

A Life Table Analysis of the Relation of Prenatal Care to Prematurity

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A life table analysis of premature and mature births demonstrates that differences in the initiation of prenatal care can be ascribed, for the most part, to the shortened gestation period of premature births.

Introduction

It has long been accepted that prematurity is associated with lack of prenatal care. Eastman¹ found that at the Johns Hopkins Hospital for the period 1926 to 1945, the prematurity rate for spontaneous single births was 26 per cent for mothers receiving no prenatal care, 24 per cent for those with one or two visits, and 8 per cent for mothers with three or more prenatal visits. He pointed out, however, that these differences may not be due to prenatal care per se, but rather to differences in habits of living between those who obtain prenatal care and those who do not.

Similar results have been reported by other investigators. Oppenheimer,² for example, found that in the District of Columbia in 1958 the prematurity rate was 23 per cent for those who did not have prenatal care and 10 per cent for those who did. The New York City study by Pakter and her colleagues³ showed a prematurity rate of 28 per cent for unmarried mothers who had no prenatal care and 14 per cent for those who received prenatal care before the third trimester. The corresponding rates for married mothers

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were 22 per cent and 8 per cent. The authors concluded that "early prenatal care pays dividends in lower rates of premature births for all mothers."

This conclusion is open to question. As Eastman had pointed out, the association of prematurity with lack of prenatal care may be a secondary association, since the failure to obtain prenatal care may merely reflect other habits of living which are responsible for prematurity. It is well established that prematurity is associated with low socioeconomic status and the age and parity of the mother; these are factors which may also influence the receipt of prenatal care. In order to determine the difference in prematurity rates of mothers with and without prenatal care, the two groups should be comparable with regard to other factors which influence the occurrence of prematurity.

Another difficulty arises from the shortened length of gestation of premature births. Mothers of premature infants may not receive prenatal care because the early birth of the infant intervenes. Shwartz and Vinyard⁴ of the District of Columbia took account of this difficulty by using a modified life table approach adapted to the span of gestation. They found no association of lack of prenatal care with prematurity for women with complications of pregnancy. There was also no association for women without complications who delivered prior to gestation week 36. A significant association of lack of prenatal care with prematurity was found only in women with uncomplicated pregnancies who delivered in gestation week 36 and

thereafter; this association was independent of maternal age, parity, race, and income level.

Other studies have failed to show any relation of prematurity to prenatal care. Martin,⁵ for example, compared 1,097 primiparous mothers of premature infants in Greater London and Southeast Lancashire with an equal number of controls matched by age and social class. The distribution by trimester in which prenatal care began was almost identical in the two groups. The average week of initiation of prenatal care was 12.8 weeks for the mothers of premature infants and 12.3 weeks for the control mothers.

Drillien⁶ in Edinburgh found that, for mothers without complications, as well as for all mothers, there was no difference in prenatal care. For example, the proportion of mothers with no complications attending prenatal clinic in the first 16 weeks of pregnancy was 83 per cent for primiparas with premature births, 84 per cent for primiparas with mature births, 86 per cent for multiparas with premature births, and 90 per cent for multiparas with mature births. The proportions in these four groups that were judged to have received adequate prenatal care, taking into account length and regularity of attendance and other relevant details, were, respectively, 91, 97, 93, and 91 per cent. Of the mothers with no complications, one of the 162 mothers of premature births had no prenatal care, as compared with none of the 269 mothers of mature births. There was an additional mother of a premature birth who put off attendance until the 33rd week or more, as compared with four mothers of mature births who did so.

Terris and Gold⁷ studied 197 premature black ward births with no known cause of prematurity, and an equal number of mature controls matched by sex and birth order of the infant and age and marital status of the mother. They found no differences between mothers of premature infants and mature controls in the week of pregnancy at which the first visit was made. Since the number of prenatal visits is limited by the duration of gestation, an expected number of prenatal visits (based on the recommended schedule of visits and the length of gestation) was calculated for each mother. It was found that the ratio of observed to expected visits was 43 per cent for the mothers of premature infants and 46 per cent for the mothers of mature controls. This failure to find a relation between prematurity and prenatal care must be interpreted with caution, however, since the study was done at a voluntary hospital with very few "walk-in" deliveries. In the municipal hospitals of New York City, a substantial proportion of deliveries occurs in women with no prenatal care. The sample used in the study essentially excluded mothers with no prenatal care, and it may be that a similar investigation conducted in a municipal hospital would give different results. The finding that the mothers of premature infants had the same timing and amount of prenatal care as a comparable group of control mothers does, however, cast additional doubt on the presumed role of prenatal care in preventing prematurity.

The present study supplements the previous investigation of Terris and Gold by including all black premature

births in New York City instead of a sample limited to a single hospital with few "walk-in" deliveries.

Methods

Punch cards with data from the birth certificates for all black single live births in New York City in 1961 were obtained from the New York City Department of Health. For each infant weight class, the distribution by month of first prenatal visit was determined.

Each premature birth (2,500 gm or less) was then paired with the next mature birth (by date of birth) that matched by hospital, sex, maternal age (5-year age group), parity, and marital status. The matched premature and mature births were then compared with regard to the month of first prenatal visit.

Those matched pairs with data recorded on month of first prenatal visit and on length of gestation were used to obtain a further comparison of the month of first prenatal visit for premature and mature births. In making this comparison, standard life table techniques were applied to avoid the bias resulting from the fact that mothers giving birth early in their pregnancy are less exposed to the "risk" of starting prenatal care.

Life tables were prepared for all of the matched pairs as well as for specific weight classes. Finally, life table analyses were done for infants premature both by weight and gestation and for those who were premature by weight alone, that is, infants who were gestationally mature but of low birth weight.

Results

There was a total of 34,949 black single live births included in the study. Of these, 4,959 or 14 per cent were premature by weight (2,500 gm or less).

The month of first prenatal visit is shown in Table 1. There is relatively little difference in the proportion receiving early prenatal care: 7 per cent of the premature and 10 per cent of the mature births. Similarly, care starting in the second trimester was received by 35 per cent of the premature and 41 per cent of the mature births. The respective percentages for the third trimester are 28 and 35. A startling difference, however, occurs in the proportion with no prenatal care: 20 per cent of the premature and only 8 per cent of the mature births. On the face of it, these data would appear to support the role of prenatal care in preventing prematurity.

This inference would appear to be confirmed in Table 2 where the data for the premature infants are presented separately for each weight group. The proportion receiving no prenatal care declines stepwise from 50 per cent of the infants weighing 1,000 gm or less to only 14 per cent of those weighing 2,001 to 2,500 gm. Nevertheless, since lighter infants are delivered earlier (Table 6), these data are subject to the suspicion that the absence of prenatal care may be an effect rather than a cause of prematurity.

TABLE 1—Month of First Prenatal Visit, Premature and Mature Black Births, New York City, 1961

Month	Premature (2,500 Gm or Less)		Mature (2,501 Gm or More)	
	No.	%	No.	%
Total	4,959	100.0	29,990	99.9
1-3	369	7.4	2,915	9.7
4-6	1,727	34.8	12,385	41.3
7-9	1,397	28.2	10,561	35.2
None	996	20.1	2,378	7.9
Not stated	470	9.5	1,751	5.8

TABLE 2—Month of First Prenatal Visit, Premature Black Single Births, by Weight, New York City, 1961

Month	1,000 Gm or Less		1,001- 1,500 Gm		1,501- 2,000 Gm		2,001- 2,500 Gm	
	No.	%	No.	%	No.	%	No.	%
Total	442	100.0	444	100.0	903	100.0	3,170	100.0
1-3	29	6.6	26	5.9	64	7.1	250	7.8
4-6	114	25.7	152	34.2	303	33.5	1,158	36.6
7-9	11	2.5	73	16.4	241	26.7	1,072	33.8
None	221	50.0	135	30.4	204	22.6	436	13.8
Not stated	67	15.2	58	13.1	91	10.1	254	8.0

Matching was successful in 4,638 of the 4,959 premature births. The effect of matching by the five variables chosen (hospital, sex, maternal age, parity, and marital status) is negligible (Table 3). The proportion with onset of prenatal care in the first trimester is now 7 per cent for premature and 8 per cent for mature births; in the second trimester, 35 per cent for premature and 40 per cent for mature births; and in the third trimester, 28 per cent for premature and 37 per cent for mature births. The large difference in the proportion with no prenatal care persists: 21 per cent of the premature and only 9 per cent of the mature births. Clearly, the differences in demographic characteristics of premature and mature births cannot account for this finding.

In order to carry out the life table analysis, it was necessary to exclude 736 pairs which lacked information on month of first prenatal visit and/or length of gestation. The findings on month of first prenatal visit for the remaining 3,902 pairs are quite similar to those for the original 4,638 pairs (Table 4).

The data on length of gestation are presented in Tables 5 and 6. Of the infants premature by weight, 52 per cent are mature by gestation (36 or more weeks). Conversely, of the infants mature by weight, 92 per cent are mature by gestation. As expected, the length of gestation is shorter for the lighter infants.

The life table analysis for the 3,902 pairs is presented

in Table 7. In place of the basic datum of the life table, namely, the mortality rate in an interval, we are concerned here with the proportion of mothers having a first prenatal visit. A mother who delivers before a first prenatal visit is a "withdrawn" case, and is no longer "at risk" of having a first prenatal visit in the interval (column 2). The "effective" number of mothers at risk of having a first prenatal visit during an interval (column 3) is equal to the number of mothers at the start of the interval (column 1)

TABLE 3—Month of First Prenatal Visit, Premature and Mature Black Single Births Matched by Hospital, Sex, Maternal Age, Parity, and Marital Status, New York City, 1961

Month	Premature (2,500 Gm or Less)		Mature (2,501 Gm or More)	
	No.	%	No.	%
Total	4,638	100.0	4,638	99.9
1-3	333	7.2	375	8.1
4-6	1,601	34.5	1,857	40.0
7-9	1,316	28.4	1,712	36.9
None	950	20.5	410	8.8
Not stated	438	9.4	284	6.1

TABLE 4—Month of First Prenatal Visit, Premature and Mature Matched Black Single Births, New York City, 1961*

Month	Premature (2,500 Gm or Less)		Mature (2,501 Gm or More)	
	No.	%	No.	%
Total	3,902	100.0	3,902	100.0
1-3	319	8.2	336	8.6
4-6	1,531	39.2	1,689	43.3
7-9	1,243	31.9	1,547	39.6
None	809	20.7	330	8.5

* Excludes pairs lacking information on month of first prenatal visit and/or length of gestation.

TABLE 5—Length of Gestation, Premature and Mature Matched Black Single Births, New York City, 1961

Months	Weeks	Premature (2,500 Gm or Less)		Mature (2,501 Gm or More)	
		No.	%	No.	%
Total		3,902	100.0	3,902	100.1
3	10-13	5	0.1	—	—
4	14-18	43	1.1	—	—
5	19-22	102	2.6	2	0.1
6	23-27	287	7.4	9	0.2
7	28-31	467	12.0	45	1.2
8	32-35	954	24.4	242	6.2
9+	36+	2,044	52.4	3,604	92.4

TABLE 6—Length of Gestation, Premature and Mature Matched Black Single Births by Weight Class of Premature Births, New York City, 1961

Months	1,000 Gm or Less		Mature Controls		1,001–1,500 Gm		Mature Controls		1,501–2,000 Gm		Mature Controls		2,001–2,500 Gm		Mature Controls	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	306	100.0	306	100.0	312	100.0	312	99.9	701	100.0	701	100.0	2,583	100.0	2,583	100.0
3	4	1.3	—	—	1	0.3	—	—	—	—	—	—	—	—	—	—
4	34	11.1	—	—	8	2.6	—	—	—	—	—	—	1	0.0	—	—
5	78	25.5	1	0.3	13	4.2	—	—	3	0.4	1	0.1	8	0.3	—	—
6	150	49.0	1	0.3	69	22.1	1	0.3	39	5.6	—	—	29	1.1	7	0.3
7	34	11.1	6	2.0	162	51.9	2	0.6	152	21.7	6	0.9	119	4.6	31	1.2
8	6	2.0	29	9.5	59	18.9	19	6.1	275	39.2	42	6.0	614	23.8	152	5.9
9+	—	—	269	87.9	—	—	290	92.9	232	33.1	652	93.0	1,812	70.2	2,393	92.6

TABLE 7—Life Table Analysis of Month of First Prenatal Visit by Mothers of Premature and Mature Matched Black Single Births, New York City, 1961

Interval since Conception (Months)	(1) No. of Mothers at Risk of Having First Prenatal Visit at Start of Interval	(2) No. of Mothers Delivering during Interval without First Prenatal Visit	(3)* “Effective” No. of Mothers at Risk	(4) No. of Mothers Having First Prenatal Visit during Interval	(5)† % of Mothers at Risk during Interval Having First Prenatal Visit during Interval	(6) % of Mothers at Risk during Interval and Not Having First Prenatal Visit during Interval	(7) % of Mothers Not Having First Prenatal Visit before or During Interval
Premature births							
0–1	3,902	0	3,902	23	0.6	99.4	99.4
1–2	3,879	0	3,879	73	1.9	98.1	97.5
2–3	3,806	5	3,803.5	223	5.9	94.1	91.7
3–4	3,578	37	2,559.5	370	10.4	89.6	82.2
4–5	3,171	66	3,138	530	16.9	83.1	68.3
5–6	2,575	124	2,513	631	25.1	74.9	51.2
6–7	1,820	143	1,748.5	659	37.7	62.3	31.9
7–8	1,018	171	932.5	400	42.9	57.1	18.2
8–9	447	224	335	133	39.7	60.3	11.0
Mature births							
0–1	3,902	0	3,902	19	0.5	99.5	99.5
1–2	3,883	0	3,883	85	2.2	97.8	97.3
2–3	3,798	0	3,798	232	6.1	93.9	91.4
3–4	3,566	0	3,566	412	11.6	88.4	80.8
4–5	3,154	1	3,153.5	533	16.9	83.1	67.1
5–6	2,620	2	2,619	744	28.4	71.6	48.0
6–7	1,874	7	1,870.5	720	38.5	61.5	29.5
7–8	1,147	29	1,132.5	522	46.1	53.9	15.9
8–9	596	229	481.5	192	39.9	60.1	9.6

* Column (1) – 1/2 column (2).

† Column (4)/column (3).

minus half of the “withdrawn” mothers (column 2), since we assume that the latter would, on the average, have been exposed to the risk for half of the interval. The proportion of mothers at risk who have a first prenatal visit during the interval (column 5) is obtained by dividing the number having such a visit (column 4) by the “effective” number of mothers at risk (column 3).

It should be noted that the number of mothers at risk

at the start of each interval (column 1) is equal to the number at the start of the previous interval minus those delivering without a first prenatal visit during that interval (column 2) as well as those having a first prenatal visit during that interval (column 4). Neither of these two groups is any longer at risk of having a first prenatal visit.

The cumulative proportions of mothers not having a first prenatal visit (column 7) are obtained by successive

multiplication of the proportions not having a first prenatal visit in each of the intervals (column 6). The percentage for the final interval (8 to 9 months) may be interpreted as the proportion of mothers with no prenatal care, adjusted for length of gestation period.

As Table 7 shows, there are negligible differences in the proportion of mothers of premature births having their first prenatal visit in each month compared to the corresponding proportion among the mothers of mature births. The cumulative proportions of mothers not having a first visit are, as indicated in column 7 of the Table and in Figure 1, also similar in the two groups. The adjusted proportions of mothers having no prenatal care are 11.0 per cent for the premature births and 9.6 per cent for the mature births, a negligible difference which is also not statistically significant ($0.05 < p < 0.10$). The determination of statistical significance here and for subsequent comparisons is based on the method described by Greiss et al.⁸ Pairing is ignored in our calculations and the "p" should therefore be considered as probably somewhat overestimated.

Table 8 presents the results of the life table analysis by

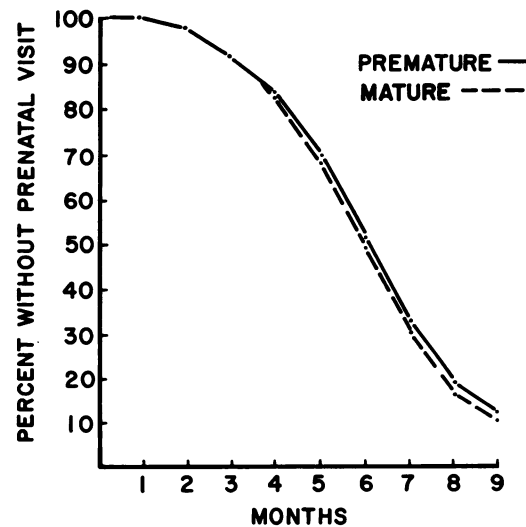


FIGURE 1 Percentage of mothers not having a prenatal visit by specified time since conception, all premature and matched mature births.

TABLE 8—Percentage of Mothers Not Having a Prenatal Visit by Specified Time since Conception, by Weight of Premature Birth, for All Premature and Matched Mature Births

Months	All Mothers		≤1,000 Gm		1,001–1,500 Gm		1,501–2,000 Gm		2001–2,500 Gm	
	Premature (N = 3,902)	Mature (N = 3,902)	Premature (N = 306)	Mature (N = 306)	Premature (N = 312)	Mature (N = 312)	Premature (N = 701)	Mature (N = 701)	Premature (N = 2,583)	Mature (N = 2,583)
1	99.4	99.5	99.3	99.7	99.0	100.0	99.6	99.9	99.4	99.3
2	97.5	97.3	98.0	96.7	98.0	98.3	98.0	98.3	97.3	97.0
3	91.7	91.4	92.7	92.5	93.9	93.5	92.0	92.7	91.6	90.6
4	82.2	80.8	82.9	83.0	84.8	84.2	82.3	81.6	82.1	79.9
5	68.3	67.1	66.1	70.6	69.6	72.1	71.4	66.6	67.8	66.3
6	51.2	48.0	43.4	51.9	47.3	48.7	53.8	47.8	51.6	47.6
7	31.9	29.5	26.0	33.7	24.2	28.6	35.0	28.9	32.2	29.4
8	18.2	15.9					20.6	16.1	18.4	15.6
9	11.0*	9.6*					12.8†	8.2†	11.0	9.7

* $0.05 < p < 0.10$.

† $p < 0.05$.

TABLE 9—Percent of Mothers Not Having a Prenatal Visit by Specified Time since Conception, by Weight of Premature Birth, for Births Premature by Both Weight and Gestation and Matched Full Term Mature Births

Months	All Mothers		≤1,000 Gm		1,001–1,500 Gm		1,501–2,000 Gm		2,001–2,500 Gm	
	Premature (N = 1,714)	Mature (N = 1,714)	Premature (N = 269)	Mature (N = 269)	Premature (N = 290)	Mature (N = 290)	Premature (N = 436)	Mature (N = 436)	Premature (N = 719)	Mature (N = 719)
1	99.4	99.8	99.3	99.6	99.0	100.0	99.5	100.0	99.4	99.7
2	97.6	97.6	97.8	96.6	98.0	98.3	97.4	98.6	97.4	97.1
3	92.1	92.5	91.5	92.5	93.5	93.7	91.2	93.1	92.2	91.7
4	81.9	82.9	83.1	83.3	84.4	84.7	80.0	81.8	81.5	82.8
5	66.3	68.5	65.7	71.8	69.3	73.3	67.6	66.4	64.5	66.9
6	47.3	49.0	42.9	53.2	46.8	50.6	50.7	47.1	46.4	48.4
7	25.6	30.0	24.8*	34.6*	24.9	29.6	29.6	27.6	26.7	30.6
8	10.1†	16.4†					13.8	14.8	9.7†	17.1†

* $p = 0.05$.

† $p < 0.01$.

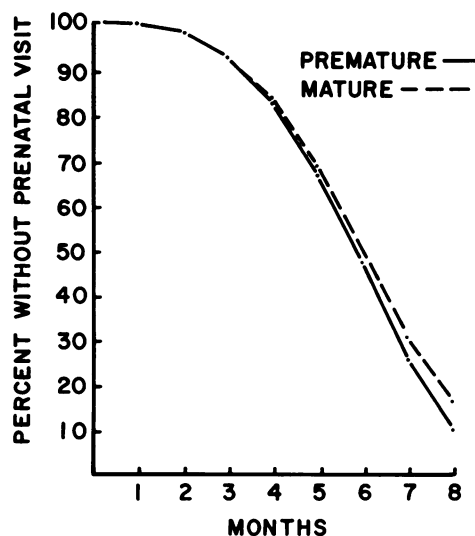


FIGURE 2 Percentage of mothers not having a prenatal visit by specified time since conception, births premature by both weight and gestation and matched full term mature births.

TABLE 10—Percentage of Mothers Not Having a Prenatal Visit by Specified Time since Conception, by Weight of Premature Birth, for Births Premature by Weight but Full Term by Gestation and Matched Full Term Mature Births

Months	All Mothers		1,501–2,000 Gm		2,001–2,500 Gm	
	Pre-mature (N = 1,890)	Mature (N = 1,890)	Pre-mature (N = 216)	Mature (N = 216)	Pre-mature (N = 1,674)	Mature (N = 1,674)
1	99.5	99.3	100.0	100.0	99.5	99.2
2	97.5	97.1	99.1	98.1	97.3	96.9
3	91.5	90.4	93.1	92.1	91.2	90.1
4	82.5	78.8	85.1	79.6	82.1	78.7
5	69.6	65.9	75.9	64.8	68.8	66.0
6	53.9	47.7	57.4	47.7	53.4	47.7
7	35.3	29.6	44.0	31.0	34.2	29.4
8	21.9	16.2	28.2	19.0	21.0	15.8
9	13.0*	9.6*	18.8*	8.5*	12.2†	9.7†

* $p < 0.01$.

† $p < 0.05$.

weight group. The differences between the proportions of mothers of mature and premature infants not having their first prenatal visit by each month after conception are generally negligible or not statistically significant in each weight group except the 1,501- to 2,000-gm group. In this weight group, the adjusted proportion of mothers with no prenatal visit throughout pregnancy is 12.8 per cent for the mothers of the premature infants and 8.2 per cent for the mothers of the mature controls. It should be noted that in the two lightest weight groups the mothers of premature infants tend to have smaller proportions with no prenatal visits while in the two heavier weight groups they have larger proportions with no prenatal visits.

The 3,902 matched pairs were then divided into two groups. The first group consisted of those pairs in which the premature infants were premature by both weight and gestation, while their corresponding matched mature births were mature by gestation (36 or more weeks) as well as by weight. There were 1,714 pairs in this group.

The second group consisted of those pairs in which the premature infants were premature by weight but not by gestation, i.e., they were full term infants of low birth weight. Their corresponding matched mature births were mature by gestation as well as by weight. There were 1,890 pairs in this group.

The remaining 298 pairs were omitted from this part of the analysis. These were pairs in which the mature member was mature by weight but not by gestation (Table 5).

Table 9 and Figure 2 present the results of the life table analysis for infants premature by weight and gestation and for their mature controls. Mothers of all infants premature by weight and gestation were more likely to have a first prenatal visit by any given month after conception than mothers of mature infants. This is reflected in the adjusted proportion of mothers with no prenatal visit, which is 10.1 per cent for the mothers of the premature infants and 16.4 per cent for the mothers of the mature infants ($p < 0.01$). The largest differences occur in the 2,001- to 2,500- and the under 1,000-gm weight groups.

Table 10 and Figure 3 present the results of the life table analysis for the infants who were premature by weight but full term and for their mature controls. The differences here are in a direction opposite to that noted in Table 9 and Figure 2. The adjusted proportion of mothers with no prenatal visit is 13.0 per cent for the mothers of the premature infants and 9.6 per cent for the mothers of the mature infants ($p < 0.01$). In the 1,501- to 2,000-gm group, the corresponding figures are 18.8 per cent for the premature and 8.5 per cent for the mature births ($p <$

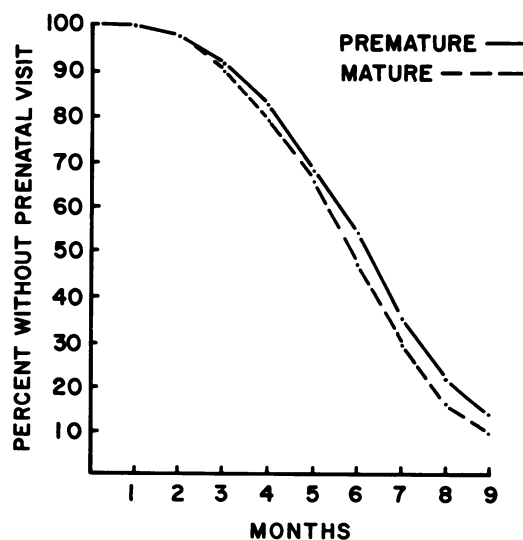


FIGURE 3 Percentage of mothers not having a prenatal visit by specified time since conception, births premature by weight but full term by gestation and matched full term mature births.

0.01). In the 2,001- to 2,500-gm weight group, the difference is much smaller: 12.2 per cent for the premature and 9.7 per cent for the mature births ($p < 0.05$).

Discussion

The results of the study indicate clearly that, for the population studied, the differences between premature and mature births with regard to the initiation of prenatal care cannot be ascribed to differences in hospital of birth, sex, or maternal age, parity, and marital status—factors which are known to be related to prematurity and which may also be related to the initiation of prenatal care. Matching on these variables made very little difference in the comparison of premature births and mature controls with regard to the initiation of prenatal visits.

On the other hand, the study demonstrates clearly that the differences in initiating prenatal care can largely be explained by the shortened gestation period of premature births which interferes with the receipt of care. When adjustment by life table methods is made for variations in gestation period, there are only small differences between premature and mature births in the proportions of mothers making their first prenatal visit by a given month after conception.

Perhaps the most intriguing findings relate to the difference between “true” premature births resulting from premature labor (infants premature by weight and gestation) and “false” premature births resulting from delivery at full term of infants with low birth weight (infants premature by weight alone). The mothers of “true” premature births tend to have their first visit sooner, and the mothers of “false” premature births tend to have their first visit later than their respective mature controls.

It is quite possible that mothers of “true” prematures do, in fact, tend to initiate prenatal care earlier because of previous or current problems associated with pregnancy. The present study contains no evidence bearing on this possibility. The differences observed for the “false” prematures are of interest in view of Shwartz and Vinyard’s⁴ report of an association of prematurity with lack of prenatal care which was limited to women with uncomplicated pregnancies who delivered in gestation week 36 and thereafter.

It must be emphasized that these data refer only to the initiation of prenatal care and do not take into account the

amount of care provided. Studies which have included the total number of prenatal visits have been reported by Drillien⁶ and Terris and Gold⁷; in neither case was a relation found between prematurity and the number of visits made for prenatal care. These studies did not examine “true” versus “false” premature births separately.

Summary

A study of all the approximately 35,000 black single live births in New York City in 1961 showed that the relation of prematurity to initiation of prenatal care could not be explained on the basis of demographic differences between the mothers of premature and mature infants. It was found, rather, to be due largely to the fact that early birth prevents the initiation of prenatal care instead of vice versa. When life table analysis was used to adjust for differences in length of gestation, only negligible differences were found in the time of initiation of prenatal care for mothers of all premature births and their mature controls. However, mothers of infants premature by weight and gestation tended to initiate prenatal care earlier than their controls, while mothers of infants premature by weight alone tended to start care later than their controls.

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