

A report on a project to see whether prenatal care, and the means by which it is provided, makes any difference in terms of maternal and infant health.

EPIDEMIOLOGIC ANALYSIS OF OUTCOMES IN MATERNAL AND INFANT HEALTH IN EVALUATING EFFECTIVENESS OF THREE PATIENT CARE TEAMS

Margaret C. Kauffman, R.N., M.P.H., F.A.P.H.A., and Anne Cunningham, R.N., M.P.H.

PHASE I

IN March, 1968, we shared with the Research Committee of the Temple University Health Science Center in Philadelphia, a desire to design a prospective study in which we wished to evaluate three patterns of prenatal care being offered to low income populations by the Hospital Out-Patient Department and two of its Neighborhood Health Centers. Our study was focused on the outcomes in maternal and infant health states. The members of the Research Committee suggested that since research had not scientifically demonstrated the positive role that prenatal care played in improved maternal and infant health, they saw little to commend a Research Proposal designed to evaluate the effectiveness of the above three patterns of the delivery of prenatal care.

A search of the literature¹⁻⁴ seemed to bear out this position, for in March, 1968, we could find no facts to account for our belief in the contribution prenatal care made to improved maternal and infant health. A research proposal was, therefore, designed to be done in two phases. Phase I: A retrospective

study of maternal and infant health outcomes of 400 ward patients delivered in Temple University Hospital from 1967 to 1968 who received prenatal care in the Out-Patient Department or who did not receive prenatal care in this clinic before delivery in Temple University Hospital. Phase II: A prospective study of maternal and infant outcomes of patients receiving their prenatal care in Temple University Hospital's Out-Patient Department, in the Comprehensive Group Health Services Neighborhood Center, and in the West Nicetown-Tioga Neighborhood Family Health Center. All of these patients were to be delivered in Temple University Hospital.

In Phase I, we sought answers to the following questions:

1. What are the occurrences in maternal patients of obstetrical and medical conditions such as toxemia (eclampsia) of pregnancy, prolonged labor (true labor lasting longer than 24 hours), poor nutrition (manifested by recorded hemoglobin below 10 gm and/or hematocrit below 30), abruptio placentae, infections, cesarean sections, recorded medical conditions found and other obstetrical abnormalities identified in a low socioeconomic population who received no

prenatal care,* inadequate prenatal care,† or adequate prenatal care.‡

2. What are the occurrences in fetal and infant health states such as prematurity, fetal§ and infant deaths, infant abnormalities, and prolonged hospitalization when the mothers of these offspring received either no prenatal care, inadequate prenatal care or adequate prenatal care?

The population samples were compared for race, occupation of the head of the household (low socioeconomic), maternal age and parity.

Because, empirically, those of us who have worked with prenatal patients have long been persuaded that the application of prenatal care based upon standards set down by the American Academy of Gynecologists and Obstetricians has resulted in healthy mothers and viable babies, we hypothesized the following:

a. Obstetrical and medical abnormalities occur most frequently in those high-risk maternal patients who receive no prenatal care.

b. The prematurity rate and fetal and infant mortality rate is greater among babies born of high-risk mothers who receive no prenatal care.

Method

The unit of observation was the patient's record. We were able to purchase the time of a sophomore medical student who was instructed to select the first 200 names and addresses of delivered, registered patients (beginning in front of the 1968 ward file drawer and to continue until the 200th patient

* No medical supervision received in Temple University Hospital for prenatal care for this pregnancy.

† Medical supervision after 26th week or in the last trimester of pregnancy in Temple University Hospital's Out-Patient Prenatal Clinic.

‡ Medical supervision of patient initiated before 26th week or last trimester of pregnancy in Temple University Hospital's Out-Patient Department.

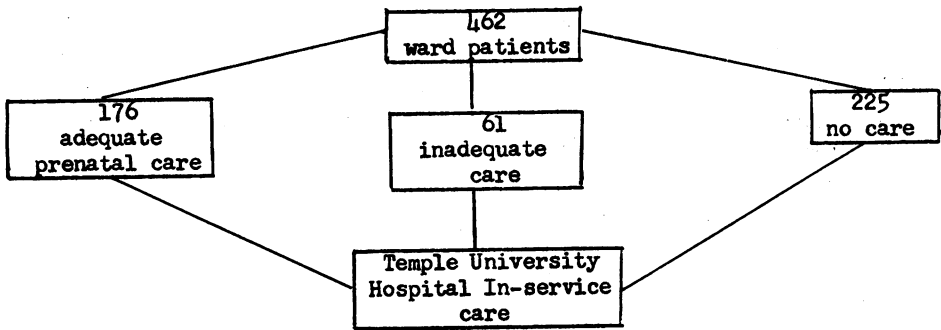
§ Fetus measures more than 18 cms in crown heel length or more than 126 gms in weight or 16 weeks gestation.

was selected "with prenatal care"), and to select the first 200 names and addresses of delivered patients in the ward unregistered 1968 file "without prenatal care." He then went to the record room and reviewed these records and recorded the following: address and age of mother, race, education, income of head of household, occupation of head of the household, marital status, parity, previously diagnosed and present medical condition, past and present obstetrical conditions, medical condition of infants, birth weight, Apgar score, infant mortality and length of hospital stay of infants who survived.

The delivered registered patients were identified over a four-month span and so the medical student proceeded from April, 1968, to January, 1968, in the file in order to reach his 237th patient (37 records were lost and then found and thus retained in our sample). The delivered unregistered patients were more rare and so he had to cover a 16-month span, April 25, 1968, back to January, 1967, to select patients meeting our criterion.* He recorded findings on 225 patients (25 records were unable to be located for a short time and when located were added to our data). We divided the 237 registered patients into two groups: 176 who received adequate care, and 61 who received inadequate care. There were 225 who received no prenatal care in Temple University Hospital before being delivered in their obstetrical department in the third group of patients. The Chi-Square Test was used to detect significance in most cases and the Kolmogorav-Smirnov Test was employed to detect significance where applicable. The 0.05 level of significance was used throughout. Unknowns and numbers in cells below 5 were not included in the analysis.

* This makes our per cents in the no care group higher although it does not affect our outcomes. Study in progress now to work with T 4 mo. in both the registered and unregistered patients.

Phase I—Flow Chart



Analysis of the data yielded the following results:

1. Among the 118 premature infants, 71.2 per cent were born of mothers who received no prenatal care, whereas 38.8 per cent of normal babies by weight were born of mothers who received no prenatal care. The higher proportion of premature infants in the no prenatal care group was significant at the 0.05 level. Of the premature infants 17.8 per cent were born to mothers who received adequate prenatal care, whereas 46.7 per cent of the normal infants by weight were born to mothers who received adequate prenatal care. This difference was significant (Table 1).

2. Among the 51 fetal and infant deaths, 84.3 per cent were born of

mothers who received no prenatal care, whereas 44.3 per cent of the survivals were in the "no prenatal care group." The higher proportion of infant and fetal deaths in the "no prenatal care group" over the fetal and infant survivals was significant; 13.7 per cent of infant and fetal deaths were in the "adequate prenatal care group," whereas 41.1 per cent of the survivals were in the adequate prenatal care group. This difference was significant (Table 2).

3. Among the 112 patients with a hemoglobin below 10 gm, 59.8 per cent were in the "no prenatal care group," whereas 44.4 per cent of the hemoglobin 10 gm or above were in the no prenatal care group. The higher proportion of anemia in the no prenatal group was

Table 1—Prematurity of infant by prenatal care of 462 low-income mothers

Prenatal care	Premature infant		Infant 5 lb 8 oz and over		Unknown*		Total	
	No.	%	No.	%	No.	%	No.	%
None	84	71.2	128	38.8	13	92.9	225	48.7
Inadequate	13	11.0	48	14.5	0	0	61	13.2
Adequate	21	17.8	154	46.7	1	7.1	176	38.1
Total	118	100.0	330	100.0	14	100.0	462	100.0

* Not included in analysis.

$\chi^2 = 38.6$
 d.f. = 2
 $p < 0.05$

significant at the 0.05 level; 31.3 per cent of the anemia was in the "adequate prenatal care group," whereas 40.6 per cent of the hemoglobin 10 gm or above was in the adequate prenatal care group (Table 3).

4. Among the 13 patients with toxemia of pregnancy, 84.6 per cent were in the "no prenatal care group," whereas 47.5 per cent of patients with

no toxemia recorded in their records were in the "no prenatal care group." The higher proportion of toxemia in the no prenatal care group was significant at the 0.05 level; 15.4 per cent of toxemia occurred in the "adequate prenatal care group," whereas 38.9 per cent of patients with no toxemia recorded in their records were in the adequate prenatal care group (Table 4).

Table 2—Fetal and infant deaths by prenatal care of 462 low-income mothers

Prenatal care	Deaths		Survivals		Total	
	No.	%	No.	%	No.	%
None	43	84.3	182	44.3	225	48.7
Inadequate	1	2.0	60	14.6	61	13.2
Adequate	7	13.7	169	41.1	176	38.1
Total	51	100.0	411	100.0	462	100.0

$\chi^2 = 29.4$
d.f. = 2
 $p < 0.05$

Table 3—Prenatal care and hemoglobin recorded as below 10 gm in records of 462 mothers

Prenatal care	Hemoglobin 10 gm or above		Hemoglobin below 10 gm		Unknown*		Total	
	No.	%	No.	%	No.	%	No.	%
None	152	44.4	67	59.8	6	75.0	225	48.7
Inadequate	51	14.9	10	8.9	0	0.0	61	13.2
Adequate	139	40.6	35	31.3	2	25.0	176	38.1
Total	342	100.0	112	100.0	8	100.0	462	100.0

* Not included in analysis.

$\chi^2 = 8.3$
d.f. = 2
 $p < 0.05$

Table 4—Toxemia (eclampsia) in 462 mothers by prenatal care

Prenatal care	Toxemia		No toxemia		Unknown*		Total	
	No.	%	No.	%	No.	%	No.	%
None	11	84.6	213	47.5	1	100	225	48.7
Inadequate	0	0	61	13.6	0	0	61	13.2
Adequate	2	15.4	174	38.9	0	0	176	38.1
Total	13	100.0	448	100.0	1	100	462	100.0

* Not included in analysis.

$\chi^2 = 7.2$
d.f. = 2
 $p < 0.05$

5. A higher per cent of Negro patients had no care. Among the Negroes 73.9 per cent of mothers of premature infants had no care, whereas 40.9 per cent of Negro mothers of normal babies by weight had no prenatal care. The higher proportion of premature infants in the no prenatal care group was significant at the 0.05 level. Of the Negro premature infants 15.3 per cent were born to mothers who received adequate prenatal care, whereas 44.6 per cent of the normal Negro infants by weight were born to mothers who received adequate prenatal care. This difference was significant (Table 5).

6. In the toxemia group 90.9 per cent of the Negro patients were in the no prenatal care group, whereas 50.5 per cent "no toxemia" were in the Negro "no prenatal care group." The higher proportion of toxemia in the no prenatal care group was significant at the 0.05 level. Of Negro patients with toxemia 9.1 per cent were in the "adequate care group" and 36.1 per cent of Negro patients with no toxemia were in the adequate prenatal care group. This difference was significant (Table 6).

7. Data for Table 7 will not appear in this analysis because we do not have similar data on our control and experimental groups. Directions were given to the medical student to collect data on hemoglobin readings no matter in which trimester they appeared. Many patients who had a low hemoglobin in early pregnancy might very well have approached the last trimester of pregnancy with a perfectly normal hemoglobin. We do not have the same data on patients who were not under supervision as we do on patients who were under care, therefore the data collected was not used.

8. Among the 47 Negro fetal and infant deaths, 89.4 per cent were born of mothers who received no prenatal care, whereas 46.8 per cent of Negro infant survivals were in the "no prenatal care

Table 5—Prematurity of 460 infants by prenatal care and race of mother

Prenatal care	Premature infant		Infant 5 lb 8 oz and over						Total							
	Negro		White		Negro		White		Negro		White		Negro		White	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	82	73.9	2	28.6	113	40.9	14	26.9	12	92.3	1	100	207	51.7	17	28.3
Inadequate	12	10.8	1	14.3	40	14.5	8	15.4	0	0	0	0	52	13.0	9	15.0
Adequate	17	15.3	4	57.1	123	44.6	30	57.7	1	7.7	0	0	141	35.3	34	56.7
Total	111	100.0	7	100.0	276	100.0	52	100.0	13	100.0	1	100	400	100.0	60	100.0

Differences between premature births and normal births by weight for the Negro infants by chi-square was $\chi^2 = 36.6$, d.f. = 2, $p < 0.05$.
* Not included in analysis.

Table 6—Toxemia (eclampsia) in 460 mothers by prenatal care and race of mother

Prenatal care	Toxemia						Unknown*						Total			
	Negro		White		Negro		White		Negro		White		Negro		White	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	10	90.9	1	50.0	196	50.5	16	27.6	1	100	0	0	207	51.7	17	28.3
Inadequate	0	0	0	0	52	13.4	9	15.5	0	0	0	0	52	13.0	9	15.0
Adequate	1	9.1	1	50.0	140	36.1	33	56.9	0	0	0	0	141	35.3	34	56.7
Total	11	100.0	2	100.0	388	100.0	58	100.0	1	100	0	0	400	100.0	60	100.0

Differences between Negro toxemia group and Negro no toxemia group by the chi-square was $\chi^2 = 7.1$, d.f. = 2, $p < 0.05$.
 * Not included in analysis.

Table 7—Hemoglobin recorded as below 10 gm in records of 460 mothers by prenatal care and by race of mother

Prenatal care	Hemoglobin 10 gm or above						Hemoglobin below 10 gm						Total			
	Negro		White		Negro		White		Negro		White		Negro		White	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	139	47.9	12	24.0	63	60.6	4	50.0	5	83.3	1	50	207	51.7	17	28.3
Inadequate	42	14.5	9	18.0	10	9.6	0	0	0	0	0	0	52	13.0	9	15.0
Adequate	109	37.6	29	58.0	31	29.8	4	50.0	1	16.7	1	50	141	35.3	34	56.7
Total	290	100.0	50	100.0	104	100.0	8	100.0	6	100.0	2	100	400	100.0	60	100.0

* Not included in analysis.
 Differences between the Negro patient with a hemoglobin below 10 gm and those Negro patients with a hemoglobin of 10 gm or above by chi-square was not significant.
 $\chi^2 = 5.1$, d.f. = 2, $p < 0.05$

group." The higher proportion of fetal and infant deaths in the no prenatal care group was significant at the 0.05 level. Of the Negro infant and fetal deaths 8.5 per cent were in the adequate prenatal care group, whereas 38.8 per cent of the Negro infant survivals were in the adequate prenatal care group. This difference was significant (Table 8).

9. Among abruptio placentae in the Negro patient, 81.8 per cent occurred in the no care group, whereas 50.9 per cent of the "no abruptio placentae" were in the "no prenatal care group." The higher proportion of abruptio placentae in the no care group was significant; 18.2 per cent of abruptio placentae occurred in the Negro patient who received adequate prenatal care, whereas 35.7 per cent of the no abruptio placentae were in the adequate prenatal care group. The difference was significant (Table 9).

10. In the fetal and infant deaths there was a higher proportion of offsprings of nulliparous patients who had no prenatal care. Among the fetal and infant deaths that occurred in babies born to mothers having their fifth or more pregnancy, there was a higher proportion in the no prenatal care group. There was a higher proportion of babies who lived in the adequate care group regardless of parity. The difference in fetal and infant deaths in the no prenatal care group and in the adequate care group was significant by the Kolmogorov-Smirnov Test (Table 10).

11. In the premature infants there was a higher proportion of per cent born to the nulliparous patient in the no prenatal care group. Among the premature infants, born to mothers after the fifth pregnancy, there was a higher proportion in the adequate prenatal care group. The proportion of per cent of premature infants and normal babies by weight in the no prenatal care group was the same regardless of parity. The difference in premature births in the no

Table 8—Fetal and infant death by prenatal care and race of 460 mothers

Prenatal care	Deaths				Survivals				Totals			
	Negro		White		Negro		White		Negro		White	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	42	89.4	1	25.0	165	46.8	16	28.6	207	51.7	17	28.3
Inadequate	1	2.1	0	0	51	14.4	9	16.1	52	13.0	9	15.0
Adequate	4	8.5	3	75.0	137	38.8	31	55.3	141	35.3	34	56.7
Total	47	100.0	4	100.0	353	100.0	56	100.0	400	100.0	60	100.0

Differences between deaths and survivals for the Negro infants by the chi-square was $\chi^2 = 30.2$, d.f. = 2, and $p < 0.05$.

Table 9—Abruptio placentae in 460 mothers by prenatal care and race of mother

Prenatal care	Abruptio placentae				No Abruptio placentae				Total			
	Negro		White		Negro		White		Negro		White	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
None	9	81.8	1	50.0	198	50.9	16	27.6	207	51.7	17	28.3
Inadequate	0	0	1	50.0	52	13.4	8	13.8	52	13.0	9	15.0
Adequate	2	18.2	0	0	139	35.7	34	58.6	141	35.3	34	56.7
Total	11	100.0	2	100.0	389	100.0	58	100.0	400	100.0	60	100.0

$\chi^2 = 12.6$
d.f. = 2

Table 10—Fetal and infant deaths by parity and prenatal care

Parity	Prenatal care																	
	None				Inadequate				Adequate				Total					
	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Total			
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
0	33	18.1	14	32.5	10	16.6	1	100	2	28.6	2	28.6	115	27.9	17	33.3	132	28.6
1	42	23.1	9	20.9	10	16.6	-	-	32	18.9	2	28.6	84	20.4	11	21.6	95	20.6
2	30	16.5	6	13.9	18	30.0	-	-	23	13.6	2	28.6	71	17.3	8	15.7	79	17.1
3	17	9.3	1	2.3	8	13.3	-	-	18	10.6	1	14.3	43	10.5	2	3.9	45	9.7
4	22	12.1	5	11.6	6	10.0	-	-	14	8.3	-	-	42	10.2	5	9.8	47	10.2
5	20	10.9	3	6.9	7	11.7	-	-	3	1.7	-	-	30	7.3	3	5.8	33	7.1
6	10	5.5	1	2.3	-	-	-	-	3	1.7	-	-	13	3.2	1	1.9	14	3.0
7	-	-	4	19.3	-	-	-	-	1	0.5	-	-	1	0.2	4	7.8	5	1.1
8	3	1.6	-	-	-	-	-	-	1	0.5	-	-	4	0.9	-	-	4	0.8
9+	5	2.7	-	-	1	1.6	0	0	2	1.2	-	-	8	1.9	-	-	8	1.7
Total	182	100.0	43	100.0	60	100.0	1	100	169	100.0	7	100.0	411	100.0	51	100.0	462	100.0

Differences in fetal and infant deaths using the Kolmogorov-Smirnov Test for significance between the groups for parity are not statistically significant. The differences in infant and fetal deaths and survivors between the no care group and the adequate care group was significant; K.S. significant $p < 0.01$.

Table 11—Prematurity of infants by parity and prenatal care

Parity	Prenatal care												Total													
	None Prematurity				Inadequate Prematurity				Adequate Prematurity				Prematurity		Total											
	No.	%	Unknown	No.	%	No.	%	Un- known	No.	%	No.	%	Yes	%	No.	%	No.	%								
0	23	17.9	22	26.2	2	15.4	7	14.6	4	30.8	0	0	63	40.9	11	52.4	0	0	93	28.2	37	31.3	2	14.3	132	28.6
1	27	21.1	20	23.8	4	30.8	9	18.8	1	7.7	0	0	28	18.2	6	28.6	0	0	64	19.4	27	22.9	4	28.6	95	20.6
2	24	18.7	10	11.9	2	15.4	14	29.2	4	30.8	0	0	24	15.6	1	4.7	0	0	62	18.8	15	12.7	2	14.3	79	17.1
3	13	10.2	5	5.9	0	0	6	12.5	2	15.4	0	0	16	10.4	2	9.5	1	100	35	10.6	9	7.6	1	7.1	45	9.7
4	16	12.5	8	9.5	3	23.1	5	10.4	1	7.7	0	0	13	8.4	1	4.7	0	0	34	10.3	10	8.5	3	21.4	47	10.1
5	15	11.7	8	9.5	0	0	6	12.5	1	7.7	0	0	3	1.9	0	0	0	0	24	7.3	9	7.6	0	0	33	7.1
6	8	6.2	3	3.6	0	0	0	0	0	0	0	0	3	1.9	0	0	0	0	11	3.3	3	2.5	0	0	14	3.0
7	0	0	4	4.8	0	0	0	0	0	0	0	0	1	0.6	0	0	0	0	1	0.3	4	3.4	0	0	5	1.1
8	1	0.8	1	1.2	1	7.7	0	0	0	0	0	0	1	0.6	0	0	0	0	2	0.6	1	0.8	1	7.1	4	0.8
9+	1	0.8	3	3.6	1	7.7	1	2.1	0	0	0	0	2	1.3	0	0	0	0	4	1.2	3	2.5	1	7.1	8	1.7
Total	128	100.0	84	100.0	13	100.0	48	100.0	13	100.0	0	0	154	100.0	21	100.0	1	100	330	100.0	118	100.0	14	100.0	462	100.0

Differences in prematurity of infants using the Kolmogorov-Smirnov test for significance between the groups for parity are not statistically significant. The differences in premature infants vs. nonpremature infants between the no prenatal group and the adequate care group was significant, K.S. significant $p < 0.01$.

Table 12—Prematurity of infants by prenatal care and age of mother

Age	Prenatal Care												Total							
	No care			Inadequate care			Adequate care			Total			Total							
	No.	%	Unk.	No.	%	Unk.	No.	%	Unk.	No.	%	Unk.	No.	%	No.	%				
11-16	2	1.6	9	10.7	—	—	5	10.4	3	23.1	—	—	23	14.9	4	19.0	—	—	46	9.4
17-19	30	23.4	15	17.9	4	30.8	8	16.6	2	15.4	—	—	39	25.3	6	28.6	—	—	104	22.5
20-34	87	67.9	55	65.5	7	53.8	32	66.6	6	46.2	—	—	82	53.2	11	52.4	1	100	281	60.8
35-40	7	5.5	4	4.7	2	15.4	2	4.2	1	7.7	—	—	8	5.2	—	—	—	—	24	5.2
41+	2	1.6	1	1.2	—	—	1	2.1	1	7.7	—	—	2	1.3	—	—	—	—	7	1.7
Total	128	100.0	84	100.0	13	100.0	48	100.0	13	100.0	—	—	154	100.0	21	100.0	1	100	462	100.0

Difference in premature births between the patients at risk by age and those from 17 to 35 years of age was not significant when measured by the Kolmogorov-Smirnov test.

Table 13—Fetal and infant deaths by prenatal care and age of mothers

Age	Prenatal care															
	No care				Inadequate care				Adequate care				Total			
	Live		Dead		Live		Dead		Live		Dead		Live		Dead	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
11-16	6	3.3	5	11.6	8	13.3	—	—	27	16.1	—	—	41	9.9	5	9.8
17-19	38	20.9	11	25.6	9	15.0	1	100	43	25.4	2	28.6	90	21.9	14	27.5
20-34	123	67.6	26	60.5	38	63.3	—	—	89	52.6	5	71.4	250	60.8	31	60.8
35-40	12	6.6	1	2.3	3	5.0	—	—	8	4.7	—	—	23	5.6	1	1.9
41+	3	1.6	—	—	2	3.3	—	—	2	1.2	—	—	7	1.7	0	—
Total	182	100.0	43	100.0	60	100.0	1	100	169	100.0	7	100.0	411	100.0	51	100.0

Difference in fetal and infant death vs. infant survivors in babies born of those patients at risk by age and those born of patients from 17 to 35 years of age was not significant by the K.S. test.

prenatal care group and in the adequate care group was significant by the Kolmogorov-Smirnov Test (Table 11).

12. Among the high-risk patients by age (11-16 years and 35 and over), there were fewer prematures in the adequate prenatal care group, whereas in the normal babies by weight there was a higher proportion born of mothers who were between the age of 11 and 16 and who had adequate prenatal care. Age of mother was not significant by the Kolmogorov-Smirnov Test (Table 12).

13. Among the high-risk patients by age (11-16 years), 11.6 per cent of the babies died in the no prenatal care group, whereas among those patients at high risk by age who had adequate prenatal care there were no fetal or infant deaths. This higher proportion of infant or fetal deaths in babies born of mothers between 11 and 16 years of age in the no prenatal care group, when compared to the absence of fetal and infant deaths in those born of mothers between 11 and 16 years of age in the adequate prenatal care group, there was significant difference by the Kolmogorov-Smirnov Test (Table 13).

14. Occupation of the head of household (economics of family) did not relate significantly to the above abnormal outcomes and prolonged labor. Infant abnormalities and prolonged hospital stay did not relate significantly to prenatal care.

Summary

Presented here is a retrospective study which reviews 462 records after delivery of 462 mothers and their offspring: 400 Negro, 60 white, and 2 "others" by race. These 237 patients who received prenatal care at Temple Hospital were identified over a four-month span, January, 1968, to April, 1968, inclusive. To get a similar number of "without prenatal care" patients it was necessary to go back over a 16-month period,

January, 1967, to April 25, 1968, inclusive. The outcomes of these pregnancies in the form of prematurity, fetal and infant mortality, extended hospitalization of newborns, recorded infant abnormalities, abruptio placentae, prolonged labor, toxemia and maternal anemia were studied in relation to maternal age, race, occupation or the source of income available for the purchase of medical care, parity of mother, and the presence of adequate, inadequate, or no prenatal care for this pregnancy, in order to see the factors which relate to fetal, infant and maternal health states.

Analysis of these data reveals significant relationship to the absence of prenatal care to prematurity, fetal and infant mortality, eclampsia, maternal anemia. In all of these abnormal outcomes, the Negro mothers and babies had more "no prenatal care" and a higher percentage of poor health manifested by the above criteria. Parity, occupation of responsible adult, and age of mother did not show a significant relationship to the abnormal maternal and infant health states described in the study.

The normal babies by weight and the babies who survived were born significantly more frequently to mothers who received either adequate or inadequate prenatal care.

Maternal anemia and toxemia of pregnancy occurred significantly more often among those patients who did not receive prenatal care at this hospital prior to delivery in Temple University Hospital.

This study of the 237 patients suggests that those mothers and babies who received inadequate or adequate care were equally as healthy according to our criteria.

Because of the inherent weaknesses in a retrospective study, the small size of the above population, and our inability to follow those patients who might have miscarried before the 16th week of ges-

tation, we are led to suggest additional epidemiological research in order to identify those babies and mothers most at risk and targets for priority prenatal care.

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PHASE II

Introduction

The hypothesis tested in Phase II is that different patterns of delivery of prenatal care are associated with maternal and infant health outcomes. The immediate objective is to compare the health of mothers who received their prenatal care at Temple University Hospital Out-Patient Department, Nicetown-Tioga Health Center, and Comprehensive Group Health Services, and the health of their infants. We are seeking answers to the following questions:

1. Are mothers' health states during pregnancy different when they receive prenatal care at Temple University OPD, Nicetown-Tioga, or Comprehensive Group Health Services?
2. Are there more obstetrical problems among mothers who receive prenatal care at Temple University OPD, Nicetown-Tioga, or Comprehensive Group Health Services?
3. Is the prematurity rate higher in infants born of mothers who received prenatal care at Temple University OPD, Nicetown-Tioga, or Comprehensive Group Health Services?

4. Is the fetal and infant mortality rate higher in infants born of mothers who received prenatal care at Temple University OPD, Nicetown-Tioga, or Comprehensive Group Health Services?

Patterns of Care

In recent years, considerable attention has been focused on the development of Neighborhood Health Centers¹ and the employment of community residents in these centers.² They serve the patient/family as a whole, "care" for total physical, emotional, and social needs, and provide tangible, action-oriented services, such as baby sitting, escort services, and transportation. Both Nicetown-Tioga and Comprehensive Group Health Services provide total services for their patients, i.e., health and social problems are identified and cared for in the same setting. The care is comprehensive and continuous. Family health workers, through knowledge of their community and ability to elicit patients' attitudes, behavior, and perception of their needs, provide meaningful services,³ cognizant of the wishes of those served.

Temple University Hospital Out-Patient Department (TUH)

Patients attending TUH Prenatal Clinic reside in the North Central Philadelphia area. A board-certified obstetrician is responsible for each prenatal clinic session. This responsibility is shared by all obstetricians on the staff of the hospital on a rotating basis. Patients are seen by the OB resident. The obstetrician in charge, who is assigned for the day, supervises the resident's activities, sees all patients with complications, and is responsible for all new patients admitted to service. Another obstetrician is responsible for teaching and supervising medical students assigned to the clinic. Patients receive social services from the TUH Social Service De-

partment, and those requiring home nursing services are referred to the appropriate office of Community Nursing Services. Patients are delivered by the resident. An obstetrician is available for consultation, supervision and/or direct service on a 24-hour basis. The pediatric resident, under the direction of a pediatrician, cares for the infant.

Nicetown-Tioga Health Center

This health center provides comprehensive/family-centered services to a defined geographic area in North Philadelphia (population approximately 30,000). Community residents, employed as family health workers, function as a link between the community and the center. Their outreach activities and intimate knowledge of the community and its problems facilitate case finding. Baby sitting, transportation, and escort services are provided.

All families receiving care are assigned to a Family Care Team which consists of a pediatrician, internist, generalist, social workers, nurses, and family health workers. Prenatal patients may be referred by the team physician to the Women's Specialty Service for complete obstetrical care by the obstetrician. If the team physician prefers, he may follow up prenatal patients with consultation from the obstetrician. However, six weeks before delivery, patients are referred to the Women's Specialty Service for care by the obstetrician.

In addition to the usual prenatal physical and laboratory examinations, all patients receive a complete history, physical, and laboratory tests, including BUN and blood sugar, and screening examinations, such as vision and time testing.

If both the obstetrician and team physician are seeing the patient, appointments are coordinated to avoid unnecessary visits to the center. Appointments are arranged at the convenience

of the patient. She remains the responsibility of the Family Care Team and her obstetrical plan of care is coordinated with the total family's plan of care. Home services, medical, nursing, and/or social are provided by members of the Family Care Team.

Patients are delivered at TUH by Health Center obstetricians and their infants are the responsibility of the team pediatrician.

Comprehensive Group Health Services

The neighborhood health center, funded by both the Children's Bureau and the Office of Economic Opportunity, provides comprehensive health care to families in another geographic area in North Philadelphia (population approximately 16,000) in much the same way as the West Nicetown-Tioga Neighborhood Center. Families are assigned to a team which consists of a pediatrician, internist, social workers, nurses, and family health workers. The obstetrician works in concert with the members of the team.

Prenatal patients are referred to the public health nurse assigned to the center from Community Nursing Services. The obstetrician, nurse, and social worker in the center work closely with the patient and the public health nurse to provide continuity of care.

The Health Center obstetrician is responsible for the delivery of the patient at TUH. The infant is cared for by the pediatric resident at TUH, under the direction of a hospital pediatrician.

Method

The study population consists of high-risk prenatal patients meeting the criteria for comprehensive care as defined by the Maternal and Infant Care Program of Community Health Services of Philadelphia. Only patients registering for care before the 26th week of pregnancy are included in the study.

We began selecting our study popula-

tion January, 1969, with the goal of selecting 100 patients from each of the three service settings by December, 1969. The number of prenatal patients registering for care at TUH greatly exceeds that of the two Health Centers. Random numbers are used to select ten patients per month from the hospital clinic. All patients meeting the study criteria are selected from the two Health Centers. A recognized limitation of this method is the fact that we are not matching patients as they are selected for the study.

All patients who register are asked why they came for care. We frequently find that those who have had problems with previous pregnancies, or are currently having problems, seek care, while those without problems, do not seek care.⁴

The unit of observation is the patient's record. Following discharge from the hospital, a medical student abstracts the required information on a data collection form. Each of the three service settings utilizes the same record forms. Dependence on recording and record analysis imposes limitations⁵ on the amount and kinds of information obtained. However, since our intent was to develop evaluation methodology which could be implemented in a service setting by service personnel, this was the only feasible method at that point in time.

All patients delivered at TUH are interviewed by a representative of the Patient Relations Department to obtain patient evaluations of service while hospitalized for delivery. In addition, study patients are interviewed by the same person, using a structured questionnaire, to obtain information regarding their satisfaction with their prenatal services.

Analysis

In the analysis of data, we will control for age, parity, marital status, previous history of medical or obstetrical

complications, and amount of care a patient receives. Each pattern of care will be analyzed for rates of the maternal and infant outcomes indicated in our questions.

Maternal health states during pregnancy:

- abnormal weight gain
- obstetrical infections
- toxemia
- hemoglobin and hematocrit levels
- medical conditions found

Labor outcomes

- obstetrical infections
- abnormal bleeding
- abruptio placenta
- cesarean section

Infant outcomes

- prematurity
- infections
- mortality

Satisfaction with prenatal services

Reason for seeking care

Conclusion

Phase II is a preliminary attempt to develop evaluation methodology which is feasible in a service setting by service personnel to answer the question: Does the care offered by the Neighborhood Health Centers, when compared to the traditional pattern of care, result in improved health states of patients?

We recognize many of the limitations of this approach. If there is a difference in the maternal and infant health outcomes, we cannot state what factor in the process of care made the difference, or, are there other factors, not related to the care, which made the difference? If there is no difference in outcomes, is it because the process of care was not fully operational in the service settings or are our theories invalid? Our study population consists only of those pa-

tients who come for care. We are not studying our impact on our community.

It is our hope that the experience and analysis of the data from this preliminary study will provide leads for a more definitive study in the future. With the continuing proliferation of new programs⁶ and approaches to delivery of health care, it is essential that evaluation of their effect on health states be recognized as part of the service.

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Mrs. Kauffman is Executive Director and Miss Cunningham is Associate Director, of Patient Services, Community Nursing Services of Philadelphia (500 South Broad Street), Philadelphia, Pa. 19146.

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