Factors Affecting Mothers' Estimations of Their Children's Birth Weights

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THE RELATIONSHIP of birth weight to postnatal growth and development has undergone intensive investigation in the past 50 years. In most studies, the sample is limited to children below the age of 5 and seldom exceeds 500 persons (*1–3*). With small numbers of young children, it is relatively easy to obtain accurate birth weights from hospital records or birth certificates. However, with large samples of older children, securing birth weights can become a major task.

In many hospitals, the older records are microfilmed or put into storage and are retrieved only with considerable difficulty. Also, some children may have been born outside the immediate locale or State; communication to hospitals in these areas must be by mail with all its attendant problems. Furthermore, some States, such as Massachusetts, have begun only recently to require birth weights on birth certificates. For these reasons, several workers (*4–5*) have used the mother's estimation of her child's birth weight, assuming that the error was within "reasonable" limits and random in direction.

The purpose of this paper is to investigate the direction, frequency, and magnitude of error made by mothers in estimating the birth weights of their children. In addition, factors relevant to her error, such as birth order, maternal age, and sibship size will be examined.

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Methods and Materials

The sample consisted of patients attending Teamster Union Local 25 Dental Clinic in Boston, Mass. These women, drawn mainly from the city of Boston or surrounding suburbs, were predominantly of Irish, Italian, and English background and can be classified as being in the middle socioeconomic strata. A total of 136 women were given questionnaires asking for the birth dates (live births) of the members of their family, the birth weights of their children, and the hospitals where the children were born. From hospital records, accurate birth weights were obtained on 372 children. The hospital birth weight was then subtracted from the mother's estimate—a negative difference means the true birth weight was underestimated.

Results

Data on the mean age of mothers and children at the time of the survey, sibship size, and birth weight follow:

Variable	*Mean*	*Standard deviation*
Age of mothers (years)	36. 99	6. 55
Age of children (years)	10. 10	4. 03
Sibship size	3. 96	1. 84
Birth weight (pounds)	7. 45	1. 21

The average birth weight estimate was in error (any deviation from the true birth weight equal to or greater than 1 ounce) by 0.23 pound. This value cannot be tested for statistical significance because any one mother made several estimates, and therefore the birth weight errors were not independent of each other. On the other hand, the average error per family was independent; with a mean of 0.24 pound, the error was significantly different from zero at the 0.01 level.

Fifty-one percent of the estimates were incorrect, and when a mistake was made, it averaged 0.43 pound. Of these errors, 58.4 percent were underestimates. This is a significant difference ($P<0.05$) from a random expectation of 50 percent. The magnitude of the directional errors (overestimates compared with underestimates) was the same.

To determine if the true birth weight of the child influenced the direction, frequency, and magnitude of the error, birth weight estimates of children below 6.1 pounds were compared to those above 8.9 pounds. The accurate weights of 43 children were less than 6.1 pounds; mothers incorrectly estimated 53.5 percent of these weights, an average of 0.27 pound per estimate. The accurate weights of only 33 children were more than 8.9 pounds; mothers incorrectly estimated 30 percent of these, an average of 0.18 pound. When an error was made, it averaged 0.51 pound for the lighter weights and 0.60 pound for the heavier ones. For both groups, mothers tended to underestimate the birth weight.

Table 1 gives the error by birth order. In general, mothers remembered more accurately the birth weights of first-born children than of those born later. The error for sixth and succeeding children was also small.

The relationship among the mother's age, the sibship size, and the magnitude and frequency of error was examined by the analysis of variance (fixed effects) on the average values within sibships. For the magnitude of the error, the age of the mother had the largest effect (table 2), and after inspection of the data, it can be said that older mothers tended to make greater mistakes. The usual significance levels do not apply since the magnitude of the absolute error and its frequency were not normally distributed.

Table 1. Error associated with birth order

Birth order	Number of births	Mean error (pounds)	Percent of incorrect estimates
1	81	0.16	42.0
2	105	.25	52.4
3	77	.25	55.8
4	49	.27	54.2
5	31	.31	64.5
6 or higher	26	.18	46.2

Table 2. Analysis of variance showing relationship among age of mother, size of sibship, and magnitude of the mother's average error

Source	Degrees of freedom	Sums of squares	Mean squares	F ratio
Age of mother	3	1.5685	0.5228	3.0541
Sibship size	3	1.0390	.3460	2.0211
Age by sibship size	9	1.0011	.1112	.6498
Error	120	20.5433	.1712	

However, the F ratios are still good indicators of the relative importance of the various components of the total variance (*6*).

The number of children in the family was also important; it appeared that as the average number of children in the family increased, so did the magnitude of the mother's average error. The interaction between the mother's age and sibship size was small.

The frequency of error also varied with the mother's age (table 3). As the age of the mother increased so did the frequency of her error. Sibship size did not seem to affect the error, and there was little interaction between the mother's age and sibship size.

It is possible that the average age of the children within families was more important than the age of the mother. However, table 4, a two-way analysis of variance, shows that the average age of the children, the number of children, and the interaction between them did not affect the magnitude of the error.

Discussion

The results point out, in general, that the mothers' estimations of their children's birth weights were relatively accurate but, when they

made a mistake, it approached 7 ounces, a fairly sizable error. Furthermore, the mothers' estimates of 51.1 percent of the children's birth weights were incorrect.

It is noteworthy that the direction of the error was probably not random; 58 percent of the incorrect estimates were too low. Even more important, birth weights of children of less than 6.1 pounds were also underestimated, and the magnitude of the error was approximately one-half pound. Consequently, studies using the mother's estimate of birth weight will tend to place children incorrectly in lower birth weight categories, and it is reasonable to assume that when dealing with premature children (5.5 pounds or less) (*7*) a relatively large error will be introduced if the actual birth weights are not known.

As might be expected, the birth weights of the first-born children were remembered accurately more frequently than those born later. Although this was also true for the sixth- or later-born children, estimates of the birth weights of children who were last born, regardless of the number of children in the family, were not significantly different in magnitude of error than the estimates for children in other birth orders. The positive results for the sixth born probably were obtained because comparatively little time had elapsed between the birth of the child and the present survey.

The analyses of variance (tables 2 and 3) demonstrated that the mother's age was an important determinant of error, whereas the number of children in the family was less so. In general, older mothers made larger and more frequent errors than younger ones. Thus, women exceeding age 37, the mean for this study, will probably make even larger errors.

The failure to find a marked difference in the mother's average error as the average age of her children increased cannot be readily explained. Intuitively, if there is a greater lapse between the births of children and the time their birth weights are estimated, the greater should be the magnitude and frequency of the error. It would seem, rather, that regardless of when the child is born, older women make more errors.

Table 3. Analysis of variance showing relationship among the age of the mother, sibship size, and frequency of the mother's error

Source	Degrees of freedom	Sum of squares	Mean squares	F ratio
Age of mother	3	0. 8919	0. 2973	2. 6305
Sibship size	3	. 5728	. 1909	1. 6892
Age by sibship size	9	1. 5623	. 1736	1. 5359
Error	120	13. 5624	. 1130	

Table 4. Analysis of variance showing relationship among average age of children within families, sibship size, and magnitude of the mother's average error

Source	Degrees of freedom	Sum of squares	Mean squares	F ratio
Age of children	2	0. 2253	0. 1127	0. 9118
Sibship size	2	. 1017	. 0509	. 4118
Age by sibship size	4	. 1202	. 0305	. 2467
Error	131	16. 1969	. 1236	

Summary

Accurate birth weights of 372 children from 136 families were compared with the mothers' estimates of birth weights. The purpose was to determine the frequency, direction, and magnitude of the mothers' errors. The mean for the mothers' ages was 37 years, for the children's ages, 10 years, for the number of children per family, 3.96, and for the birth weights, 7.45 pounds.

The middle class white women from the Boston area had a mean error of only 0.24 pound, but when an error was made, it averaged 0.43 pound. Furthermore, 51.1 percent of the birth weights were incorrectly estimated and, of these, 58.4 percent were underestimations.

Of the factors examined for their influence on the estimate, the mother's age and number of children had a major effect on the magnitude of the error, but only the age of the mother affected the frequency of the error. The estimate also varied with birth order and birth weight.

It can be concluded that if women more than 37 years old, with an average of four or more children, are asked to recall the birth weights

of their children, an error in excess of 0.43 pound can be expected if a mistake is made. In addition, the error will tend to be greater for birth weights of less than 6.1 pounds but smaller for first-born children.

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Education Notes

Principles of Epidemiology. The Training Program of the National Communicable Disease Center, Public Health Service, will conduct a multidisciplinary course in epidemiology, January 20–24, 1969, as part of the continuing education program.

The course is designed to provide public health workers with a basic understanding of the use of epidemiologic techniques in disease prevention. It is offered for physicians, dentists, veterinarians, nurses, laboratory workers, environmental health personnel, and other members of the public health team.

Participants will be admitted on the basis of professional education and experience and current responsibility in public health programs. Preference will be given to applicants whose professional tasks involve application of epidemiologic procedures.

Further information and application forms may be obtained from the National Communicable Disease Center, Atlanta, Ga. 30333, Attention: Medical Training Officer, Health Professions Training Section, Training Program.

Courses for Nurses. A course in surveillance, prevention, and control of hospital-associated infections will be given at the National Communicable Disease Center, Public Health Service, Atlanta, Ga., January 27–31, 1969.

This course has been designed for nurse administrators in clinical and public health programs, nurse educators in basic education and inservice programs, and nurse surveillance officers in infections control. The course is intended to acquaint participants with the magnitude and complexity of the existing problem in hospital-associated infections; to present principles and methods for surveillance, prevention, and control of infections; and to stimulate an increased awareness of the opportunity inherent in nursing to influence and effect higher quality of nursing care.

Course content will include a review of the basic principles of epidemiology; status of hospital-associated infections; basic microbiology; laboratory support in infections control; clinical features of infections; the concept of surveillance; principles of sterilization, disinfection, and isolation; and administrative aspects of control programs. Time will be allotted also for questions and discussion from the floor.

No tuition will be charged. However, participants must make their own arrangements to fund travel and living costs. Applications may be obtained by writing to the National Communicable Disease Center, Public Health Service, Atlanta, Ga. 30333. Attention: Nurse Training Activities, Training Program.