisation*, 74(2), 209-216.

Da Vanzo, J., Habicht, J.-P., & Butz, W. (1984). Assessing Socioeconomic Correlates of Birthweight in Peninsular Malaysia: Ethnic Differences and Changes over Time. *Social Science and Medicine*, 18(5), 387-404.

McCormick, M. (1985). The Contribution of Low Birth Weight to Infant Mortality and Childhood Morbidity. *The New England Journal of Medicine*, 312(2), 82-90.

Millman, S.R., & Cooksey, E.C. (1987). Birth Weight and the Effects of Birth Spacing and Breastfeeding on Infant Mortality. *Studies in Family Planning*, 18(4), 202-212.

Moreno, L., & Goldman, N. (1990). An Assessment of Survey Data on Birthweight. *Social Science and Medicine*, 31(4), 491-500.

O'Sullivan, J., Pearce, M., & Parker, L. (2000). Parental recall of birth weight: how accurate is it? *Archives of Disease in Childhood*, 82, 202-203.

UNDP (2003). Human Development Report 2003. New York: Oxford University Press.