Notes

Maternal Stress and Premature Delivery *

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In 1950 the World Health Organization Expert Group on Prematurity drew up a list of several urgently needed types of research. Among these were studies of the causes of premature birth, since in about half the cases the cause of the spontaneous premature delivery is unknown.[a]

In the intervening decade, studies have been made which demonstrate the relation of premature birth to many factors, among which are poor maternal nutrition, maternal work history during pregnancy, age, height, race, prenatal care, and marital status. A relation between birth weight and social class has been particularly well established and has been reported in studies from different parts of the world.

No exclusive relationship has been established between any of these factors and premature delivery.

"All one can conclude is that the patient most likely to have a premature infant is the young Negress in her first pregnancy who has received little or no prenatal care, who comes from an underprivileged group, who works hard and eats badly. The woman least likely to have a premature infant is the white private patient over twenty, who has had at least one baby and who belongs to the favored, well-fed, leisured, economic top ten per cent."[b]

Adam, who worked with a patient population with a good standard of living, reported that 5% of all births were premature and that of these 40%-50% had no known cause for the premature delivery. He considered these figures comparable to those from other hospitals serving patients of the same social class. Adam concluded that in a population with a consistently high standard of living, the core of the problem of premature delivery lies in the substantial proportion of completely unexplained and often-repeated premature births. He suggested that "... for the bulk of the community, reasonably well housed and fed, a study of the psychogenic factors in the production of spontaneous premature labor would be most rewarding".[c]

The suggestion that psychological or other types of stress may give rise to a premature delivery comes at a time of increasing interest in the relation of stress to all aspects of the female reproductive cycle. Thus, Caplan [d] sees all pregnancy as a period of increased susceptibility to crisis, in which biological factors in the expectant mother react reciprocally with factors in her psychological functioning, and with the social, cultural, and economic factors in her background. O'Neil [e] suggests that emotional tension outweighs physical malfunction and diseases as a cause of gynaecological illness in women and that delivery is also subject to interference by stress and tension. Scott & Thomson [f] found that women whom they considered emotionally well adjusted had a relatively low incidence of difficult labour. Gordon & Gordon [g] successfully predicted the emotional reactions to pregnancy and maternity by rating the mother's previous social experience. Modzham & Kanestrari [h] similarly reported a successful prediction of the course of labour, based on social and psychological information gathered before the delivery.

Other authors have noted that emotional disturbance may bring about premature labour resulting in abortion. It has been suggested that pathways from the cerebral cortex through higher autonomic centres involving the pituitary-adrenal axis are implicated in the mechanism of premature labour. The production of uterine contractions by emotional stress has been demonstrated. Likewise, the increase of uterine irritability and ischaemia when emotional

* Note submitted to the WHO Expert Committee on Maternal and Child Health, November 1960.

[a] *Wld Hlth Org. techn. Rep. Ser.*, 1950, **27**.

[b] Guttmacher, A. F. (1953) *N.Y. St. J. Med.*, **53**, 2781.

[c] Adam, G. S. (1959) *J. Obstet. Gynaec. Brit. Emp.*, **66**, 732.

[d] Caplan, G. (1957) *Amer. J. publ. Hlth*, **47**, 25.

[e] O'Neil, D. (1959) *J. Obstet. Gynaec. Brit. Emp.*, **66**, 762.

[f] Scott, E. M. & Thomson, A. M. (1956) *J. Obstet. Gynaec. Brit. Emp.*, **63**, 502.

[g] Gordon, R. E. & Gordon, K. K. (1959) *Amer. J. Obstet. Gynec.*, **77**, 1074.

[h] Modzham, D. & Kanestrari, R. (1959) *Akuš. i Ginek.*, **35**, 54.

tension is heightened has been noted. Among several papers describing experimental work with animals one may be cited which describes physiological changes in the reproductive organs of female rats which had been subjected to painful stimuli.[i] J. R. Weil has indicated that habitual abortion may be a result of the inability of the patient to cope with the stresses of pregnancy. That premature delivery occurs as a result of a specific stress situation is a commonplace of the folklore of pregnancy.

In this note we offer the hypothesis that the high incidence of premature labour among women of low socio-economic class may be related to stress reaction to their life experience. The authors recently scrutinized the social characteristics of a group of women of low socio-economic status who had delivered premature infants.[j] Our sample was drawn from a municipal hospital in New York City which serves the medically indigent population of a well-defined geographic area. The primary purpose of the hospital is to provide free medical care for patients who cannot afford private care. The geographic area which it serves includes a highly congested section populated almost entirely by unskilled Negro workers. This section is known to have a high incidence of premature births. In 1957 there were 6421 live births in this hospital, of which 947 (14.7%) were infants weighing under 2500 g. Of the 1540 white infants delivered, 168 (10.9%) were prematures, and of the 4881 Negro infants delivered, 779 (16.1%) were prematures.

Our information about the mothers of prematures was drawn from the histories of 267 women who had delivered infants weighing 2100 g or less during a ten-month period in 1956 and 1957. All were single births and all mothers of infants of this weight were included. Social information about the mothers was secured after the delivery and while the mother was still in the hospital. This information was subsequently reviewed when the mothers brought their infants for well-baby care and developmental examinations.

The accompanying figure describes the social attributes of the mothers of prematures. Of particular interest are the youth of the mothers, the number without prenatal care, the immigrant status of the Negro women, and the fact that approximately one-third of the entire group had borne these children out of wedlock. The group was also characterized by unskilled professions, low incomes, a large percentage living in shared quarters, and the short time of residence in the present dwellings. The Negro and Puerto Rican women were migrants who had come to New York City to improve their economic condition. Their life-histories reflected the impoverishment and, in the case of the Negroes, the discrimination which had made the migration desirable. The white women included many young primiparae living in crowded quarters.

Individual instances of drug addiction, alcoholism and antisocial behaviour were found. However, the predominant symptom of social disorganization in our population was the breakdown of the family. We have already mentioned that 31% of the mothers were not married to the infant's father. Of those who were married, many were separated from their husbands. Many had themselves spent their childhood in broken homes.

If we understand the family in our culture to be a group composed of a husband and wife living under one roof with their minor children, then the picture which presented itself was atypical. The breakdown of family in this lowest social class and the attendant conflicts, anxieties and tensions which ensure are not peculiar to our population or to these ethnic and cultural groups. They have been described elsewhere as attributes of low socio-economic class.[k]

It is difficult adequately to describe the quality of the life-histories which we elicited in our interviews. Low socio-economic status had a specific meaning in terms of the quality of human experience. As seen in our population we would say that almost every individual had led a life of continual stress. For most of these women, it was clear in our interviews, the birth of a premature child seemed to be only one more traumatic event in a life full of such happenings.

To what degree were these characteristics attributes of the premature mother rather than of her social class? In order to secure this information, we decided to compare the social situation of mothers of prematures with that of mothers of term infants delivered in the same hospital (see the accompanying table). Social information was collected regarding 67 Negro, white and Puerto Rican women who had delivered at term in the same hospital.

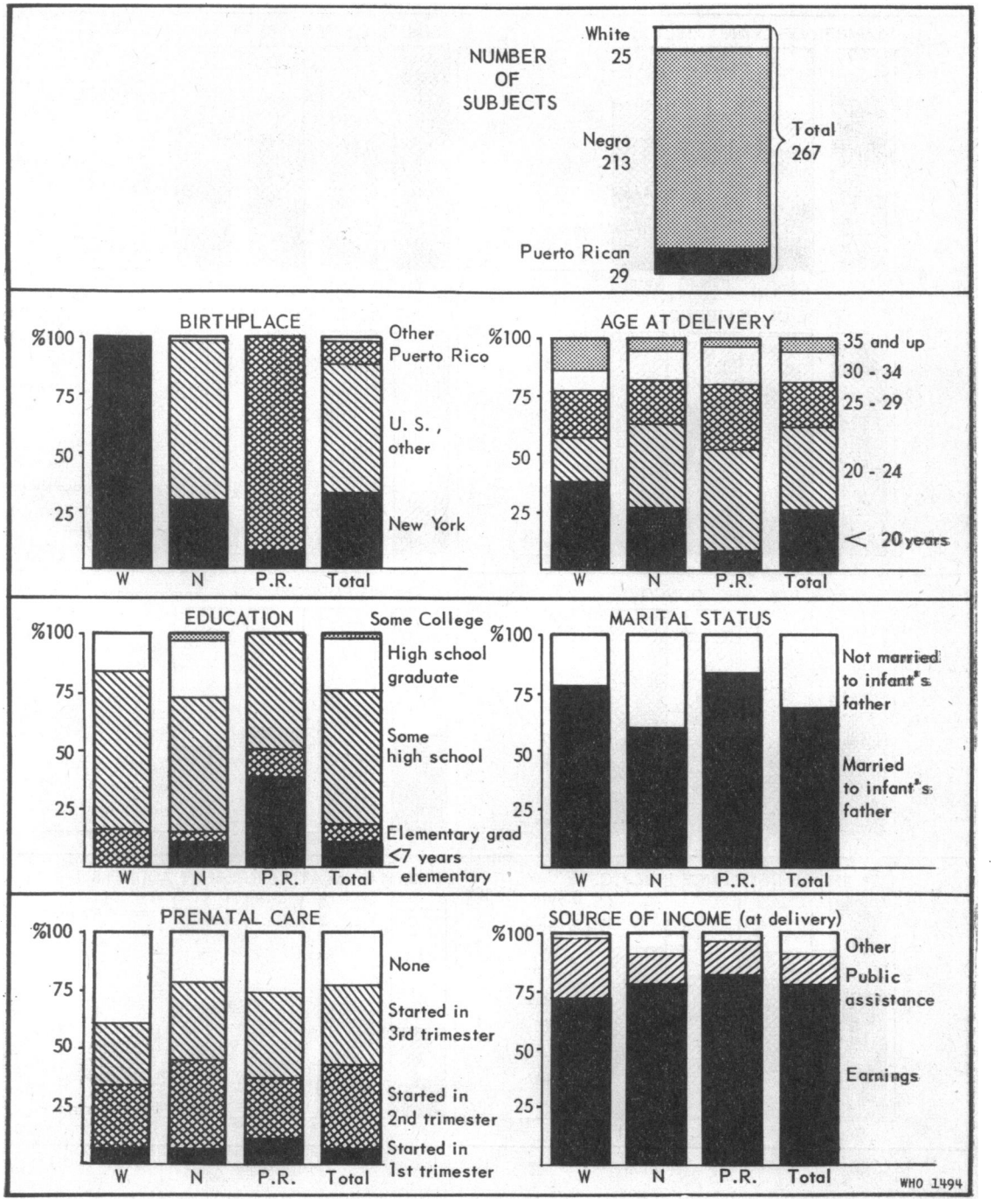
According to the information we collected, the social attributes of the mothers who delivered at

[i] Soiva, K., Grönross, M., Rinne, U. K. & Naatanea, E. (1959) *Acta obstet. gynec. scand.*, **28**, Suppl. 4.

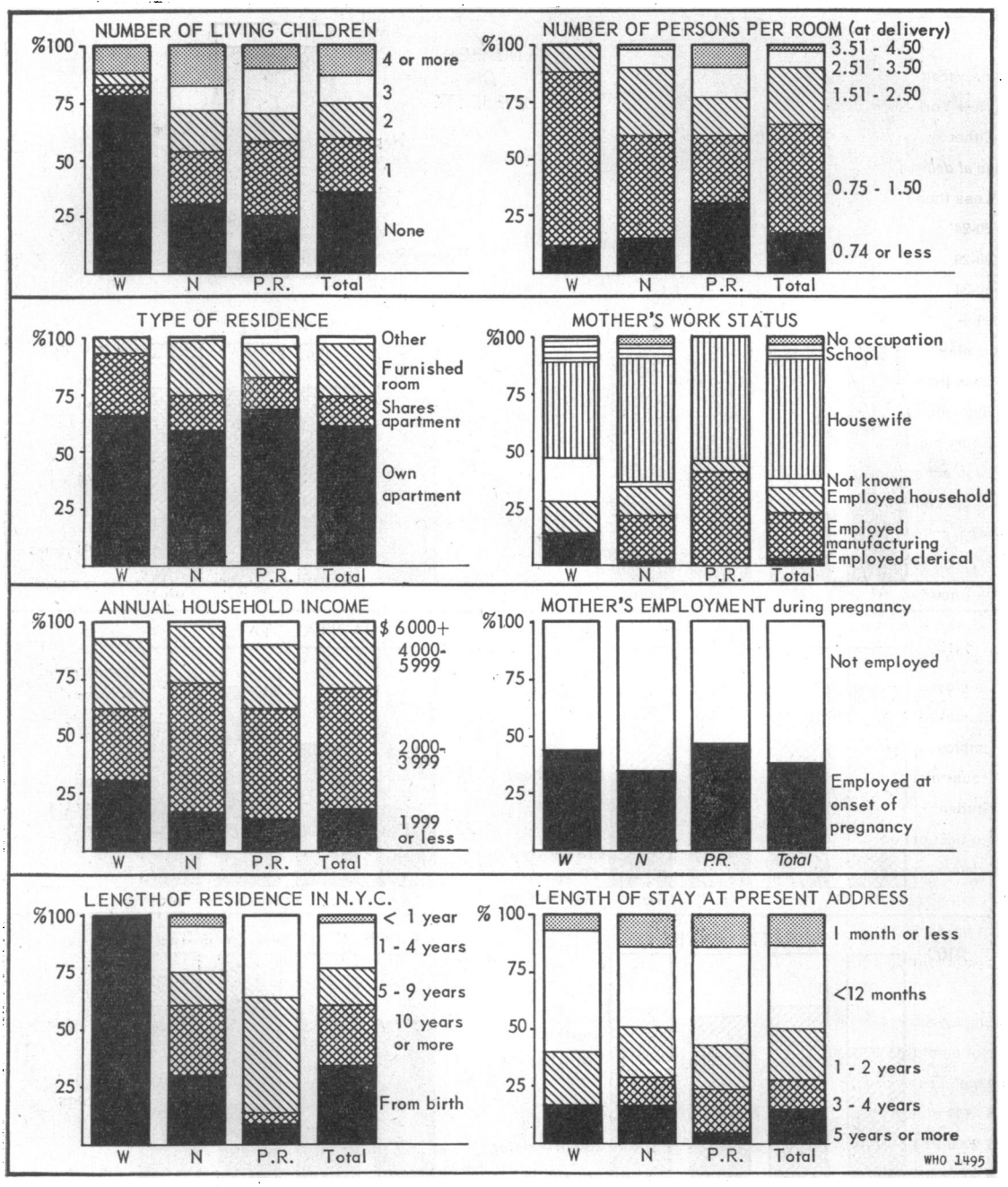
[j] This work was part of an on-going study of the development of premature infants, supported by United States Public Health Service Grant B-1104(CISI).

[k] Hollingshead, A. B. & Redlich, F. C. (1958) *Social class and mental illness*, New York, Wiley.

SOCIAL STATUS OF MOTHERS OF PREMATURES



SOCIAL STATUS OF MOTHERS OF PREMATURES (*continued*)



COMPARATIVE SOCIAL STATUS OF MOTHERS OF TERMS AND MOTHERS OF PREMATURES

	Term (67 subjects)	Premature (267 subjects)		Term (67 subjects)	Premature (267 subjects)
	%	%		%	%
Birthplace			*Source of income*		
New York State	29	33	Earnings	74	78
Other	71	67	Public assistance	22	13.5
Age at delivery			Other	4	8.5
Less than 20	10	26.5	*Persons per room (at delivery)*		
20-24	40	35	0.74 or less	12	17
25-29	28	19	0.75-1.50	53	48
30-34	13	13	1.51-2.50	22	25
35 +	9	6.5	2.51-3.50	9	7
Education			3.51-4.50	2	3
Less than 7 years	20	11	4.51 +	2	—
Elementary graduation	3	7	*Type of residence*		
Some high school	50	58	Own apartment	58	61
High school graduation	24	22	Shares apartment	28	13.5
Some college	3	2	Furnished room	14	22
Marital status			Other	—	3.5
Married to infant's father	68	69	*Length of residence in New York City*		
Not married to infant's father	32	31	From birth	28	34
Work status at conception			10 years or more	31	26
Employed : clerical	10	3	5-9 years	16	16.5
Employed : manufacturing	22	20	1-4 years	18	20
Employed : household	7	11	Less than one year	7	3.5
Employed : work not known	—	4	*Length of stay at present address*		
Housewife	56	52	5 years or more	15	34
Student	4	7	3-4 years	22	26
No occupation	1	3	1-2 years	13	16.5
Prenatal care			Less than 12 months	35	20
Started 1st trimester	19	7	1 month or less	15	3.5
Started 2nd trimester	43	36	*Number of living children*		
Started 3rd trimester	34	34	0	31	35
None	4	23	1	15	24
Employed at onset	40	38	2	16	16
Not employed at onset	60	62	3	10	11.5
Annual income at onset			4 +	28	13.5
$ 1999 or less	21	18			
$ 2000-3999	55	53			
$ 4000-5999	19	25			
$ 6000 +	5	4			

term were almost identical with those of the mothers who delivered prematurely. No important differences were noted with regard to immigrant status, marital status, education, size and source of income, profession and work status. It should be noted, however, that the mothers of prematures tended to be younger and that a statistically highly significant difference was seen when the prenatal care of the mothers of terms was compared with that of the mothers of prematures, the term mothers tending to have more prenatal care and to start such care earlier.

Thus we found that the social attributes of these women were the same regardless of race and regardless of whether they had delivered at term or prematurely. Social attributes such as poor education and out-of-wedlock pregnancy, which have been described as characteristic of the mother of the premature, were in fact attributes of her social class. Nevertheless, we consider these social attributes of great significance and related to the large number of spontaneous abortions in this population.

If we scrutinize the life experience of these women we get a better understanding of the meaning of low social class in terms of individual experience. Low class signifies broken families, poor housing, poor education, high mobility, family disorganization and social pathology. In terms of the individual it means an accumulation of emotional stress, since we are talking about human beings and we assume that the social situations which we have described resolve themselves into psychological stresses which affect the individual. Most of the women who had delivered in this hospital had been subject from infancy to a variety of stresses, some direct and physiological, some indirect and psychological. These stresses were largely inherent in the milieu in which they lived, and pertained equally to the white and Negro women.

In our interviews in the obstetrical wards, it was our general clinical impression that the premature mothers included a number of disturbed and neurotic women. Some women were withdrawn, unrelated and depressed, while others were bland, without affect, and seemingly out of touch with reality. These neurotic symptoms were difficult to evaluate. Seen after delivery, the premature mother has recently gone through an experience which in itself produces anxiety and trauma. The relaxation and lack of tension of term mothers might well be associated with the successful delivery.

Kaplan & Mason [l] have described the disturbance and anxiety associated with the premature delivery which, in their opinion, can be attributed to the trauma of delivery and to the precarious state of the infant. However, our interviews suggested that the mother of the premature had a previous history of stressful reaction to life situations, and that, in reacting with extreme anxiety to the delivery, she was following a previously established pattern.

We suggest that the extremely high proportion of premature births among women delivered in this hospital had a direct relation to the life situations which we have described, and that the endemic nature of premature delivery among women of low social class, as reported in the literature, is similarly related to the stress of life experience. Stresses, associated with low social class, do not equally affect all women and there are women who are more susceptible than others to the negative experiences of daily life. Those women who react with more sensitivity and less resilience to their life situation would also be those more likely to deliver prematurely.

The impression that among the mothers of prematures we were dealing with a group which included a large number of disturbed and neurotic women was confirmed in subsequent interviews after the mother had taken the infant home. Since we were following the development of the premature infant, we continued to see and to interview the mothers. One year after the delivery, six of the women in our population of 267 mothers of prematures were known to have been hospitalized for psychiatric illness. White and his co-workers [m] have stated that one in three hundred women have a post-partum psychosis, which is defined as a psychiatric illness occurring within 12 months after the delivery. Excluding one woman in our group who was psychotic at the time of delivery, we thus had five cases of post-partum psychoses among 266 women, or more than five times the anticipated number. We believe that the number of women with post-partum psychosis in this group of women of low socio-economic class who delivered prematurely supports our hypothesis of the relation of stress to premature delivery.

A multiplicity of stress factors is thus found to characterize this whole population in which a very high rate of prematurity is found. Within the group, the exact degree and multiplication and timing of the stresses are difficult to analyse, and the vulnerability to stress no doubt varies from person to

[l] Kaplan, D. M. & Mason, E. A. (1960) *Amer. J. Orthopsychiat.*, **30**, 539.

[m] White, M. A., Prout, C. T., Fixsen, C. & Foundeur, M. (1957) *J. Amer. med. Ass.*, **165**, 138.

person, just as susceptibility to rheumatic fever or tuberculosis varies even among populations whose living conditions predispose them to those diseases.

In order to confirm the hypothesis that the stresses of life experience, together with a subjective vulnerability to these stresses, account for the high incidence of premature deliveries among women of low socio-economic status, it would now be necessary to carry out predictive studies in which pregnant women would be rated at some time before delivery and a prediction made as to the likelihood of carrying the pregnancy to term.

Environmental and Obstetrical Factors in Prematurity, with Special Reference to Experience in Aberdeen *

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A birth weight of 2500 g is taken as the dividing line between the mature and the premature baby for three main reasons: (1) most babies are weighed at birth; (2) experience shows that under 2500 g more medical and nursing care is needed than with heavier babies and that, despite this, prognosis is less often satisfactory; (3) the length of gestation is not known in a high percentage of cases so that the incidence of premature expulsion of the foetus from the uterus cannot be given accurately.

Some babies are born at term weighing less than 2500 g. When the mother appears to have been clinically well during pregnancy, it is difficult to tell whether the small baby is "normal" for this particular woman or whether foetal growth had been depressed because of some disturbance of pregnancy physiology. Some small babies at term look healthy and well nourished; others seem undernourished, with wrinkled skin and relatively little subcutaneous fat. Very little is known about the variations in reproductive physiology in the human, and although laboratory methods of studying this are now becoming available they are time-consuming and it will be some years before significant facts can be collected.

However, there is much evidence that the incidence of prematurity is greatly influenced by such important general factors as the health, nutrition and physique of the mother. The clinician often finds it difficult to measure such factors accurately, but a valuble indirect estimate can be derived from a classification of the family's social position. The method of classification will necessarily vary from country to country, but in Great Britain the Registrar-General has developed a method of classifying the occupation of the husband which is widely employed in British vital statistics and is used throughout this paper. Broadly speaking, Social Classes I and II comprise the professionally qualified and managerial groups, Class III routine clerical workers and skilled manual workers, and Classes IV and V semi-skilled and unskilled workers. The classification may also be applied to the occupation of the wife's father to give an indication of her childhood environment and to the premarital occupation of the wife herself.

Adult height can also be used statistically as a useful measure of physical well-being. There is much evidence to suggest that in Britain today many short women (less than 5 feet 1 inch, or 155 cm) have not grown to their full potential height because of unfavourable environmental factors and in consequence have reduced reproductive efficiency, which can be demonstrated in a number of ways; for example, a high prematurity rate and high perinatal death-rates from all causes. The percentage of short primigravidae in Aberdeen varies from 7% in Social Classes I and II to 30% in Social Class V.

The effect of these indirect indices of health on the prematurity rate is shown in the following tables, which are based on 10 224 first births, being the total in the City of Aberdeen from 1951 to 1959 inclusive.

Table 1 shows that the lowest rate is found when the mother has been brought up in Social Classes I and II and marries into the same social class (4.3%). It can be seen also that those who go from the

* Revised version of a note submitted to the WHO Expert Committee on Maternal and Child Health, November 1960.