

*Photographs of their children induce mothers to keep appointments in a long-term study on their growth and development*

## Participation in a Longitudinal Study of Negro Infants and Children

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NUMEROUS problems accompany longitudinal studies in which participation depends on voluntary cooperation. The degree of cooperation obtained may be related to the type of population studied as well as to the benefits, if any, which participants feel they are receiving. Even under the most favorable conditions such factors as migration and loss of interest are difficult, if not impossible, to control.

Yet, as Senn has stated (1) longitudinal studies produce answers to certain questions that cannot be found by any short-term approach. It therefore becomes important to attempt to isolate characteristics, attributes, or traits which encourage or discourage cooperation in longitudinal research.

In the general area of public health research, it might be assumed that socioeconomic status will play an important part in the degree of

cooperation received. Simmons (2) raises the question of whether persons of lower status are as willing as those of higher status to inconvenience themselves in the present for possible benefits in the future. He further states, "The lower status individual may be much less likely to think that responsibility for his well-being rests solely with himself, and more likely to think that if something does happen the kin group will see him through."

Simmons feels also that there may be a tendency for "higher status patients" to reject the health worker because "they perceive his attempts to serve them at all as identifying them with the lower status people typically served by public health, and thus regard him as a threat to their social position."

In a study of a group of Negro and white mothers, Yonkoner, Gross, and Romeo (3) found that within 1 year after delivery more than one-half of the mothers had moved. This degree of mobility becomes a serious handicap if participants move outside the research area or fail to leave a record of their new addresses when moving within the research area.

Since 1953 the department of pediatrics of the George W. Hubbard Hospital, Meharry Medical College, has been studying the growth and development of Negro infants and children in Nashville, Tenn. It is our purpose to discuss some of the specific problems encountered in maintaining cooperation in the study, to describe some of the devices used to encourage

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cooperation, and to attempt to measure the influence of socioeconomic status and certain other factors in order to learn whether these are specific, determining characteristics in relation to cooperation.

### **Methods and Materials**

The study from which the data are taken has been described elsewhere (4-7). Basically, it consists of an analysis of anatomical, physical, and psychological factors influencing the growth and development of Negro infants from birth through 5 years of age. The mothers enrolled in the study are seen prior to delivery in order to obtain a prenatal nutrition record and a socioeconomic index of the family. After delivery, physical and bone X-ray examinations and psychological evaluations are made of each child at 3-month intervals from birth through 24 months and thereafter at 6-month intervals until the child is 5 years old.

Each mother is sent a letter 6 to 7 days in advance of the scheduled appointment, setting a specific time and day. The mother is invited to call the research office if another time or day is more convenient for her. When an appointment is missed, the medical social worker tries to contact the mother personally to insure that the child is seen. The research staff provides transportation to and from the hospital if the mother requests it.

Included in this analysis is a group of 523 mothers of children who were between 36 and 42 months of age by March 31, 1959. By that time each mother should have made at least 10 visits to the clinic. Not all of these mothers, however, were still being scheduled for appointments. Some had become inactive because of movement within or outside the city or lack of cooperation. The 11 mothers whose children had died are excluded from the study.

Of the 523 mothers, 247 who had moved and could not be reached or were not responsive were listed as inactive; 276 remained in the active group.

These two groups are compared to ascertain whether the active and inactive mothers differ with respect to socioeconomic status, number of children, education, age, and marital status and whether these factors have a bearing on continued participation.

The active mothers are also grouped according to these various characteristics to see if they are related to the number of appointments kept. Analysis by number of completed appointments was impracticable for the inactive group because of the varying ages of the children at the time of withdrawal (table 1).

The division into active and inactive groups should not be taken to mean that all mothers who become inactive are necessarily uncooperative. The three reasons for becoming inactive (table 1) reflect varying degrees of cooperation. Certainly the mother who is unresponsive is not necessarily comparable with the mother who moves outside the city.

While cooperation for the active group is measured for practical purposes in terms of the number of appointments kept, we are not assuming that the degree of clinical participation is a complete indication of clinical cooperation. The amount of effort required to obtain each appointment varies with each mother. Some mothers come in when scheduled with no additional prompting; some have to be reminded; others may break several appointments before one is kept. This, too, cannot be fully quantitated and is beyond the scope of this paper. Cooperation has been equated with participation since participation is after all the ultimate aim.

### **Difficulty in Maintaining Cooperation**

Undoubtedly all longitudinal research projects have problems in common. In addition there are difficulties peculiar to specific studies. The following apply to the present study:

- The high rate of mobility within the city greatly impairs followup because many of the mothers fail to leave forwarding addresses. Since they often do not establish separate households, they frequently cannot be traced. Almost three-fourths (72.6 percent) of the inactive mothers are so classified because they had moved. Of this total, 74.3 percent moved within the city, leaving no forwarding address or other means of being reached.

- A large number of homes have no telephone. When an appointment is missed, the social worker must contact the mothers personally, often making repeated trips.

**Table 1. Percentage distribution of 247 mothers who became inactive, by age of child and reason for withdrawal**

Age of child (months)	Reason for becoming inactive		
	Moved within city (N=133)	Moved outside city (N=46)	Uncooperative (N=68)
3	1.5	19.6	5.9
6	4.5	2.2	
9	10.5		4.4
12	6.0	13.0	11.8
15	9.0	19.6	17.6
18	14.3	13.0	11.8
21	18.0	13.0	10.3
24	12.0	8.7	7.4
30	10.5	6.5	4.4
36 or more	13.5	4.3	26.5
Total	100.0	100.0	100.0

- Many mothers return to work before or shortly after the scheduled 3-month appointment. Generally, working hours of the mothers coincide with those of the research staff.

- The subsequent birth of children increases demands on the mothers' time. Also mothers with several young children frequently have a baby-sitting problem.

- After the first year of participation, many mothers feel that they can use the services of community well-baby clinics which are generally closer to their homes.

- Transportation to and from the hospital is often a drawback, especially for mothers with low incomes.

- Finally, there is the continuing problem of convincing each mother that she and her child are receiving some benefit from the research program. This is difficult because the program does not provide treatment for infants and children who are ill, unless such treatment cannot be given at the time by any other department in the hospital.

#### Devices to Encourage Cooperation

It was evident before data collection began that if participation in the followup clinic was to be at all representative, inducements would have to be offered to the mothers. Some of the following devices were decided on in advance,

while others were developed following experience in trying to maintain a high proportion of completed appointments.

- When an expectant mother was accepted for participation in the project, an attempt was made to record some telephone number other than her own at which she could be reached. This, theoretically, should have made it easier to trace mothers who moved and left no forwarding address.

- Efforts are made to accommodate working mothers and those with other young children. A relatively large number of Saturday appointments are scheduled for the working mothers. Mothers with children who are not enrolled in the study may bring them along with the participating sibling.

- Comforts are provided for the child who may have to wait his turn in the clinic. High chairs, toys, lollipops, and balloons rank high among the necessary items of equipment and supplies.

- As stated earlier, transportation to and from the hospital is provided whenever it is requested by the mother. This has proved a major inducement. In any given month, approximately 50 to 60 percent of all appointments kept are made possible through provision of transportation.

- Originally, no medical treatment was to be given to the participating children. It became apparent, however, that many mothers could see no advantage in continuing to bring their children. The program was therefore expanded to include a service phase providing on request a complete series of inoculations for the child.

- One of the most effective inducements has been the practice of mailing the mother a photograph of her child, taken at each appointment. Mothers may also obtain the negatives of these pictures. This practice was followed also by Moore, Hendley, and Faulkner (8). The photographs have been so effective in our study that many mothers now feel that they bring the child in "to have his picture taken."

#### Comparison of Active and Inactive Groups

The distribution of the active and inactive mothers by socioeconomic group is shown in

**Table 2. Percentage distribution of active and inactive mothers, by socioeconomic group <sup>1</sup>**

Socioeconomic group	Active (N=273)	Inactive		
		Moved outside city (N=43)	Moved within city (N=128)	Uncooperative (N=60)
I (low)-----	12.8	18.6	23.4	21.7
II-----	48.4	20.9	51.6	48.3
III-----	30.0	44.2	24.2	26.7
IV (high)-----	8.8	16.3	0.8	3.3
Total-----	100.0	100.0	100.0	100.0

<sup>1</sup> Socioeconomic data were unavailable for 19 cases. References 4, 6, and 7 describe the socioeconomic index.

table 2. The chi-square test (significant at the 1 percent level) indicates that there is some association between socioeconomic status and type of case. Approximately 60 percent of the mothers who moved outside the city are in the upper half of the socioeconomic distribution. This is perhaps a reflection of the fact that persons in the lower socioeconomic categories can ill afford to move from one city to another. The other three types of cases show relatively minor differences in their socioeconomic composition. The mothers who moved within the city and those who were dropped for lack of cooperation are perhaps more like each other socioeconomically than they are like the active mothers, but the difference is not outstanding. Variance analysis shows the association between socioeconomic status and type of case to be significant at the 1 percent level. The mean socioeconomic score falls in group II for all

cases except those mothers who moved outside the city, whose mean score falls in group III.

Comparative statistics on the background characteristics of the mothers are shown by type of case in table 3. Only socioeconomic status, discussed above, and education of mother are significantly associated with type of case. According to variance analysis, both factors are significant at the 1 percent level. Mothers who moved outside the city show evidence of higher socioeconomic status by having the highest mean educational attainment, 11.6 years. Education correlated more highly ( $r=0.665$  for all cases) with socioeconomic status than did any of the other factors being considered. Both the means and medians for educational attainment follow the same order as those for socioeconomic status, with mothers who moved within the city falling at the bottom. In both instances the active mothers are close in mean score to mothers moving outside the city, while the other two groups are similarly close.

Although no significant differences were found for age of mother and number of children by type of case, we again seem to have two sets of similar groups. For these two factors, the active and uncooperative groups are close in mean score, while there is very little difference in the mean scores of mothers who moved within and outside the city. Mothers who were dropped for lack of cooperation had the highest mean age and number of children.

Marital status of the mothers is shown by type of case in table 4. The chi-square test, applying only to the married and unmarried mothers, revealed no significant association be-

**Table 3. Comparison of active and inactive mothers, by age, number of children, education, and socioeconomic status**

Type of case	Age of mother (years)		Number of children			Education of mother (years)			Socioeconomic index	
	Mean	Standard deviation	Mean	Standard deviation	Median	Mean	Standard deviation	Median	Mean	Standard deviation
Active-----	25.5	5.9	3.0	2.0	3.0	10.1	2.5	10.6	27.2	12.0
Inactive:										
Moved within city-----	23.6	5.6	2.6	1.6	2.8	9.5	1.8	9.5	21.4	10.0
Moved outside city-----	24.1	4.8	2.5	1.5	2.6	11.6	3.0	12.2	30.3	13.4
Uncooperative-----	25.9	6.8	3.3	2.1	3.4	9.8	2.1	10.1	23.2	11.0

**Table 4. Percentage distribution of active and inactive mothers, by marital status**

Marital status	Active (N=276)	Inactive		
		Moved within city (N=133)	Moved outside city (N=46)	Uncoop- erative (N=67)
Married.....	78.3	72.2	76.1	62.7
Separated.....	3.3	4.5	2.2	3.0
Widowed.....	.7	.8		
Divorced.....				1.5
Unmarried.....	17.8	22.6	21.7	32.8
Total.....	100.0	100.0	100.0	100.0

tween these factors. Fewer of the uncooperative mothers were married, there being a very large divergence between this group and the active group. When only these two groups are compared, the chi-square test indicates an association between marital status and type of case which is significant at the 1 percent level.

**Factors Presumed to Encourage Cooperation**

Appointments kept by mothers who were active when their children were 36 months old are analyzed in relation to five background factors (table 5). Both the mean and median are discussed since the distribution departs significantly from normal distribution.

The mean number of appointments kept by all active mothers is 7.6 and the median is 8.7.

*Socioeconomic status.* The mean and the median number of appointments tend to increase as socioeconomic status improves, except for groups II and III which have the same mean and median. Regression analysis indicates a correlation ratio of 0.623.

*Number of children.* With one exception (table 5), the mean number of appointments kept decreases as number of children in the family increases. A somewhat similar pattern emerges when the median is used. Here a correlation ratio of 0.251 is found, indicating a lesser degree of association than exists between socioeconomic status and average number of appointments kept. The problem of maintaining the participation of mothers with several children has been discussed. Less difference than

might be expected is apparent, however, in the participation of mothers with one child and that of mothers with five or more children.

*Education of mother.* Of the factors for which correlation could be measured, education of the mother correlates most highly with average number of appointments kept. The correlation ratio is 0.764. Both the mean and median figures, however, show that the average number of appointments kept was greater for

**Table 5. Appointments kept by the active mothers in relation to socioeconomic groups and other factors**

Factors	Number moth- ers	Number appointments kept		
		Mean	Stand- ard devia- tion	Me- dian
<i>Socioeconomic group<sup>1</sup></i>				
I.....	35	6.2	2.6	6.8
II.....	132	7.7	2.2	8.9
III.....	82	7.7	2.2	8.9
IV.....	24	8.2	1.7	9.1
<i>Number of children</i>				
1.....	65	8.1	2.2	9.4
2.....	72	7.6	2.0	8.2
3.....	51	7.2	2.4	8.3
4.....	42	7.6	2.4	8.9
5 or more.....	46	7.0	2.6	7.8
<i>Education of mother (years)<sup>2</sup></i>				
Less than 8.....	47	7.0	2.5	7.8
8.....	46	7.2	2.5	7.9
9-12.....	142	7.8	2.2	9.1
College 1-4.....	40	7.7	1.9	8.4
<i>Age of mother (years)</i>				
15-20.....	67	7.3	2.2	8.0
21-23.....	64	7.4	2.2	8.2
24-26.....	45	7.5	2.3	8.7
27-29.....	45	7.2	2.6	8.4
30 or more.....	55	8.4	1.8	9.5
<i>Marital status</i>				
Married.....	216	7.7	2.2	8.9
Separated.....	9	7.7	1.6	7.0
Widowed.....	2	9.0	1.0	9.0
Divorced.....	0			
Single.....	49	6.9	2.4	6.4
Total.....	276	7.6	2.3	8.7

<sup>1</sup> Socioeconomic data were unavailable for 3 mothers.  
<sup>2</sup> Amount of education was unavailable for 1 mother.

mothers whose schooling was completed between grades 9-12 than for those who had from 1-4 years of college. This deviation apparently is not great enough to mask a direct association between education and average number of appointments kept.

*Age of mother at delivery.* A slight degree of linear association between age of mother and average number of appointments kept was shown by regression analysis ( $r=0.1485$ ). Both the mean and the median increase with age. The differences are relatively small until the oldest age group (30 years or more) is reached. Half of the mothers who were 30 or older at the time of delivery had kept either 9 or 10 scheduled appointments.

*Marital status.* Significant association was found for marital status and average number of appointments kept, with the proportion being higher for the married mothers. The chi-square test was significant at the 5 percent level, using only the married and unmarried mothers. Those mothers whose marriages were broken were excluded from the correlation analyses because of the extremely small number, but comparative figures for them are included in table 5.

### Summary and Conclusions

Of a group of 523 mothers enrolled in a 5-year study in Nashville, Tenn., on the growth and development of Negro infants and children, almost half had become inactive by the third year of the study.

Comparison of the active and inactive mothers according to socioeconomic status, number of children, education, age, and marital status yielded the following results:

1. Significant differences exist between the four types of cases according to socioeconomic status and education of the mother. For both factors, the mothers who moved outside the city are highest on the scales. These mothers are closest in mean score to the active mothers.

2. Variations exist among the types of cases with respect to age of mother at delivery and number of children in the family, but these are not significant. For these two factors, however, mothers who were dropped from the study for lack of cooperation are closest in mean score to the active mothers.

3. When all of the categories are compared, no significant differences are found with regard to marital status of the mother. However, the proportion of unmarried mothers is significantly higher in the group of uncooperative mothers than in the group of active mothers.

With regard to participation of the active mothers as an index to cooperation, some degree of association was found for all of the background factors considered:

1. The strongest association between participation and any of the factors considered appears to exist for socioeconomic status and educational attainment, with mothers in the higher socioeconomic categories and the upper educational levels keeping more of their appointments.

2. Inverse association exists between number of children in the family and appointments kept.

3. Older mothers tend to keep more appointments than younger mothers, the difference becoming quite noticeable when mothers reach 30 years of age. However, mothers who were dropped for lack of cooperation had a mean age higher than that of any of the mothers, though not significantly higher.

4. Mothers who are married keep more appointments than do unmarried mothers.

In the final analysis, the degree of cooperation exhibited, as measured by participation, is a function of the person's maturity and feeling of responsibility as regards carrying through a commitment. The characteristics which are apparently allied with maturity and responsibility in the present context are also those which typify persons who move outside the city. This loss is, however, relatively small. Thus it would seem that if participation is to be representative of the various elements of the population being studied, extra inducements must be offered to those persons who do not possess the characteristics which seem to be allied with voluntary participation.

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## Plague Remains Modern Hazard

Vigilance against plague must not be relaxed, despite modern advances in fighting the disease, Dr. Karl Friederich Meyer of the University of California cautioned in his acceptance speech at the University of Chicago, where he received the Howard Taylor Ricketts Memorial Award for 1960 on June 6.

"What in 1928 was thought to be a localized epizootic entity in California," he said, "is now known to extend through 131 counties in 15 western States, an area comprising 40 percent of the continental United States from the Pacific Coast to the 100th meridian.

"During the period 1908-51, 98 cases (60 deaths) in eight western States have been contracted from wild rodents. There is every reason to predict that in that area, sporadic cases of bubonic plague may make an annual appearance."

Dr. Meyer, who is director emeritus of the George Williams Hooper Foundation for Medical Research and professor emeritus of experimental pathology at the University of California, attributed the special vulnerability in that State to the booming population. Although the building of suburbs will keep away appreciable wild rodent populations, he said, "There is an initial period of joint tenancy by people and wild and commensal rodents—a condition theoretically ideal for the propagation of plague."

Wholesale destruction of the diseased rodent population is not always possible as a preventive meas-

ure, owing to geographic and financial considerations, Dr. Meyer added.

Long thought transmissible only through rat fleas, plague is now known to spread through exchange of fleas of many wild rodents and other small animals, including ground squirrels, wood rats, chipmunks, prairie dogs, and field mice, according to Dr. Meyer.

Dr. Meyer traced the course of the plague in the United States since it was first diagnosed in a human in 1900 and in rats in 1902.

Plague reservoirs of rodents exist in South Africa, East Africa, Iran, and the Soviet Union. Soviet health workers have eliminated the danger on the fringes of their vast wild rodent area, but fear that plague may break out again or be reimported, Dr. Meyer said.

The sulfa drugs and the antibiotics have proved effective in treatment, allaying some of the panic caused by the appearance of human plague. Plague vaccines have been developed, but a dependable immunity cannot be achieved with a single injection, he added.

"Active immunization in the face of or during an epidemic is of little or no value, but a persistent long range vaccination program could serve as a supportive preventive measure." Modern chemotherapy is more effective in the vaccinated, Dr. Meyer believes.