

Prenatal Care Utilization in Hawaii: Did it Improve During the Last 16 Years?

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This paper examines the utilization of prenatal care in Hawaii from 1979 to 1994 to determine if early and adequate utilization of prenatal care has changed during this period. Birth certificates of single live born infants of resident women were the source of data for the study. During the study period, the proportion of women receiving prenatal care in the first trimester increased by nearly 5 percent but was still below the national and state Year 2000 health objective of 90 percent. Notwithstanding this improvement, the percentage of women who did not receive the recommended number of visits in spite of starting care early significantly increased. The overall proportion of women with 'intensive' prenatal care use markedly increased (134.7%). The proportion of women with 'inadequate' care use declined (10.3%), although the proportion of women with 'no care' use doubled. Complete reporting of use of care through birth certificates markedly deteriorated. The findings of this study indicate the need for changes in the targeting and provision of counseling and education on the part of health care providers. Public health leaders, policy makers, health care providers, and advocacy groups need to collectively review programmatic directions with an aim toward the development of innovative approaches to address the emerging health needs of mothers and infants in the state.

Introduction

Prenatal care is considered one of the most important components of maternal and child health by both providers of clinical services and public health officials.¹ Its importance is predicated upon the benefits of 'adequate' prenatal care for the mother and the infant.²⁻⁵ Further, 'adequate' prenatal care utilization has been associated with other future health-promoting behaviors, including appropriate utilization of pediatric health care and positive life-style choices.⁶⁻⁷ While adequacy of prenatal care utilization is typically measured by indices that consider the timing of its initiation and the number of visits, adjusted by the length of gestation,⁸⁻⁹ the content and quality of prenatal care are also considered essential to its effectiveness.¹⁰⁻¹¹ Recently, increasing research has been directed at assessing the impact of the content of prenatal care and establishing its relation with positive birth outcomes.¹² Nevertheless, the benefits of high quality and comprehensive care will not be fully realized without early initiation and regular prenatal care visits.

The national health objectives for the Year 2000 aim at 90 percent first trimester initiation of prenatal care.¹³ In the United States however, early initiation of prenatal care has been far below this target.¹⁴ As a result, several policy initiatives, including expanding the eligibility of the Medicaid program, have been implemented to reduce financial and other barriers to obtaining early care.¹⁵ It remains unclear to what extent these initiatives have changed patterns of participation in prenatal care in individual states or in the U.S. as a whole.

This study examines the utilization of prenatal care in Hawaii from 1979 to 1994. In addition to the expansion of Medicaid eligibility, several programs were initiated in Hawaii during this period with an aim at providing prenatal care to under-served populations and increasing its access and availability.¹⁶⁻¹⁹ Further, 1979-1994 represents a period of increasing health insurance coverage in Hawaii.²⁰ The purpose of this investigation is to determine if early and 'adequate' utilization of prenatal care has changed during this period and to assess the present need of further improvement in prenatal care use among population sub-groups.

Methods

Birth certificates of single live born infants of Hawaii resident women from 1979 to 1994 were the source of data for this study. Births to 283,272 women were included and analyzed by major ethnic groups. Ethnicity was based on the self-reported race/ethnicity of the mother as stated in the birth certificate.

Prenatal care utilization was measured by the trimester care began and the number of prenatal care visits given the gestational age at

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Table 1.—Prenatal Care Utilization, 1993-94, and Percentage Change since 1979-80 by Ethnic Group, Hawaii Resident Single Live Births.

Maternal Ethnicity	Prenatal Care Utilization			
	1st trimester start ² (% change)		1st trimester start, <adeq. ^{2,3} (% change)	
Caucasian N 10,030	83.3	(+4.8)	12.7	(+46.0)*
Hawaiian/PH N 9,092	73.9	(+8.0)	14.7	(+33.6)*
Filipino N 7,170	78.5	(+5.6)	15.1	(+42.4)*
Japanese N 4,532	88.9	(+1.3)	13.1	(+118.3)*
Other Asian/PI N 2,868	84.1	(+3.7)	16.1	(+140.3)*
Samoan N 1,049	61.1	(+31.7)	13.5	(+55.2)*
Black N 1,189	77.5	(+7.5)	12.7	(+19.8)*
Total ¹ N 37,299	79.6	(+4.9)	14.1	(+54.9)*

1. Includes all ethnic groups shown and all other ethnic groups which had too few births.
 2. Percentages based on cases not missing prenatal care data.
 3. Less than adequate = less than 9 prenatal care visits.
- *Indicates statistical significance of the linear trend at P < 0.05 as calculated by linear regression.

Table 2.—Adequacy of Prenatal Care Utilization, 1993-94, and Percentage Change since 1979-80 by Ethnic Group, Hawaii Resident Single Live Births.

Maternal Ethnicity	Prenatal Care Utilization					
	Intensive ² (% change)		Adequate ² (% change)		Intermediate ² (% change)	
Caucasian N 10,030	11.6	(+70.6)*	60.2	(-7.9)*	23.0	(+2.2)
Hawaiian/PH N 9,092	12.2	(+229.7)*	48.8	(-11.3)*	29.9	(-2.9)
Filipino N 7,170	10.5	(+275.0)*	53.9	(-12.6)*	28.7	(0)
Japanese N 4,532	13.9	(+162.3)*	62.4	(-19.4)*	19.1	(+27.3)*
Other Asian/PI N 2,868	9.3	(+121.4)*	58.7	(-17.4)*	24.6	(+33.0)*
Samoan N 1,049	8.1	(+145.4)*	40.3	(+14.8)*	33.1	(+2.2)
Black N 1,189	10.8	(+56.5)*	54.9	(-2.0)	28.0	(-3.4)
Total ¹ N 37,299	11.5	(+134.7)*	55.2	(-12.5)*	26.0	(+5.3)*

1. Includes all ethnic groups shown and all other ethnic groups which had too few births.
 2. Percentages based on cases not missing prenatal care data.
- *Indicates statistical significance of the linear trend at P < 0.05 as calculated by linear regression.
Note: Intensive = 16 or more prenatal care visits. Adequate = 9-15 prenatal care visits. Intermediate = 5-8 prenatal care visits.

birth. Adequacy of prenatal care use was defined according to the index proposed by Alexander and Cornely and categorized as intensive, adequate, intermediate, inadequate and no care.⁹ For a full-term pregnancy with a first trimester initiation of prenatal care, intensive prenatal care implies 16 or more visits, adequate prenatal care 9-15 visits, intermediate prenatal care 5-8 visits and inadequate prenatal care 1-4 visits. Criteria for the number of visits are based on recommendations of the American College of Obstetricians and Gynecologists.²¹ Prenatal care started in the second and third trimester of pregnancy were classified as intermediate and inadequate.

Gestational age in completed weeks was calculated as the interval between date of delivery and date of last menstrual period. When the day of the last normal menstrual period was missing, but the month and the year were known, the Preceding Case method of imputing weeks of gestational age, with the exclusion of implausible gestational ages, was used.²²

Differences in measures of adequacy of prenatal care between 1979-1980 and 1993-1994 were calculated as percent changes. Data for two years were combined to increase the stability of the measures and to reduce the impact of any one-year atypical fluctuation. Linear regression was used to test the statistical significance of the slope in the annual trends of each prenatal care utilization measure for each ethnic group and for the total population. The results of linear regression analysis are provided in Tables 1-3 and are based on data on prenatal care from each of the 16 individual years under investigation. Logistic regression was used to calculate the odds ratios measuring the independent effect of prenatal care utilization on low birth weight, prematurity, and small-for-gestational age in the last four years of the study period. The odds ratios of the logistic regressions were adjusted for maternal socio-demographic charac-

teristics, e.g., maternal age, education, parity, marital status, country of birth, military/civilian status, and ethnicity.

Results

In 1993-94, nearly 80 percent of women who delivered single live births obtained prenatal care in the first trimester (Table 1). This represents a 4.9 percent increase in first trimester initiation of prenatal care since 1979-1980. However, an appreciable proportion of all women (14.1%) did not adhere to the recommended prenatal care visit schedule in spite of starting care in the first trimester of pregnancy and, as such, were classified as not receiving adequate prenatal care. This category of inadequate use of prenatal care significantly increased by 54.9 percent since 1979-80.

Marked ethnic variations in the timing of prenatal care were observed, although over the study period all ethnic groups exhibited an increased proportion of women starting prenatal care in the first trimester. In 1993-1994, Samoan women had the lowest (61.1%) and Japanese the highest (88.9%) percentage of women initiating prenatal care in the first trimester. Further, Samoan women had the highest percent change in early initiation of care (31.7%), while Japanese women had the lowest percent change (1.3%). The proportion of women who had inadequate use of prenatal care, after having initiated care in the first trimester, ranged from 12.7 (Caucasians and Blacks) to 16.1 percent (Other Asian/Pacific Islanders). A greater than 100 percent change in these percentages were observed for Japanese and Other Asian/Pacific Island women, while Black women exhibited the lowest increase (19.8%).

Tables 2 and 3 display levels of adequacy of prenatal care by ethnic group. In the total population, intensive and intermediate levels of prenatal care use increased significantly, while adequate

Table 3.—Adequacy of Prenatal Care Utilization, 1993-94, and Percentage Change since 1979-80 by Ethnic Group, Hawaii Resident Single Live Births.

Maternal Ethnicity	Prenatal Care Utilization					
	Inadeq. PNC ² % (%change)		No PNC ² % (%change)		Missing info. % (%change)	
Caucasian N 10,030	4.6	(-6.1)	0.6	(+50.0)	7.2	(+140.0)*
Hawaiian/PH N 9,092	7.4	(-25.2)	1.7	(+183.3)*	11.9	(+271.9)*
Filipino N 7,170	6.0	(-6.2)	0.9	(+125.0)*	11.1	(+382.6)*
Japanese N 4,532	3.5	(+66.7)*	1.1	(+450.0)	11.6	(+452.4)*
Other Asian/PI N 2,868	5.9	(+1.7)	1.5	(+200.0)	14.1	(+314.7)*
Samoan N 1,049	16.4	(-36.7)*	2.0	(-41.2)	20.3	(+190.0)*
Black N 1,189	5.4	(-25.0)	0.9	(-10.0)	7.7	(+165.5)*
Total ¹ N 37,299	6.1	(-10.3)	1.2	(+100.0)*	10.8	(+260.0)*

1. Includes all ethnic groups shown and all other ethnic groups which had too few births.
 2. Percentages based on cases not missing prenatal care data.
 *Indicates statistical significance of the linear trend at P < 0.05 as calculated by linear regression.
 Note: PNC = prenatal care. Inadequate = 1-4 prenatal care visits. Missing info = missing month/trimester of first prenatal care visit, number of prenatal care visits, or date of last menstrual period on birth certificates.

Table 4.—Regression Analysis of Measures of Adequacy of Prenatal Care Utilization on Pregnancy Outcomes, Hawaii Resident Single Live Births, 1991-94.

Prenatal Care Utilization	LBW (<2,500 g)		PreTerm (<37 wks)		SGA	
	odds ratio (95% C.I.)	P value	odds ratio (95% C.I.)	P value	odds ratio (95% C.I.)	P value
Adequate PNC utilization	1.00		1.00		1.00	
Intensive PNC utilization	1.19 (1.06,1.34)	<.01	0.96 (0.87,1.06)	.45	1.15 (0.06,1.25)	<.01
Intermediate PNC utilization	1.17 (1.08,1.28)	<.01	1.27 (1.19,1.35)	<.01	1.05 (0.99, 1.12)	.08
Inadequate PNC utilization	1.38 (1.21,1.59)	<.01	1.28 (1.14,1.43)	<.01	1.29 (1.17,1.43)	<.01
No PNC utilization	3.71 (2.89,4.77)	<.01	3.17 (2.44,4.12)	<.01	1.54 (1.14,2.08)	<.01
Missing PNC criteria	2.68 (2.44,2.94)	<.01	2.59 (2.32,2.88)	<.01	1.41 (1.26,1.58)	<.01

Note: all odds ratios are adjusted for maternal age, education, parity, marital status, country of birth, military/civilian status, and ethnicity.
 PNC = prenatal care. Adequate = 9-15 prenatal care visits. Intensive ≥ 16 prenatal care visits. Intermediate = 5-8 prenatal care visits. Inadequate = 1-4 prenatal care visits. LBW = low birth weight. SGA = small-for-gestational age.

prenatal care decreased significantly (Table 2). Japanese women had the highest proportion of intensive use of prenatal care (13.9%), while Samoan women had the lowest proportion (8.1%). Intensive prenatal care use significantly increased over the study period for all ethnic groups, especially for Hawaiian/Part Hawaiian and Filipino women. These two ethnic groups demonstrated a rise in intensive prenatal care use of 230 and 275 percent respectively. Blacks and Caucasians had the smallest increase in intensive use of prenatal care.

Every ethnic group experienced a decline in the proportion of women obtaining adequate prenatal care except Samoans. In spite of a 14.8 percent increase in adequate use of prenatal care, Samoans still had the lowest percentage (40.3%) of adequate use. Conversely, Japanese women had the highest percent of adequate use of prenatal care (62.4%) and the greatest decrease in this percentage over time (19.1%). In 1993-94, 6.1 percent of women in Hawaii had inadequate use of prenatal care. (Table 3) Overall inadequate use of prenatal care declined over the study period and decreased 36.7 percent in Samoan women. Inadequate prenatal care utilization significantly increased (66.7%) in Japanese women, the only ethnic group to experienced a significant increase in this indicator. Only a small proportion of women (1.2%) did not receive prenatal care in 1993-94. (Table 3) However, this proportion doubled since the first two years of the study period and significantly increased for Hawaiian/Part Hawaiians and Filipinos.

The percentage of birth certificates missing information on gestational age, the month prenatal care began or the number of prenatal care visits increased 260 percent during the study period. All ethnic groups demonstrated this trend with Japanese (452%), Filipino (383%), and Other Asian/Pacific Islander (315%) surpassing the

state rate of increase.

Results of the logistic regression analyses of measures of prenatal care adequacy on pregnancy outcomes are shown in Table 4. As compared with adequate prenatal care utilization, intensive, intermediate, inadequate, and no prenatal care showed a significantly higher risk of low birth weight and, with the exception of intensive care, were also predictors of preterm birth. Women with intensive, inadequate and no prenatal care use had a higher risk of a small-for-gestational age infant. Women with missing prenatal care information on the birth certificate demonstrated a higher risk for all three outcomes.

Discussion

This study of prenatal care utilization in Hawaii during the past 16 years revealed several important trends. The proportion of women receiving prenatal care in the first trimester has increased by nearly 5 percent but is still below the national and state Year 2000 health objective of 90 percent.^{13,23} Notwithstanding this improvement in early participation in prenatal care, the percentage of women starting care early but not receiving the recommended number of visits significantly increased (55%). While the proportion of women utilizing prenatal care at the intensive level markedly increased (134.7%), the overall proportion of women in Hawaii who utilized prenatal care at the adequate level declined by 12.5 percent as well as inadequate use which declined by 10.3 percent. Finally, no care use doubled, although remained relatively rare, and the reporting of prenatal care use in birth certificates clearly deteriorated, reducing the value of this data source for public health assessment and policy analysis.

The state of Hawaii has been very active in implementing initiatives aimed at reducing financial and other barriers to obtaining early prenatal care. In 1974, Hawaii enacted the Prepaid Health Care Act that required most employers to provide coverage by a prepaid

health care plan that would include maternity benefits to employees working more than fifty percent time.²⁰ The federal expansion of Medicaid eligibility in the early eighties and later the implementation of presumptive eligibility for pregnant women ensured the availability of prenatal care without delay.¹⁶ The enactment of the State Health Insurance Program brought the availability of care to virtually the whole population.²⁰ Several educational efforts were also initiated by the collaboration of public and private agencies as the Healthy Mothers Healthy Babies Coalition, Mothers' Care for Tomorrow's Children, the MCH Branch of the Department of Health Family Health Services Division, and others.¹⁷⁻¹⁹ Our findings of improved early use of prenatal care probably reflect the results of these initiatives in the change from 76 percent early initiation of care in 1979-80 to almost 80 percent in 1993-94.

The improvement in early initiation of care is tempered by the large increase of the proportion of women who in spite of starting prenatal care in the first trimester do not receive the recommended number of prenatal care visits. It is possible that, while the efforts to ensure access to care were successful, education campaigns and care providers were not sufficiently clear on the need for continued care throughout pregnancy. It is also possible that the care provided was not attentive enough to the cultural needs of the woman, which may have increased the occurrence of non-compliance with the scheduled follow-up visits. In addition to influencing compliance with scheduled visits, the information provided by the physician at the first prenatal care contact may be especially effective and greatly valued by the woman. It has been reported, for example, that smokers are more likely to quit after receiving advice from a physician.²⁴ It has also been reported that prenatal care advice is differentially provided to different population groups by health care providers.²⁵ It may be appropriate for local professional organizations to promote and monitor the educational content of prenatal care in addition to its medical component so that the quality of prenatal care delivered in the state may be maximized.¹¹

The significant reduction in the proportion of women who received adequate prenatal care may be compensated by the marked increase in the proportion of those receiving intensive prenatal care. Intensive prenatal care (16 or more visits for a full-term pregnancy) has been found to be associated with an increased risk of delivering a low birth weight and a small-for-gestational age infant in this and other studies,²⁶ indicating that this level of care reflects the presence of pregnancy complications. To this extent, the large increases in intensive prenatal care utilization experienced by Hawaiian/Part-Hawaiian, Filipino, and Samoan mothers can be interpreted as an indication of improved availability of prenatal care for these traditionally higher risk population groups. Whether the same assumption can be made for the significant increase of intensive prenatal care utilization by Japanese and Other Asian/Pacific Island mothers deserves further investigation.

At the state level, one-fourth of pregnant women utilize prenatal care at the intermediate level (5-8 visits for a full-term pregnancy), while a smaller but important proportion (7.3%) have inadequate (1-4 visits for a full-term pregnancy) or no prenatal care use. Unmarried status at the time of delivery was identified as the most important determinant of no prenatal care utilization in a previous study.²⁷ High parity-for-age, low educational attainment, and foreign nativity status were also found to be risk factors. While high parity-for-age and low educational attainment have declined during the study

period, foreign nativity status and especially unmarried status have increased markedly.²⁸ This finding highlights the need to enhance efforts to reach single pregnant women with the message of the importance of prenatal care. It should be noted that the rise in births to single women is not limited to mothers less than 18 years of age, which constitute less than 4 percent of all Hawaii women who give birth.²⁸ Outreach activities and the provision of health insurance should also focus on foreign-born mothers. More than one fourth of births in Hawaii were to foreign-born mothers in 1993-94, many of which could be new immigrants.²⁸

The findings of this study highlight the importance of monitoring indicators of health status and health services utilization, particularly during periods of changing health care financing and insurance policies, in order to facilitate the assessment of the potential impact of these policies. In Hawaii, managed care for Medicaid clients was initiated in July 1994 through the enactment of the QUEST program.²⁹ It is unclear what effect the establishment of this new publicly financed health insurance system will have on the current levels and rate of change in prenatal care utilization. The examination of vital records in the years following the QUEST enactment may help to clarify what if any impact this development will have on prenatal care use in Hawaii.

The present validity and accuracy of birth certificates in Hawaii is not known. A report of the Research and Statistics Office of the Health Department in 1979, described a remarkable improvement of the completeness and accuracy of birth certificates after the initiation of a collaborative program with the National Center for Health Statistics.³⁰ Most of the errors at the time involved the reporting of complications and anomalies, which were not reported or noted in the wrong place. Another common error was the omission of the day in the date of the last menstrual period. This study demonstrates the value of birth certificates as a readily available and useful source of data for monitoring health status and health care use. Unfortunately, it also shows a striking increase in the number of records with incomplete information on important aspects of care, a fact which erodes their relevance. It is important that the responsible officials identify the source of the incompleteness and assess the accuracy of the information reported. Although birth certificates are not completed by obstetricians, their expressed concern and cooperation in this effort will be essential to reverse the trend and ensure that the reliability and validity of this unique data source for monitoring maternal and infant care in Hawaii is maintained.

The health status of mothers and infants and their access to needed health care are concerns of both public health officials and providers of health services. The findings of this study are relevant to all providers of care, public and private, as old maternal risk problems (e.g., low educational attainment, high parity-for-age) decrease and new ones (e.g., inadequate prenatal care use after early initiation, births to single women, and births to women 35 years or older) emerge or become more frequent in all ethnic groups in the population.²⁸ These changes in risk status and prenatal care use patterns necessitate changes in the targeting and provision of counseling and education on the part of individual providers. Public health leaders, health care providers, policy makers and advocacy groups need to collectively review traditionally accepted risk indicators and related programmatic directions with an aim toward the future development of innovative approaches to address emerging health needs of mothers and infants in the state.

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American Heart Association Marks 50 Years of Progress



1950s

AHA links smoking to heart disease

1960s

AHA-funded scientists develop pacemaker, valve replacement surgery

1970s

Educational campaign emphasizes heart attack warning signs

1980s

Washington office opened to be nation's advocate on heart and stroke health issues

1990s

AHA's long-term investment in research surpasses \$1 billion



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