Monitoring low birth weight: an evaluation of international estimates and an updated estimation procedure

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Objective To critically examine the data used to produce estimates of the proportion of infants with low birth weight in developing countries and to describe biases in these data. To assess the effect of adjustment procedures on the estimates and propose a modified estimation procedure for international reporting purposes.

Methods Mothers' reports about their recent births in 62 nationally representative Demographic and Health Surveys (DHS) conducted between 1990 and 2000 were analysed. The proportion of infants weighed at birth, characteristics of those weighed, extent of misreporting, and mothers' subjective assessments of their children's size at birth were examined.

Findings In many developing countries the majority of infants were not weighed at birth. Those who were weighed were more likely to have mothers who live in urban areas and are educated, and to be born in a medical facility with assistance from medically trained personnel. Birth weights reported by mothers are "heaped" on multiples of 500 grams.

Conclusion Current survey-based estimates of the prevalence of low birth weight are biased substantially downwards. Two adjustments to reported data are recommended: a weighting procedure that combines reported birth weights with mothers' assessment of the child's size at birth, and categorization of one-quarter of the infants reported to have a birth weight of exactly 2500 grams as having low birth weight. Averaged over all surveys, these procedures increased the proportion classified as having low birth weight by 25%. We also recommend that the proportion of infants not weighed at birth be routinely reported. Efforts are needed to increase the weighing of newborns and the recording of their weights.

Keywords Birth weight; Infant, Low birth weight; Research design/standards; Bias (Epidemiology); Data interpretation, Statistical; Health surveys; Developing countries (*source: MeSH, NLM*).

Mots clés Poids naissance; Nourrisson faible poids naissance; Projet recherche/normes; Biais (Epidémiologie); Interprétation statistique données; Enquête santé; Pays en développement (*source: MeSH, INSERM*).

Palabras clave Peso al nacer; Recién nacido de bajo peso; Proyectos de investigación/normas; Sesgo (Epidemiología); Interpretación estadística de datos; Encuestas epidemiológicas; Países en desarrollo (*fuente: DeCS, BIREME*).

Arabic

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Voir page 184 le résumé en français. En la página 184 figura un resumen en español.

Introduction

A reduction of at least one-third in the proportion of infants with low birth weight is one of the seven major goals for the current decade of the "A World Fit for Children" programme of the United Nations. Moreover, nutritional deprivation — the major determinant of low birth weight — is a clear obstacle to the attainment of many of the Millennium Development Goals (*1*). Monitoring improvements in low birth weight is thus being given high priority within the UN system, as well as by national governments and the international nutrition community.

Although the significance and interpretation of low birth weight has recently been debated (*2–4*), most experts agree that weight at birth is an indicator of a newborn's chances for survival, growth, long-term health and psychosocial development (*5*). Babies whose birth weight is low as a result of undernourishment face a greatly increased risk of death during their first months and years of life (*5–7*). The evidence also suggests that those children who do survive may be more likely to experience health problems throughout their lives; these include impaired cognitive development, as well as diabetes and coronary heart disease in adulthood (*8*, *9*). Low birth weight in developing countries occurs primarily because of poor maternal health and nutrition. In addition, diseases such as diarrhoea, malaria and respiratory infections, which are common in many developing countries, can significantly impair fetal growth when women become infected during pregnancy (*5*, *6*).

For most developing countries, estimates of low birth weight based on data compiled from health facilities are biased because the majority of newborns are not delivered in health facilities, and those who are represent a biased sample of all births. As an alternative to health-facility-based data, information on birth weight has been collected systematically since about 1990 from mothers participating in nationally representative household surveys. However, an assessment of the

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results from 15 countries by Boerma et al. published in 1996 (*10*) found that mothers were often unable to provide numerical birth weights for their infants, primarily because the infants had not been weighed at delivery. Boerma et al. proposed an adjustment procedure in which additional information obtained from the mother on her assessment of the child's size at birth is used in combination with reported birth weights to calculate the percentage with low birth weight for all births (for details, see Results).

Since this initial assessment, data on low birth weight have been collected routinely in surveys, but the data have been evaluated for only a small number (*11*–*13*). Reviews of low birth weight data and estimates consistently note their limitations (*6*, *7*, *14*, *15*). Thus, a comprehensive examination of the data and estimation procedures is timely. The present study had three objectives:

- to critically examine the quality of the data used to produce estimates of the proportion of infants with low birth weight and to describe biases in these data;
- to assess the effect of adjustment procedures on the estimates; and
- to propose an extension of the adjustment proposed by Boerma et al. for international monitoring purposes.

Methods

Until relatively recently, international comparative reviews of low birth weight, as well as databases maintained by the United Nations Children's Fund (UNICEF) and WHO relied primarily on health-facility-based data and routine reporting systems. For example, a review published jointly by WHO and UNICEF in 1992 included data derived from hospital studies, vital registration data, health service records and some surveys (*16*). The advantages of survey data are that they are likely to include information on infants who were not delivered in health facilities and that, with access to the data files, a standardized methodology can be used to derive the estimates for different countries.

The Demographic and Health Surveys (DHS) programme began including questions on birth weight in its core questionnaire in about 1990. Building on the results of a previous study in Malaysia (*17*), questions on birth weight and prematurity were tested in an experimental DHS survey in the Dominican Republic and questions on birth weight and birth size in Peru in 1986. Subsequent evaluations suggested that the collection of such data was feasible and that they were of reasonable quality. As a result, some combination of questions on birth weight, birth size and prematurity was included in most subsequent DHS surveys as well as in the UNICEF-sponsored Multiple Indicator Cluster Surveys (MICS), Pan Arab Project for Child Development, and the Reproductive Health Surveys supported by the US Centers for Disease Control (*18*–*20*).

The analyses in this paper are based on data from 62 DHS surveys conducted between 1990 and 2000 in 42 developing countries. About half of the surveys were conducted in sub-Saharan Africa. The DHS surveys are nationally representative household surveys for which women of reproductive age (15–49 years) are interviewed. These surveys were chosen because survey files containing data on individuals were readily available from the DHS data archive maintained by ORC Macro (*21*).

Because the purpose of this research was not to estimate the current prevalence of low birth weight, but to assess the quality of survey data and estimation methodology, the maximum possible number of available surveys was included in the analysis; where more than one survey came from the same country, these were treated as individual surveys and where averages were calculated they were not weighted by population size. Therefore, the regional averages presented in the tables are not representative of the regional population but are simple averages derived from surveys conducted in that region. Country and weighted regional and global estimates of low birth weight are reported in a UNICEF/WHO publication (*22*).

The estimation of the percentage of infants with low birth weight is based on mothers' answers to questions about each of their live births in either the three years or the five years prior to the survey. The mother was first asked to assess the relative size of a specific child at birth. She was asked, "When (NAME) was born, was he/she very large, larger than average, average, smaller than average or very small"? (In a few surveys, the categories used in this question were modified (e.g. small, average or large). For this analysis, surveys with non-standard categories (except India) were excluded.)

The mother was then asked whether or not the child had been weighed at birth. If the answer was "yes", then the child's birth weight was obtained. The units in which birth weights had been recorded in the questionnaire varied between countries, but were usually in grams or kilograms. In addition, beginning in surveys conducted from around 1994–95, interviewers were instructed to record whether the birth weight was obtained from a health card or from the mother's recall.

Low birth weight is defined as a weight at birth of less than 2500 grams (irrespective of gestational age) (*23*). Although information on gestational age would allow the separation of infants born prematurely from those who were small for their gestational age (intrauterine growth retardation), this information is rarely available from developing countries (*5*). For the purposes of comparative reporting by international organizations, the indicator is taken to be the proportion of infants born in a certain recent period who weighed less than 2500 grams at birth.

Results

Birth weight reporting

In many surveys, birth weights are not reported for a substantial proportion of infants because they were not weighed (Table 1, web version only, available at http:www.who.int/bulletin; Table 2). The percentage of infants not weighed at birth, was extremely variable from less than 1% in Kazakhstan (1995) to 96% in Ethiopia (2000); the average percentage of infants not weighed at birth across all surveys was nearly half (48.7%). On the basis of data mainly from DHS and MICS surveys and some official statistics (weighted by population size), UNICEF and WHO (*22*) have estimated that 58% of all newborn infants in the developing world are not weighed.

In addition to Ethiopia, 12 surveys reported that more than 70% of infants were not weighed at birth (Burkina Faso (1999), Chad (1997), Egypt (1992 and 1995), Haiti (1994), India (1993 and 1999), Morocco (1992), Niger (1992 and 1998), Nigeria (1990) and Uganda (1995).

Overall, for infants who were weighed at birth, the mother did not know or did not remember the weight for about 10%. Of the roughly half of infants for whom a birth weight was reported, only about 29% of the weights were obtained from the child's health card; the remainder were based on the mother's recall.

Table 2. **Percentage of infants with low birth weight, according to different estimation procedures**

Survey area and date	No. of births	Percentage not weighed	Percentage with low birth weight		
			Based on reported birth weights only	Based on birth weight by birth size	Based on birth weight by birth size adjusted for heaping[a]
Central Asia					
Kazakhstan 1995	810	0.5	9.2	9.1	9.6
Kazakhstan 1999	1449	1.2	7.5	7.7	8.2
Kyrgyzstan 1997	1172	1.6	5.8	6.3	6.8
Turkey 1998	3459	31.7	12.3	14.4	15.5
Uzbekistan 1996	1392	3.2	4.4	4.3	4.9
Other Asia					
India 1993	50 001	79.2	25.8	28.4	31.7
India 1999	32 393	70.1	22.6	25.5	30.4
Indonesia 1991	14 493	62.7	7.2	7.4	9.1
Indonesia 1994	16 983	50.9	7.1	8.1	9.7
Indonesia 1997	16 217	38.1	7.7	8.4	10.3
Pakistan 1991	6492	88.4	16.0	18.9	19.0
Philippines 1993	8859	35.6	16.7	17.9	17.9
Philippines 1998	7566	36.9	16.2	17.2	17.2
Latin America/Caribbean					
Bolivia 1994	3614	45.1	5.7	7.0	8.2
Bolivia 1998	6893	36.3	7.4	7.9	8.7
Brazil 1996	4782	7.2	9.1	9.9	10.4
Colombia 1990	3731	19.2	5.4	5.7	7.2
Colombia 1995	5050	19.0	6.6	7.2	8.7
Dominican Republic 1991	3848	9.0	11.2	11.7	11.7
Dominican Republic 1996	4379	4.4	12.5	12.5	12.5
Guatemala 1999	4545	21.6	12.0	13.0	13.0
Haiti 1994	3624	82.4	21.7	29.3	29.4
Nicaragua 1998	7992	24.0	11.8	13.0	13.0
Peru 1992	8540	35.4	8.4	9.2	10.2
Peru 1996	15 639	33.0	9.0	10.1	11.1
Middle East/N. Africa					
Egypt 1992	8697	87.9	11.1	9.7	11.9
Egypt 1995	11 454	84.2	12.1	13.2	16.5
Jordan 1990	8261	NA[b]	10.3	10.5	12.1
Morocco 1992	5197	70.5	7.5	9.3	11.1
East/Southern Africa					
Comoros 1996	1145	55.0	14.9	18.4	20.7
Ethiopia 2000	12 258	95.6	7.0	12.4	14.9
Kenya 1993	6128	52.4	8.7	9.6	11.4
Kenya 1998	3464	53.6	8.3	9.2	10.8
Madagascar 1992	5683	52.1	16.6	17.2	20.0
Madagascar 1997	3893	64.1	13.7	15.2	17.9
Malawi 1992	4574	46.2	10.1	12.9	15.4
Mozambique 1997	4207	54.6	12.5	12.5	14.1
Namibia 1992	3859	27.7	12.8	14.7	15.5
United Republic of Tanzania 1992	8117	47.7	13.7	14.0	16.4
United Republic of Tanzania 1996	6916	48.8	10.7	11.2	13.7
United Republic of Tanzania 1999	3282	54.9	8.6	10.6	12.9
Uganda 1995	6027	73.0	11.2	13.1	16.3
Zambia 1992	6279	49.0	11.4	11.1	12.7
Zambia 1996	7159	52.6	11.3	11.1	12.4
Zimbabwe 1994	2364	26.0	12.0	12.6	14.3
Zimbabwe 1999	3559	20.8	9.7	10.2	11.4
West/Central Africa					
Benin 1996	2939	41.4	15.4	15.1	16.1
Burkina Faso 1993	6366	61.4	12.1	15.5	17.3

(Table 2, cont.)

Survey area and date	No. of births	Percentage not weighed	Percentage with low birth weight		
			Based on reported birth weights only	Based on birth weight by birth size	Based on birth weight by birth size adjusted for heaping[a]
Burkina Faso 1999	6218	72.2	14.9	17.3	18.7
Cameroon 1998	2469	45.2	8.2	9.7	10.7
Central African Republic 1994	2836	41.9	12.9	13.4	14.3
Chad 1997	7497	89.0	9.3	14.5	16.6
Côte d'Ivoire 1994	3989	45.6	14.1	14.3	16.0
Ghana 1993	2204	68.1	9.4	9.5	11.3
Ghana 1998	3194	66.8	8.6	9.8	11.4
Guinea 1999	5842	56.7	10.4	10.5	12.1
Mali 1996	6019	69.1	13.7	16.0	18.6
Niger 1992	7207	82.8	9.0	12.3	14.8
Niger 1998	5007	79.9	13.4	16.3	17.3
Nigeria 1990	8205	72.9	7.5	10.0	11.9
Nigeria 1999	3551	66.4	8.5	9.3	11.6
Togo 1998	3978	55.3	11.9	13.0	14.7
All surveys (62)			**11.2**	**12.5**	**14.0**
Central Asia (5)			**7.8**	**8.4**	**9.0**
Other Asia (8)			**14.9**	**16.5**	**18.2**
Latin America (12)			**10.1**	**11.4**	**12.0**
Middle East/North Africa (4)			**10.3**	**10.7**	**12.9**
East/South Africa (17)			**11.4**	**12.7**	**14.8**
West/Central Africa (16)			**11.2**	**12.9**	**14.6**

All averages are unweighted. Regional averages are not representative.
For the Dominican Republic, Guatemala, Nicaragua and the Philippines, birth weights were collected only in pounds and ounces so the adjustment for heaping has no effect.
[a] One-quarter of infants reported as weighing exactly 2500 grams were counted as having low birth weight.
[b] Not available.

Heaping

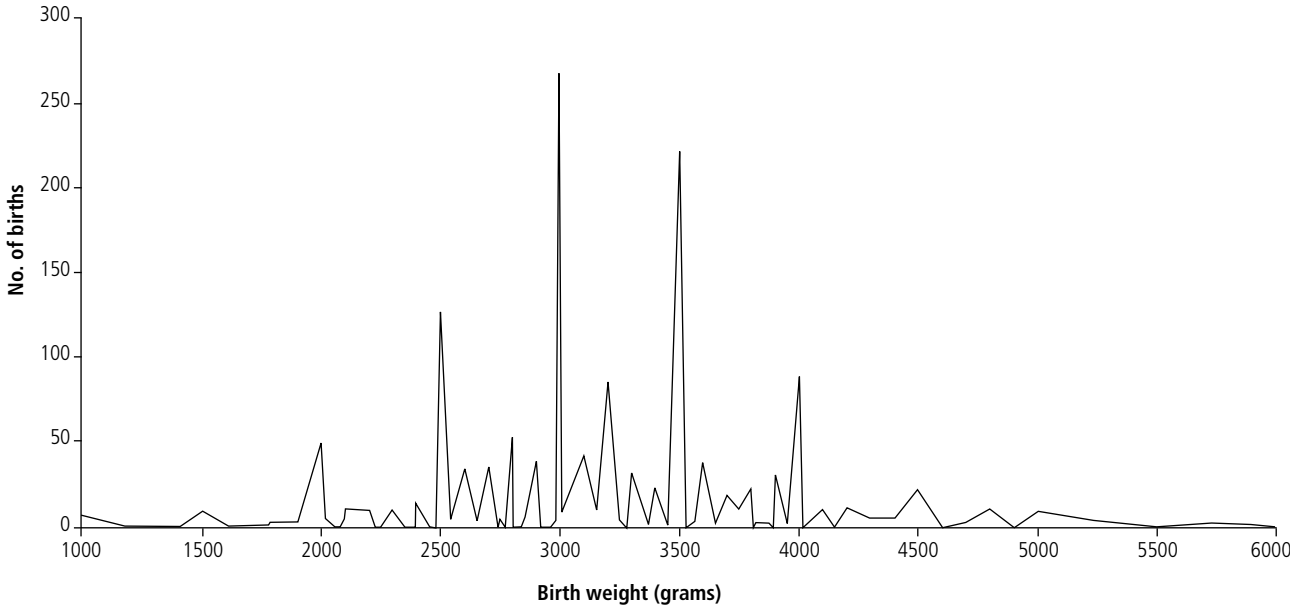
The data on numerical birth weight exhibit considerable heaping on digits that are multiples of 500 grams. Heaping refers to a pattern of misreporting in which the distribution of a number reported by respondents, such as age or birth weight, shows implausibly large frequencies of particular values, usually values ending in 0 or 5. A typical example of the frequency distribution of birth weights (from the United Republic of Tanzania) is shown in Fig. 1 in which the heaping is clearly visible. Across all surveys, about four in 10 reported birth weights were multiples of 500 grams. The heaping indicates that birth weights are often rounded, either by medical personnel who weigh the infants and report the weight to the mother, or by mothers themselves when recalling the figure. In many surveys, the magnitude of the heaping tended to increase with the time elapsed since the birth of the child. This pattern suggests that there is some diminution in mothers' ability to recall the exact weight as time since the birth increases. In addition, heaping is substantially worse (i.e. there are more birth weights that are multiples of 500 grams) for infants whose weights are reported from mothers' recall than when birth weights are recorded on a health card.

Although heaping is an indication of overall data quality, for the purposes of estimating the percentage of infants with low birth weight, it is the heaping at 2500 g — the cut-off point for low birth weight — that is most important. Averaged across all 62 surveys, approximately 6% of infants were reported to have weighed exactly 2500 grams at birth. Assuming that a proportion of the newborns reported as weighing 2500 grams actually weighed less than 2500 grams, some low-birth-weight babies would be misclassified as having had a normal birth weight and the prevalence of low birth weight will be biased downwards. The consequences of adjusting for this bias are examined below.

Reporting of birth size

The distribution of births by the mother's subjective assessment of the child's size at birth is shown in Table 3 (web version only, available at http://www.who.int/bulletin). Unlike birth weight, virtually all mothers provided this information about their children. With some regional variation, the distributions demonstrated a moderate tendency on the part of mothers to classify their children towards the larger end of the scale. The regions are also differentiated by the extent to which the distribution of birth size is concentrated within the "average" category; the countries in the Middle East and north Africa were the most concentrated and the countries in western and central Africa, the least concentrated. However regional patterns disguise a great deal of country-level variation; the proportion of infants of a size judged to be "average" by their mothers ranged from 27% in Nicaragua to 81% in the United Republic of Tanzania (1992). It is not clear whether this variation reflects relative differences in the actual size distributions or differences in mothers' perceptions of size. Cultural differences in the desirability of large versus small babies may also have some effect on mothers' reporting of birth size.

Fig. 1. **Heaping of reported birth weights on multiples of 500 grams. United Republic of Tanzania, Demographic and Health Survey, 1999**



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Characteristics of infants who were weighed compared with infants who were not weighed

Newborns who were weighed had characteristics that were substantially different from those who were not weighed (Fig. 2). Country-level results averaged across all surveys showed that 52% of infants weighed at birth had mothers who resided in urban areas whereas only 15% of infants who were not weighed had mothers who did so. Infants who were weighed were much more likely to have educated mothers and to be first births. No differences in the sex distribution of weighed versus non-weighed newborns were noted. The differences in urban–rural residence and education of the mother tended to be larger as the overall percentage of infants who were not weighed at birth increased.

Not surprisingly, infants who were weighed at birth were also far more likely to have been delivered in a medical facility and to have had medical assistance than infants who were not weighed at birth. Averaged across surveys, 85% of infants who were delivered in a medical facility were weighed whereas 12% of those not delivered in a medical facility were weighed. Moreover, 89% of newborns who were weighed had been delivered with the assistance of medically trained personnel whereas only 19% of the infants who were not weighed had such assistance.

The large differences between the infants who were weighed and those who were not weighed introduce bias into the estimates of the proportion with low birth weight because the factors associated with not being weighed overlap with some of the factors associated with low birth weight (e.g. low level of education of the mother). The exclusion from the estimates of newborns who were not weighed will bias the prevalence of low birth weight downwards. The magnitude of the bias is likely to be greater the higher the proportion of infants who are not weighed.

Relationship between birth weight and birth size

There was considerable consistency and regularity at the aggregate level in the birth weights reported across categories of size. The mean birth weight declined monotonically as birth size declined in every survey, except that conducted in Ethiopia. The mean birth weight for "very small" babies was less than 2500 grams in all except seven countries whereas the weight for the "average" birth size ranged from 2802 grams in India to 3477 grams in Bolivia. The mean birth weight across all surveys (3229 grams) was also very similar to the birth weight reported by mothers who classified their infants as "average" (3172 grams). However, although size and weight are consistent in the aggregate, there is considerable variation in consistency between the two measures at the individual level.

Adjustments and their effects

The adjustment proposed by Boerma et al. (*8*) is a straightforward weighting procedure. First, for each survey separately, the proportion of infants with low birth weight within each category of subjective size is calculated. Then, this proportion is multiplied by the overall proportion of births in each size category and summed to obtain the overall prevalence of low birth weight. The assumptions implicit in this adjustment are:

- that the infants for whom numerical birth weights are reported are as likely to have a low birth weight as those for whom no birth weight is reported; and
- that the relationship between birth weight and the size category in which the mother places her child is, within a given country, the same for infants weighed and not weighed at birth.

Based on our examination of the characteristics of infants weighed at birth, it seems clear that the first assumption is violated; no information on which to judge the extent to which the second assumption holds was available.

Estimates of the proportion of infants with low birth weight based on three different procedures are shown in Table 2. The third column gives the percentage of infants with low birth

weight based only on those who were weighed — the conventional procedure. These estimates range from 4% in Uzbekistan to 26% in India (1993) and average 11% over all surveys. In the fourth column, estimates that employ the adjustment proposed by Boerma et al. are shown. As expected, these estimates are almost uniformly higher than the estimates based only on infants for whom birth weights were reported and average 13% over all surveys.

In the fifth column, an additional adjustment was made for the heaping of birth weights on exactly 2500 grams. This adjustment was based on evidence from 88 DHS surveys. First, for each survey we tabulated the frequency distribution of reported birth weights between 2000 and 2999 grams. Then, we calculated the percentage of infants who weighed less than 2500 grams, after excluding those with weights reported as being exactly 2500 grams. That percentage, on average, was 25%. We therefore reclassified 25% of the infants reported as weighing exactly 2500 grams as having a low birth weight. This adjustment has a substantial effect on the percentage of infants with low birth weight in some countries. For example, in India (1999) the percentage increased by almost five percentage points from 25.5% to 30.4%. Averaged across all surveys, the estimated percentage of infants with low birth weight was approximately 13% higher after the adjustment for heaping than the estimate obtained using the adjustment proposed by Boerma et al. Overall, the average percentage of infants with low birth weight increased from 11.2%, when no adjustment was made, to 14.0% after making the two adjustments, an increase of 25%.

Conclusions

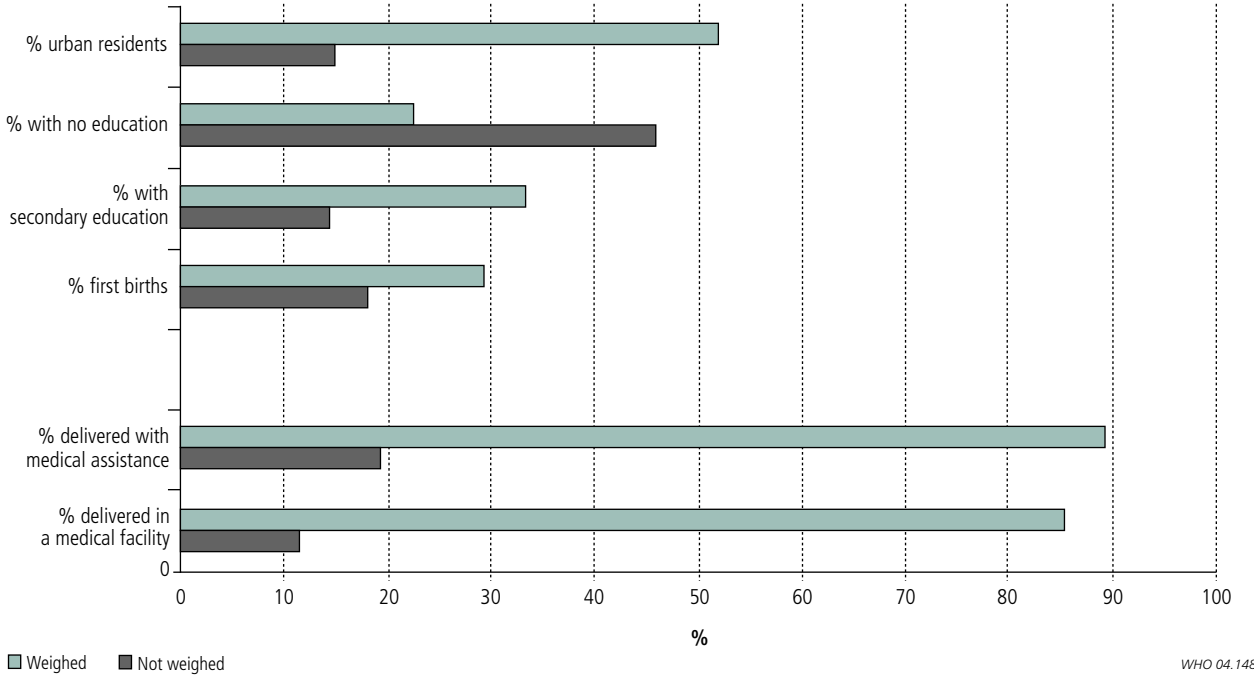
Although survey data yield more accurate estimates of the numbers of infants with low birth weight than health-facility-based data in countries where a large proportion of infants are not delivered in health facilities, these data have a number of limitations. First, survey data show that in many developing countries the majority of infants are not weighed at birth. We recommend that the percentage of infants who are weighed be reported whenever the percentage with low birth weight is reported. Indeed, the percentage weighed itself merits consideration as an indicator for regular monitoring.

Infants who are weighed at birth are a biased sample of all births and this bias becomes stronger the smaller the percentage of infants weighed at birth. All other things being equal, infants who are weighed at birth are less likely to have a low birth weight, so using these data alone to estimate the prevalence of low birth weight will result in an underestimate. Moreover, using infants for whom birth weights have been reported to calculate adjusted estimates based on birth size, as in the present study, also yields rates that are biased downwards because the population for which we have information on low birth weight is biased. Nevertheless, this procedure no doubt yields estimates that are more accurate than estimates based only on infants weighed at birth.

Substantial heaping of reported weights occurs on weights of exactly 2500 grams, the cut-off point for low birth weight. Some of the birth weights reported as being exactly 2500 grams were no doubt less than 2500 grams; thus, not including them biases estimates of the prevalence of low birth weight downwards. Estimates that count one-quarter of these births as low birth weight are substantially higher than those that do not account for the effect of heaping. We believe that estimates that include this adjustment are the most accurate available at present. Field-based studies that examine how and when mothers acquire birth weight information on their newborns as well as on mothers' beliefs about birth size would allow better interpretation of existing data and may enable improvements to be made in survey instruments.

One of the advantages of survey data on birth weight is that they include some information on infants not born

Fig. 2. **Comparison of infants weighed with those who were not weighed, by selected characteristics using data from Demographic and Health Surveys**



in medical facilities and on those not weighed. Paradoxically, estimates of the proportion of infants with low birth weight may rise in some countries as the proportion of newborns who are weighed increases and includes more of those infants who are likely to be born with low birth weight. The fundamental issue for accurately monitoring the prevalence of low birth weight — a low percentage of infants weighed at birth — cannot be solved by statistical manipulation but only by efforts to increase the weighing of newborns and the recording of their weights. ■

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Conflicts of interest: none declared.

Résumé

Surveillance des faibles poids à la naissance : évaluation des estimations internationales et actualisation de la méthode d'estimation

Objectif Réaliser un examen critique des données servant à estimer la proportion de nourrissons présentant un faible poids à la naissance dans les pays en développement et décrire les biais attachés à ces données. Évaluer l'effet de procédures d'ajustement sur les estimations et proposer une méthode d'estimation modifiée à des fins de notification internationale.

Méthodes On a analysé les rapports fournis par les mères à propos de leur accouchement récent dans 62 enquêtes démographiques et de santé (EDS), représentatives de différents pays et menées entre 1990 et 2000. On a examiné la proportion de nourrissons pesés à la naissance, les caractéristiques de ceux ayant été pesés, l'ampleur des erreurs de relevé et les évaluations subjectives des mères quant à la taille à la naissance de leur enfant.

Résultats Dans nombre de pays en développement, la majorité des nourrissons n'étaient pas pesés à la naissance. Les enfants pesés avaient une plus grande probabilité d'être nés de mères vivant dans des zones urbaines et éduquées et d'avoir vu le jour dans une installation médicale, avec l'aide de personnel bénéficiant d'une formation médicale. Les poids à la naissance indiqués par les mères sont « arrondis » aux multiples de 500 g.

Conclusion Les estimations actuelles, établies à partir des enquêtes, de la prévalence des faibles poids à la naissance comportent un biais baissier important. Les auteurs recommandent de procéder à deux ajustements sur les données rapportées : une opération de pondération combinant le poids à la naissance indiqué et l'évaluation par la mère de la taille de l'enfant à la naissance et la catégorisation d'un quart des nourrissons signalés comme ayant un poids à la naissance de 2500 g exactement comme des enfants de faible poids à la naissance. En moyenne sur l'ensemble des enquêtes, ces méthodes augmentent la proportion d'enfants classés comme ayant un faible poids à la naissance de 25 %. Les auteurs recommandent également de notifier systématiquement la proportion de nourrissons non pesés à la naissance. Des efforts sont nécessaires pour étendre la pesée des nouveaux-nés et l'enregistrement de leur poids.

Resumen

Monitoreo de la insuficiencia ponderal del recién nacido: evaluación de las estimaciones internacionales y método de estimación actualizado

Objetivo Analizar críticamente los datos empleados para generar estimaciones de la proporción de lactantes con bajo peso de nacimiento en los países en desarrollo y describir los sesgos de que adolecen esos datos. Evaluar el efecto de los métodos de ajuste en las estimaciones y proponer un procedimiento de estimación modificado a efectos de la notificación internacional.

Métodos Se analizaron las declaraciones efectuadas por madres acerca del nacimiento de sus hijos más recientes en un total de 62 encuestas de Demografía y Salud de ámbito nacional llevadas a cabo entre 1990 y 2000. Se estudiaron la proporción de lactantes pesados al nacer, las características de los niños efectivamente pesados, la magnitud del problema de la declaración de datos incorrectos, y las evaluaciones subjetivas de las madres acerca del tamaño de sus hijos recién nacidos.

Resultados En muchos países en desarrollo la mayoría de los niños no eran pesados al nacer. Entre los que sí lo fueron, se observó una mayor probabilidad de tener una madre residente en una zona urbana y con cierto nivel de instrucción, así como de haber nacido en un establecimiento médico con la ayuda de personal preparado técnicamente. Los pesos de nacimiento declarados por las madres se han «escalonado» en forma de múltiplos de 500 g.

Conclusión Las estimaciones encuestales actuales de la prevalencia de insuficiencia ponderal del recién nacido están sesgadas sustancialmente a la baja. Se recomiendan dos ajustes para los datos notificados: un procedimiento de ponderación que combina los pesos de nacimiento declarados y la evaluación de la madre sobre el tamaño del hijo recién nacido, y la clasificación de la cuarta parte de los lactantes que según lo declarado pesaban exactamente 2500 g al nacer dentro de la categoría de lactantes con insuficiencia ponderal. Aplicando este método al conjunto de las encuestas se obtuvo un aumento medio del 25% de la proporción de niños nacidos con insuficiencia ponderal. Recomendamos también que se notifique sistemáticamente la proporción de lactantes no pesados en el momento del nacimiento. Es necesario desplegar un mayor esfuerzo para extender la práctica de pesar a los recién nacidos y registrar su peso.

Arabic

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Table 1. **Percentage distribution of births by type of data on birth weight using data from Demographic and Health Surveys**

Survey area and date	Not weighed	Weighed			Data missing	Total	No. of births
		Data from card	Data from recall	Weight unknown			
Central Asia							
Kazakhstan 1995	0.5	6.0	92.1	1.4	0.0	100.0	810
Kazakhstan 1999	1.2	1.3	95.7	1.4	0.3	100.0	1449
Kyrgyzstan 1997	1.6	0.1	97.3	1.0	0.0	100.0	1172
Turkey 1998	31.7	1.9	62.2	3.5	0.7	100.0	3459
Uzbekistan 1996	3.2	1.2	95.1	0.5	0.0	100.0	1392
Other Asia							
India 1993	79.2	NA	14.6	0.0	6.2	100.0	50 001
India 1999	70.1	NA	25.1	4.3	0.5	100.0	32 393
Indonesia 1991	62.7	NA	36.9	0.2	0.3	100.0	14 493
Indonesia 1994	50.9	9.1	39.3	0.3	0.3	100.0	16 983
Indonesia 1997	38.1	10.7	51.0	0.2	0.0	100.0	16 217
Pakistan 1991	88.4	NA	7.4	1.9	2.3	100.0	6492
Philippines 1993	35.6	NA	60.5	3.7	0.3	100.0	8859
Philippines 1998	36.9	5.8	53.6	3.2	0.5	100.0	7566
Latin America/Caribbean							
Bolivia 1994	45.1	NA	51.8	2.8	0.3	100.0	3614
Bolivia 1998	36.3	9.0	49.7	4.6	0.4	100.0	6893
Brazil 1996	7.2	28.5	60.5	2.4	1.4	100.0	4782
Colombia 1990	19.2	NA	62.2	18.4	0.1	100.0	3731
Colombia 1995	19.0	10.4	58.1	12.3	0.2	100.0	5050
Dominican Republic 1991	9.0	NA	90.3	0.4	0.2	100.0	3848
Dominican Republic 1996	4.4	NA	94.8	0.2	0.6	100.0	4379
Guatemala 1999	21.6	5.2	72.2	0.5	0.5	100.0	4545
Haiti 1995	82.4	NA	7.2	0.0	10.3	100.0	3624
Nicaragua 1998	24.0	NA	73.5	0.0	2.5	100.0	7992
Peru 1992	35.4	NA	61.7	2.4	0.5	100.0	8540
Peru 1996	33.0	8.9	55.5	2.3	0.3	100.0	15 639
Middle East/North Africa							
Egypt 1992	87.9	NA	8.0	4.0	0.1	100.0	8697
Egypt 1995	84.2	NA	10.4	5.2	0.2	100.0	11 454
Jordan 1990[a]	NA	NA	NA	NA	NA	NA	8261
Morocco 1992	70.5	NA	21.5	7.7	0.3	100.0	5197
East/Southern Africa							
Comoros 1996	55.0	22.7	13.6	7.9	0.8	100.0	1145
Ethiopia 2000	95.6	0.2	2.4	1.7	0.1	100.0	12 258
Kenya 1993	52.4	NA	43.7	2.1	1.8	100.0	6128
Kenya 1998	53.6	14.5	30.6	0.9	0.4	100.0	3464
Madagascar 1992	52.1	NA	43.9	2.7	1.2	100.0	5683
Madagascar 1997	64.1	8.0	25.5	1.7	0.7	100.0	3893
Malawi 1992	46.2	NA	35.4	17.2	1.2	100.0	4574
Mozambique 1997	54.6	26.0	13.3	3.7	2.4	100.0	4207
Namibia 1992	27.7	NA	44.2	26.6	1.5	100.0	3859
United Republic of Tanzania 1992	47.7	NA	49.2	2.5	0.7	100.0	8117
United Republic of Tanzania 1996	48.8	21.5	27.2	1.6	0.9	100.0	6916
United Republic of Tanzania 1999	54.9	24.2	20.2	0.7	0.1	100.0	3282
Uganda 1995	73.0	7.2	18.4	0.3	1.1	100.0	6027
Zambia 1992	49.0	NA	43.1	7.3	0.6	100.0	6279
Zambia 1996	52.6	17.9	25.0	4.2	0.3	100.0	7159
Zimbabwe 1994	26.0	NA	68.0	5.0	0.4	100.0	2364
Zimbabwe 1999	20.8	40.2	35.3	3.2	0.4	100.0	3559
West/Central Africa							
Benin 1996	41.4	38.1	9.2	10.6	0.6	100.0	2939
Burkina Faso 1993	61.4	NA	21.5	16.5	0.6	100.0	6366
Burkina Faso 1999	72.2	11.5	5.7	10.4	0.1	100.0	6218

(Table 1, cont.)

Survey area and date	Not weighed	Weighed			Data missing	Total	No. of births
		Data from card	Data from recall	Weight unknown			
Cameroon 1998	45.2	15.7	35.4	2.9	0.8	100.0	2469
Central African Republic 1995	41.9	29.4	21.8	6.8	0.1	100.0	2836
Chad 1997	89.0	2.3	5.5	3.1	0.2	100.0	7497
Côte d'Ivoire 1994	45.6	41.5	10.2	2.6	0.1	100.0	3989
Ghana 1993	68.1	NA	19.2	11.4	1.3	100.0	2204
Ghana 1998	66.8	16.5	4.3	11.5	0.9	100.0	3194
Guinea 1999	56.7	18.6	18.3	4.5	1.9	100.0	5842
Mali 1996	69.1	7.2	13.5	9.9	0.2	100.0	6019
Niger 1992	82.8	NA	12.6	4.2	0.4	100.0	7207
Niger 1998	79.9	14.3	2.2	2.9	0.6	100.0	5007
Nigeria 1990	72.9	NA	9.5	16.5	1.1	100.0	8205
Nigeria 1999	66.4	8.1	6.2	15.2	4.1	100.0	3551
Togo 1998	55.3	17.5	8.6	17.7	0.9	100.0	3978
All surveys (unweighted average)	**48.7**	**14.3**	**36.9**	**5.3**	**0.9**	**100.0**	

NA, not available.
[a] Survey did not include the question on whether the infant was weighed at birth.

Table 3. **Percentage distribution of births by mother's assessment of size**

Survey area and date	Very large	Larger than average	Average	Smaller than average	Very small	Total	Number of births
Central Asia							
Kazakhstan 1995	4.5	11.2	63.4	12.9	8.0	100.0	808
Kazakhstan 1999	4.6	13.0	63.5	13.2	5.6	100.0	1438
Kyrgyzstan 1997	1.9	13.9	70.6	10.3	3.3	100.0	1164
Turkey 1998	2.3	14.8	56.4	16.4	10.1	100.0	3415
Uzbekistan 1996	1.5	8.0	78.2	11.4	1.0	100.0	1376
Other Asia							
India 1993	–	14.0	64.6	21.5	–	100.0	49 272
India 1999	–	14.0	61.6	19.4	5.0	100.0	32 273
Indonesia 1991	5.8	24.6	56.6	11.3	1.6	100.0	14 317
Indonesia 1994	3.4	32.5	50.0	12.6	1.5	100.0	16 682
Indonesia 1997	3.6	30.1	52.1	12.5	1.7	100.0	15 836
Pakistan 1991	1.9	9.8	65.6	16.2	6.5	100.0	6393
Philippines 1993	2.6	17.8	60.9	14.3	4.3	100.0	8635
Philippines 1998	5.5	17.8	58.1	12.8	5.8	100.0	7529
Latin America/Caribbean							
Bolivia 1994	0.6	16.2	60.4	13.5	9.3	100.0	3585
Bolivia 1998	0.5	17.1	61.5	12.4	8.4	100.0	6849
Brazil 1996	9.4	26.7	38.9	20.7	4.4	100.0	4700
Colombia 1990	7.2	23.7	47.7	13.1	8.3	100.0	3712
Colombia 1995	5.7	21.5	52.5	12.6	7.7	100.0	5005
Dominican Republic 1991	4.6	46.4	28.9	16.6	3.5	100.0	3837
Dominican Republic 1996	4.8	39.0	35.1	17.4	3.8	100.0	4364
Guatemala 1999	6.1	17.5	46.7	19.9	9.9	100.0	4462
Haiti 1995	18.0	19.0	31.5	16.1	15.4	100.0	3617
Nicaragua 1998	3.5	39.1	27.4	25.0	4.9	100.0	7862
Peru 1992	1.4	19.9	58.3	16.6	3.8	100.0	8493
Peru 1996	2.0	15.5	61.0	16.0	5.6	100.0	15 552
Middle East/N. Africa							
Egypt 1992	0.6	6.1	78.0	14.5	0.7	100.0	8689
Egypt 1995	0.4	5.9	73.8	16.4	3.4	100.0	11 414
Jordan 1990	2.2	11.7	69.5	10.0	6.6	100.0	8216
Morocco 1992	1.7	19.4	53.0	21.7	4.2	100.0	5193
East/Southern Africa							
Comoros 1996	8.0	9.8	56.7	13.6	11.9	100.0	1125
Ethiopia 2000	5.3	25.5	35.8	27.5	5.9	100.0	12 231
Kenya 1993	3.8	28.2	52.3	13.6	2.1	100.0	6050
Kenya 1998	4.5	18.3	61.2	11.3	4.7	100.0	3438
Madagascar 1992	26.8	9.3	38.2	15.9	9.9	100.0	5616
Madagascar 1997	19.1	23.2	31.0	13.2	13.5	100.0	3853
Malawi 1992	3.5	15.4	63.0	13.7	4.4	100.0	4493
Mozambique 1997	3.0	39.9	36.4	18.8	1.9	100.0	4133
Namibia 1992	6.5	5.1	70.3	10.3	7.8	100.0	3782
United Republic of Tanzania 1992	1.5	8.5	80.5	7.1	2.4	100.0	8041
United Republic of Tanzania 1996	4.9	10.9	73.2	7.5	3.6	100.0	6795
United Republic of Tanzania 1999	8.2	12.0	68.6	7.5	3.7	100.0	3277
Uganda 1995	3.7	20.1	56.5	14.7	5.0	100.0	5934
Zambia 1992	3.2	16.6	68.5	9.4	2.2	100.0	6247
Zambia 1996	7.9	22.3	56.3	10.2	3.3	100.0	7137
Zimbabwe 1994	7.5	24.2	49.7	12.6	6.0	100.0	2360
Zimbabwe 1999	12.5	27.9	43.5	10.7	5.5	100.0	3521
West/Central Africa							
Benin 1996	10.0	21.1	52.6	12.1	4.1	100.0	2912
Burkina Faso 1993	8.8	29.8	39.6	15.2	6.7	100.0	6128
Burkina Faso 1999	20.4	17.8	45.8	10.1	6.0	100.0	6188
Cameroon 1998	10.7	26.3	46.7	11.3	5.0	100.0	2444

(Table 3, cont.)

Survey area and date	Very large	Larger than average	Average	Smaller than average	Very small	Total	Number of births
Central African Republic 1995	7.6	15.1	59.7	13.0	4.6	100.0	2774
Chad 1997	15.3	17.3	34.5	18.5	14.4	100.0	7453
Côte d'Ivoire 1994	20.1	23.4	38.6	11.7	6.3	100.0	3982
Ghana 1993	12.2	29.1	46.1	8.2	4.4	100.0	2188
Ghana 1998	10.9	47.3	28.9	11.4	1.5	100.0	3172
Guinea 1999	24.0	32.7	30.1	8.9	4.3	100.0	5701
Mali 1996	10.1	23.8	51.2	10.6	4.3	100.0	5945
Niger 1992	5.7	16.1	41.1	22.1	14.9	100.0	7109
Niger 1998	3.9	12.1	48.0	20.6	15.4	100.0	4977
Nigeria 1990	16.9	13.2	53.2	10.2	6.5	100.0	8065
Nigeria 1999	15.9	17.0	51.8	8.2	7.0	100.0	3395
Togo 1998	16.0	25.4	39.7	11.3	7.6	100.0	3943
All surveys (unweighted average)	**7.4**	**20.2**	**52.8**	**14.0**	**5.9**	**100.0**	