BIRTH WEIGHT OF NEWBORNS AND MATERNAL HEALTH

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SYNOPSIS

The trend of the mean birth weight among the 3 main ethnic groups in Singapore, and the incidence of low birth weight are studied. For the period 1967 to 1982 there is a statistically significant increase in the mean birth weight, an indication that in general there is an improvement in the health of mothers. This increase is seen despite a slight increase in the proportion of smaller babies salvaged as a result of improved medical care. Male newborns are consistently heavier than females. In 1982, the mean birth weight for male newborns is 3171 gm and for females it is 3077 gm. Ethnic differentials also exist, with the Chinese having the highest mean birth weights and Indians the lowest. Women at extremes of childbearing ages (under twenty and above forty years) are more at risk of having low-birth-weight babies. The incidence of low-birth-weights at 8% is comparable to that seen in some developed countries.

INTRODUCTION

The general state of health in Singapore is good. The infant mortality rate has fallen dramatically from about 90 per 1,000 live births in the immediate post-war years to 10.7 in 1982, a level which is among the lowest in the world. Similarly, the maternal mortality rate has fallen from about 3 to fluctuate around 0.1 per 1000 total births in the last decade. As an index of maternal health, the maternal mortality rate because of its very low level can no longer be regarded as a sensitive indicator. Another proxy for the measurement of maternal health is the birth weight of a new-born infant. The birth weight of an infant is strongly influenced by the health and nutritional status of the mother. This is in turn closely associated with the economic, social and environmental conditions surrounding the mother and the complex interaction between fertility, medical intervention and the increasing sophistication and availability of maternal care.

This paper analyses the trends in the weights of new-born babies in Singapore; compares the birth weights of babies belonging to mothers of different ethnic and age groups; determines the incidence of low birth weights; and relates the trends of birth weights to maternal health.

MATERIAL

The analysis was based on data on the weights of infants as recorded by the birth attendants on the preliminary birth report forms. As all births in Singapore are reported, the figures used in this paper therefore referred to total births which occurred during the period 1967 to 1982. Prior to 1975, birth weights were recorded in non-metric units. It was only from 1975 that the metric system of weights was used.

RESULTS

Mean Birth Weight of New Borns

During the period studied, the average birthweight showed a gradual rise. The difference in the average birth weight for the two periods 1967 to 1969 (3080 g) and 1980 to 1982 (3121 g) was highly significant (p 0.01), demonstrating that there has been a statistically significant increase in mean birth weights over the past 15 years. The median and the modal weights also showed a rise over the years. The increase was most noticeable with the modal birth weight which had risen from 3091 gms in 1967 to 3169 gms in 1982, a rise of 78 gms (table 1).

this larger proportion of smaller babies which has reduced the mean birth weight of the babies born more recently, which would otherwise be higher.

Studying only full-term babies, ie infants born after 36 weeks of gestation (table 2), the difference in the means of the two periods, 1968 to 1970 (3116 g) and 1980 to 1982 (3151 g), was highly significant ($p < 0.01$). This meant that by excluding premature babies, the increase in birth weight over the years even more significant.

As shown in previous studies (1, 2) male infants were consistently heavier than females throughout the whole period reviewed. In 1982, the mean birth weight for males was 3171 gms and for females, 3077 gms, this difference being highly significant ($p < 0.01$).

Birth Weight and Ethnicity

An examination of the birth weight distribution among the various ethnic groups (table 3) revealed that the Chinese infants were on the average heavier than Malay and Indian infants. During the period 1975 to 1982, the mean birth weight of Chinese infants was 3,118 gms and that of Malay and Indian infants were 3079 and 3032 gms respectively. The differences in birth weights among the 3 races were statistically highly significant (p 0.01). This ethnic differential was also found in Cheng's study (3), between Indian and non-Indian babies.

A further examination of the distribution of birth weights of the three ethnic groups in 1982 (table 4) showed that for both males and females, the Indians had a higher proportion of low birth weight babies

TABLE 1
BIRTH WEIGHT OF INFANTS, 1967—1982

grams

Year	Mean		Median		Mode	
	Male	Female	Male	Female	Male	Female
1967	3149	3061	3157	3058	3142	3039
1968	3137	3044	3147	3044	3151	3030
1969	3118	3024	3130	3027	3138	3017
1970	3129	3034	3143	3036	3149	3026
1971	3133	3041	3144	3042	3151	3029
1972	3139	3051	3158	3052	3178	3039
1973	3132	3045	3141	3044	3141	3030
1974	3135	3048	3143	3047	3137	3035
1975	3117	3022	3139	3038	3165	3054
1976	3157	3068	3178	3087	3200	3114
1977	3150	3055	3169	3076	3191	3104
1978	3151	3052	3173	3068	3197	3090
1979	3158	3061	3180	3084	3203	3112
1980	3171	3069	3189	3093	3206	3124
1981	3163	3071	3182	3094	3201	3123
1982	3171	3077	3191	3099	3211	3127

A comprison of the frequency distribution of birth weights of babies in 1967 and 1982 showed that the proportion of smaller babies born had increased (figure 1). This indicated that a higher number of smaller babies who might have been prematures or multiple births or small for dates babies had been delivered alive through improved medical care. It is

(under 2,500 gms). There were 7% of low birth weight babies among the Chinese, 9.7% among the Malays and 11.5% among Indians. Although the mean birth weight of the Chinese babies was the highest, the Chinese had the lowest proportion of large babies (greater than 4,500 gms). The comparative proportions were 0.2% among the Chinese, 0.4% among Malays

FIGURE 1

FREQUENCY DISTRIBUTION OF BIRTH WEIGHTS 1967 AND 1982 AND BRITAIN 1970

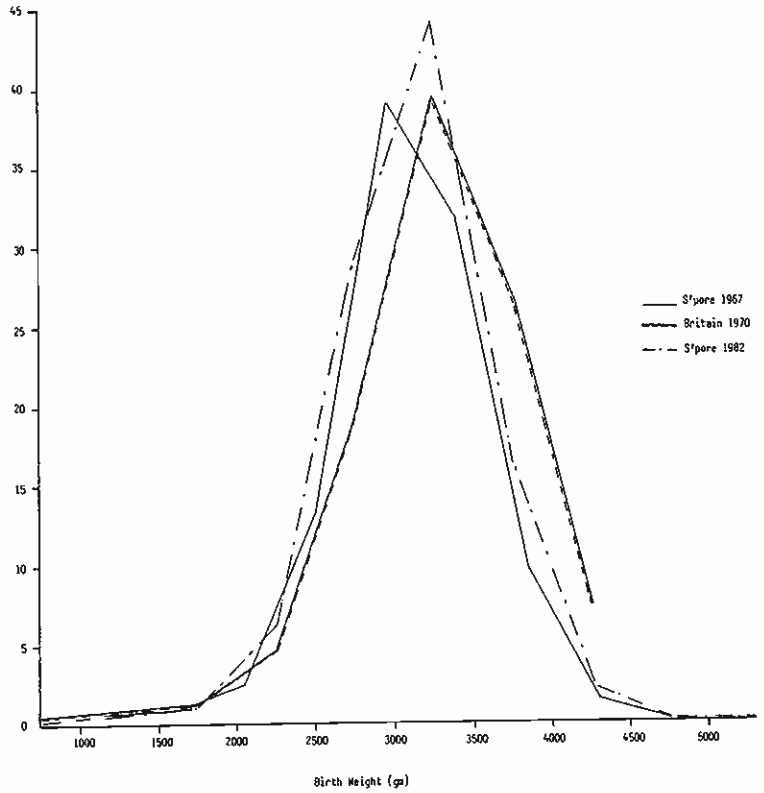

TABLE 2
MEAN BIRTH WEIGHT OF FULL-TERM NEWBORN 1968 — 1982

grams

Year	Male		Female	
	Mean	SD	Mean	SD
1968	3173	457	3076	441
1969	3156	458	3058	437
1970	3167	455	3067	439
1971	3167	454	3072	438
1972	3176	455	3081	441
1973	3167	454	3076	431
1974	3171	446	3077	427
1975	3173	449	3078	436
1976	3184	446	3095	438
1977	3177	450	3082	437
1978	3185	441	3076	429
1979	3189	447	3089	433
1980	3202	449	3098	442
1981	3195	452	3101	436
1982	3204	453	3107	445

TABLE 3
MEAN BIRTH WEIGHTS OF DIFFERENT ETHNIC GROUPS 1975 — 82

grams

Ethnic Group	Male		Female		Total	
	Mean	SD	Mean	SD	Mean	SD
Chinese	3166	470	3067	458	3118	467
Malay	3119	515	3037	497	3079	508
Indian	3074	515	2988	503	3032	511

TABLE 4
DISTRIBUTION OF BIRTH WEIGHTS BY ETHNIC GROUP AND SEX 1982

Percent

Birth Weight (gm)	Chinese	Malay	Indian
		Males	
<1000	0.1	0.1	0.1
1000 — 1499	0.3	0.5	0.5
1500 — 1999	0.9	1.1	1.2
2000 — 2499	4.9	6.6	8.3
2500 — 2999	25.5	25.9	31.8
3000 — 3499	46.3	44.0	39.1
3500 — 3999	18.9	18.0	15.4
4000 — 4499	2.8	3.4	3.2
4500 — 4999	0.3	0.3	0.3
5000 —	0.01	0.1	0.1
Total	100.0	100.0	100.0
Mean (gm)	3166	3119	3074
SD (gm)	470	515	515
		Females	
< 1000	0.1	0.2	0.3
1000 — 1499	0.3	0.5	0.2
1500 — 1999	1.0	1.7	2.1
2000 — 2499	6.5	8.8	10.2
2500 — 2999	32.7	32.7	36.2
3000 — 3499	43.6	39.7	36.5
3500 — 3999	14.1	14.2	12.6
4000 — 4499	1.6	1.9	1.8
4500 — 4999	0.1	0.2	0.1
5000 —	0.0	0.1	—
Total	100.0	100.0	100.0
Mean (gm)	3067	.3037	2988
SD (gm)	458	497	503

and 0.3% among Indians.

A comparison with British Caucasian infants (4) showed that the latter were heavier, with an average birth weight of 3,284 gms. Although the modal birth weights of the British and Singapore new-borns were similar in the group 3,000 to 3,499 gms (figure 1), the British had a larger proportion of bigger babies, with 35% of their babies above 3,500 gms, compared to 19% of Singapore babies. This difference was also noted by Cheng (3) who found that the mean for the Singapore Chinese infants at 40 weeks was 235 gms less than for British Caucasian new-borns.

Prevalence of Low Birth Weight (LBW)

The proportion of live births below 2,500 gms (low birth weight) remained fairly stable at about 8% over the entire period 1975 to 1982. An analysis of low birth weight babies by age of mothers, (table 5) showed that women at extremes of child-bearing ages were more at risk of having low birth weight babies, 13.5% for teenage mothers, 10.9% for mothers over 40 years of age, when compared to only 7.7% for mothers 20 to 39 years of age.

TABLE 5
PROPORTION OF LOW BIRTH WEIGHT BABIES BY AGE OF MOTHER 1975 — 1982

Age Group	% LBW babies
20 years	13.5
20 — 39 years	7.5
40 years and above	10.9
All age groups	7.8

DISCUSSION

The study has shown that consistently during the last one and a half decades there is an increase in the mean birth weight of infants. This increase in the birth weight was seen in all babies born and in full-term babies as well. It is therefore beyond any doubt that there is an improvement in the health of mothers. The improvement may be related to improved socio-economic status and improved ante-natal care of mothers. It is not possible here to identify the relative contribution of each of these two factors. The mean birth weight however is not expected to increase indefinitely despite improved health of mothers, as there is an optimum size beyond which the survival of the newborn declines.

Although mean birth weights differed in the 3 major ethnic groups, with Chinese infants having the highest and Indian infants the lowest mean birth weights, and with Malay infants being intermediate in size, the infant mortality rate is highest for Malay infants, followed by Indian and Chinese babies. This illustrates that birth weight alone will not determine survival of the infant, but rather, survival results from the complex interaction of the quality of obstetric and child care. It is interesting to note that Yadav in a study of birth weight of Malaysian newborns (5) also noted that the Indians have the lowest mean birth weight. Perhaps it is worthwhile to study the factors contributing to the difference in birthweight among different ethnic groups.

The most favourable period for child-bearing is between 20-39 years, for various medical and obstetric reasons. This study also showed that the incidence of low-birth-weight babies is lowest in women of this age group. The incidence of low birth weight in Singapore at 8% compares closely with that in some developed countries eg Sweden 4.8%, UK 6.9% (6).

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