Several reports have been published on the age of menarche in Bantu schoolgirls. In 1943, Kark drew attention to the later menarche experienced by girls living in the more northern rural regions of South Africa, compared with those living further south. She suggested that differences in nutrition, endemicity of disease and possibly the mean annual temperature might account for this. These theories are borne out by her subsequent findings among Indian girls who showed a progressive trend towards later menarche as the level of family income declined. A number of studies in other parts of the world all confirm that improved health and nutrition are accompanied by an earlier menarche.

In a paper published in 1957, Kark related the heights and weights of Bantu girls in Durban to their sexual maturity. Data presented showed that the mature girls were at least 13 years more advanced in height and weight than the sexually immature girls of the same age. Her work demonstrates that in the use of growth charts, allowance should be made for the degree of sexual maturity.

Burrell et al. have studied the age at menarche of a large number of schoolgirls living in the Transkei. The age at which 50% of girls were menstruating (15-42 years in the 'poor' group and 15-04 years in the 'not poor' group) was slightly higher than the age found by Oettle and Higginson in a similar study of urban Bantu (14-89 years). It was estimated that 52% of the girls included in this latter study were living below the 'poverty datum line'. In both studies the mean age was significantly higher than that found in studies reported from other countries. 1-6

During August and September 1965, anthropometric and clinical examinations were conducted on 301 Pedi schoolchildren living in the Kgolokoe's location area of the Bantu Reserve of Sekhukhuniland in the north-eastern Transvaal. The geographical and cultural background, mean anthropometric findings and serum protein figures of these children have already been described, as has the statistical method in which a representative sample was selected from the more than 6,000 children attending schools in this area. In drawing the sample, age was taken as at 1 July 1965, by calculating 1965 less the year of birth.

METHOD AND RESULTS

In the course of clinical examinations on the 145 girls included in the survey, the development of secondary sexual characteristics was noted. The results are tabulated in Tables I and II.

Breast Development

Tanner classifies pubertal development into 5 stages. In the present survey it was found that the breast development of Pedi girls at puberty may be conveniently divided into 3 stages, and the girls showing evidence of breast development have been grouped accordingly:

Stage 1: Elevation of breast and papilla as a small mound.
Stage 2: Enlargement of breast and areola, with no separation of their respective contours.
Stage 3: Mature breast.

TABLE I. SECONDARY SEXUAL CHARACTERISTICS IN PEDI GIRLS*

<table>
<thead>
<tr>
<th>Age in years</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast development</td>
<td>13</td>
<td>57·1</td>
<td>64·7</td>
<td>78·9</td>
<td>91·7</td>
</tr>
<tr>
<td>Pubic hair</td>
<td>—</td>
<td>23·8</td>
<td>29·4</td>
<td>68·4</td>
<td>83·3</td>
</tr>
<tr>
<td>Menstruation</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

*Findings expressed as percentages of the number of girls in each age-group.

TABLE II. BREAST DEVELOPMENT*

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Stage 1</th>
<th>Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>6·7</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>52·3</td>
<td>4·8</td>
</tr>
<tr>
<td>13</td>
<td>47·1</td>
<td>5·9</td>
</tr>
<tr>
<td>14</td>
<td>57·9</td>
<td>15·8</td>
</tr>
<tr>
<td>15</td>
<td>33·3</td>
<td>8·3</td>
</tr>
</tbody>
</table>

*Findings expressed as percentages of the number of girls in each age-group.

Thirteen percent of 11-year-old girls and 57·1% of the 12-year-old girls had early breast development. Of the 15-year-old girls, 8·3% had no breast development and 50% had mature breasts.

Pubic Hair

In the 12-year-old group, 23·8% of the girls had pubic hair. The proportion increased with age, as expected, and pubic hair was present in 83% of the 15-year-old group.

Menstruation

A Bantu nursing sister enquired of the girls whether or not menstruation had commenced. The menarche had not occurred in a single girl under 15 years of age, but 50% of the 15-year-old group were menstruating.

DISCUSSION

The first menstrual period is a definite milestone in the secondary sexual development of the female. Other secondary sexual characteristics develop over a number of years and exact stages of development for comparative purposes are difficult to define. For this reason, the age of menarche has been studied in many parts of the world, and reports have indicated considerable variation in age from one race to another and from one climatic area to another. 1-6,10,12-14 A number of authors have advanced theories to explain this variation, and climate, race, social class and nutritional status have all been considered. The evidence appears to favour nutritional status as the prime factor in determining the age of menarche:

Benjamin quotes Tilt (1862) as stating that women in tropical climates reached the menarche earlier than those living in temperate and cold climates, and Foll noted in...
1958 that this was still popularly believed. Mills\textsuperscript{36} took the opposite view and stated that 'in regions of depressing moist heat, both growth and menarche are delayed and the final adult form is slender and small'. He pointed out that sexual maturity in tropical countries comes fully 2 years later than in the more stimulating temperate regions. He felt that the ease or difficulty of body-heat loss was the determining factor, and that an adequate diet would not overcome this.

Subsequent studies have failed to provide support for Mills's hypothesis. Foll\textsuperscript{11} compared the mean age at menarche of two groups of Burmese children living under very different climatic conditions, but with a similar socioeconomic environment and good diet. There was no difference in the mean ages, which were lower than that for a reported study of English girls.\textsuperscript{34} A study of urban schoolchildren\textsuperscript{\textsuperscript{\textsuperscript{22}}} drawn from various Eastern races in Colombo again showed a mean age (12-84 years) which was lower than that of English girls. However, rural Cingalese questioned at the same time showed a mean age of 14-39 years.

Fluhman\textsuperscript{6} has noted that the mean age of menarche is the same for all groups of American girls, irrespective of the country of origin of their parents. Italian, Jewish and Japanese children living in the USA have a similar mean menarchal age which is earlier than that in Italy, Central Europe or Japan. As the effect of climate is unimportant, the superior diet enjoyed by American children would appear to be the responsible factor.

In communities where the diet is poor, the mean age of menarche is delayed. In Central Europe girls reached the menarche at a greatly delayed age in the years of deprivation which followed World War I. Boas\textsuperscript{10} found that the mean age of menarche for girls living in a Jewish orphanage was significantly delayed. Wilson and Sutherland\textsuperscript{\textsuperscript{\textsuperscript{6}}} showed that girls in rural Ceylon began to menstruate, on average, 2 years later than their urban counterparts in Colombo (see above). This difference between rural and urban children could not be demonstrated in England, where the diet of the 2 groups is substantially the same. In the Transkei, where malnutrition is prevalent, Burrell \textit{et al.}\textsuperscript{8} found a mean menarchal age of 15-22 years, and in Alexandra Township, Johannesburg, Oettle and Higgins\textsuperscript{\textsuperscript{4}} found a mean age of 14-89 years. These figures are both higher than the means in most other reported series.

In her study of Bantu girls, Kark\textsuperscript{1} did not record a single child under the age of 13 years in whom menstruation had commenced. Among Indian girls she demonstrated a social gradient, with menstruation in girls from the wealthy classes occurring on average 5-3 months earlier than in girls from the poorer classes. Michelson\textsuperscript{18} showed that where social class could be equated, menarche occurred at the same mean age in groups of American Whites and Negroes.

There is, therefore, much evidence to suggest a direct relationship between a good diet and the early onset of menstruation.

Data from Pedi girls were obtained simply by asking each child whether or not menstruation had commenced. Out of 145 children so questioned, only 6, all in the 15-year-old group, replied in the affirmative. In order to obtain an accurate median age of menarche by probit or logit analysis\textsuperscript{11} it will clearly be necessary to question much larger numbers of girls and to include samples from age-groups beyond the upper limits of this survey. It is felt, however, that there is significance in the fact that no girl under the age of 15 years had commenced menstruation. It suggests that the average age for rural Pedi is no lower than that found among Transkei children.

Tanner\textsuperscript{16} has illustrated graphically the secular trend in the mean age of menarche which has occurred among Caucasian children over the last 130 years. Among girls from the privileged classes, this secular trend is less marked than among girls from the poorer classes whose nutritional status has improved relatively more. The trend in mean menarchal age shows a pattern comparable with that of the secular growth trend already mentioned,\textsuperscript{11} and the two are clearly related.

It would seem, therefore, that an improvement in nutritional standards could logically account for both trends. The present late age of menarche among Pedi girls correlates with their height and weight means, and is a further index of their poor nutritional standard. When dietary improvements lead to an increase in the mean height and weight of Pedi children, one may anticipate a corresponding drop in the mean age at which menstruation begins.

SUMMARY

In the course of an anthropometric and clinical survey of schoolgirls in a rural Bantu Reserve, development of secondary sexual characteristics was noted. The girls were questioned about the onset of menstrual periods. It was found that menstruation had not started in any girl under 15 years. The relationship between nutritional status and the menarche is discussed.

REFERENCES