Maternal size, as assessed by height and weight, is recognized as an important determinant of birth weight.\(^5\) Published data show that infants born to Coloured women in Cape Town are relatively growth-retarded.\(^6\) There is also a high perinatal mortality rate\(^7\) which is related to maternal stature.\(^8\)

Recent evidence suggests that maternal size reflects nutritional status during pregnancy,\(^9\) and that an improvement in maternal diet favourably influences both fetal growth and developmental progress after birth.\(^10\)

The aim of the present study was to record accurately the anthropometric measurements of Coloured primigravidas who delivered at term. These data would provide a baseline for any further studies on the effects of maternal nutrition on fetal growth and development.

### SUBJECTS AND METHODS

Between April 1975 and March 1976, consecutive Coloured women delivering live, first-born singletons at the Peninsulâ Maternity and Groote Schuur Hospitals, Cape Town, were studied. There were 1 186 mothers who gave birth at or beyond 37 weeks of gestation and who fulfilled these criteria. This number represents the majority of primigravidas in the community assisted by the Peninsula Maternity Services during this period.

The height of each mother was measured to the nearest centimetre and her weight was recorded at each antenatal visit and on admission to hospital when in labour. The mean weekly weight gain during the last trimester was calculated and the weight at 29 weeks' gestation determined by interpolation.

On the day after delivery, each mother's weight was again recorded and the postdelivery weight/height ratio calculated. At the same time the left upper arm circumference\(^5\) and left triceps double skinfold thickness were measured.\(^9\) From these results the upper arm muscle circumference was calculated.\(^9\) It was not possible to record all variables on each woman throughout the entire study. All the infants were examined on the day after delivery, and their gestational age was assessed.\(^11\)

During June and July 1976 a similar study was carried out at the Mowbray Maternity Hospital and 100 consecutive White primigravidas, delivering at term, were examined using the same methods described above. The mean and standard deviation were calculated for each of the maternal variables studied. Student's \(t\) test was used in the analysis.

### RESULTS

The mean height of 1 186 Coloured women was 154.2 (± 7.4) cm. At 28 weeks of gestation the mean weight in 300 was 59.6 (± 9.3) kg and at delivery it was 64.4 (± 9.7) kg in 1 157 mothers. In 395 mothers the postdelivery weight was 59.3 (± 9.5) kg and in 382, the postdelivery weight/height ratio was 0.38 (± 0.06). In 419 mothers the left upper arm circumference, triceps double skinfold thickness and arm muscle circumference were 24.8 (± 2.6) cm, 13.9 (± 7.6) mm and 20.6 (± 2) cm respectively (Table I).

When the two groups of term primigravidas were compared, Coloured mothers were significantly smaller than their White counterparts in all the variables measured, except for arm muscle circumference.

### DISCUSSION

Few anthropometric surveys have been conducted during pregnancy and no in-depth study is available. The size and dietary intake of primigravidas in Aberdeen, studied by Thomson and Billewicz\(^11\) have provided an acceptable standard for many years. The average maternal height and weight at delivery were found to be 159 cm, and 71 kg respectively\(^11,12\) which is similar to that of White mothers delivering at the Mowbray Maternity Hospital. The latter were therefore investigated to obtain detailed comparative data which were not available from the study done in Aberdeen.

Maternal height reflects both genetic endowment and nutritional status during childhood. Studies in Japan suggest that shortness of stature in a community is usually due to nutrition rather than heredity.\(^13\) Protein energy malnutrition is still common among Coloured children in Cape Town\(^4\) and almost certainly provides an explanation.
TABLE I. STATURE AND WEIGHT OF COLOURED AND WHITE MOTHERS DELIVERING AT TERM (MEAN ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Coloured</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>154.2 ± 7.4</td>
<td>162.0 ± 6.0</td>
</tr>
<tr>
<td>Weight at 28 weeks (kg)</td>
<td>59.6 ± 9.3</td>
<td>67.1 ± 11.0</td>
</tr>
<tr>
<td>Weight at delivery (kg)</td>
<td>64.4 ± 9.7</td>
<td>72.9 ± 11.8</td>
</tr>
<tr>
<td>Weight gain weekly (kg)</td>
<td>0.42 ± 0.26</td>
<td>0.48 ± 0.19</td>
</tr>
<tr>
<td>Postdelivery weight (kg)</td>
<td>59.3 ± 9.5</td>
<td>66.0 ± 12.0</td>
</tr>
<tr>
<td>Postdelivery weight/height</td>
<td>0.38 ± 0.06</td>
<td>0.41 ± 0.07</td>
</tr>
<tr>
<td>Upper arm circumference (cm)</td>
<td>24.8 ± 2.6</td>
<td>26.0 ± 3.0</td>
</tr>
<tr>
<td>Triceps skinfold thickness (mm)</td>
<td>13.5 ± 7.6</td>
<td>18.0 ± 7.0</td>
</tr>
<tr>
<td>Arm muscle circumference (cm)</td>
<td>20.6 ± 2.0</td>
<td>20.7 ± 1.5</td>
</tr>
</tbody>
</table>

P<0.0001 for all comparisons except P>0.05 for arm muscle circumference.

for most of the differences in height noted between the Coloured and White mothers.

Weight before pregnancy has been taken as an index of maternal nutrition.15 As this information was unavailable to us, mass at 28 weeks of pregnancy was used to assess nutrition before the start of the last trimester. The comparatively low weight of 59.6 kg in the Coloured mothers suggests a poor dietary intake, either before or during early pregnancy.

Mean weekly gain in weight and weight at delivery also show significant differences between the two groups, suggesting that nutrition during the last trimester is also suboptimal in Coloured mothers. Postdelivery weight and postdelivery weight/height ratio confirm this finding, the effect of fetoplacental weight having been removed.

The accurate assessment of adiposity, using arm circumference and triceps skinfold thickness, has been confirmed in the non-pregnant state.16,17 During pregnancy, fat is stored asymmetrically, with an increase in subcutaneous fat over the trunk, but not on the arms and lower legs.16 Thus the reduced arm circumference and skinfold thickness in the Coloured mothers probably reflect their nutritional status before pregnancy.

The validity of using the arm muscle circumference as an index of muscle bulk and protein stores in pregnancy is open to question, but our findings suggest an adequate protein intake. This conclusion is supported by the finding of very similar serum albumin values in the Coloured and White mothers at delivery.18

The Coloured population studies are thus characterized by short, light, thin women suggesting an inadequate energy intake before and during pregnancy. With various criteria of maternal size now well documented, those mothers who are at greatest risk of undernutrition can be identified.

Nutritional improvement can then be planned on a rational basis. It is hoped that an increase in the rate of intra-uterine growth of infants born to underweight mothers will be achieved with nutritional advice or supplementation. This may improve the condition of these babies, reduce perinatal risk and possibly improve their long-term mental and physical development.

REFERENCES