

DISPARITIES

IN MATERNAL & INFANT HEALTH:

ARE WE MAKING PROGRESS?
LESSONS FROM CALIFORNIA

Fall 2004

Disparities In Maternal And Infant Health: Are We Making Progress? Lessons From California

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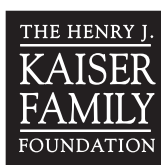
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INTRODUCTION

Eliminating health disparities between different population groups is a national priority outlined in the *Healthy People 2000/2010* goals set by the U.S. government.¹ The large and persistent racial/ethnic and socioeconomic disparities in maternal and infant health have been of particular concern (Figure 1).

For example, babies born to African American mothers are twice as likely as babies born to White mothers to have low birth weights and to die before their first birthdays. Women who have not finished high school are three times as likely as women who have completed college to lack prenatal care during the first three months of pregnancy. There is widespread recognition that closing these gaps will require more effective strategies, which in turn require ongoing monitoring and study of disparities in the context of changing social policies and programs.

Figure 1. Selected *Healthy People 2010* Objectives in Maternal and Infant Health:

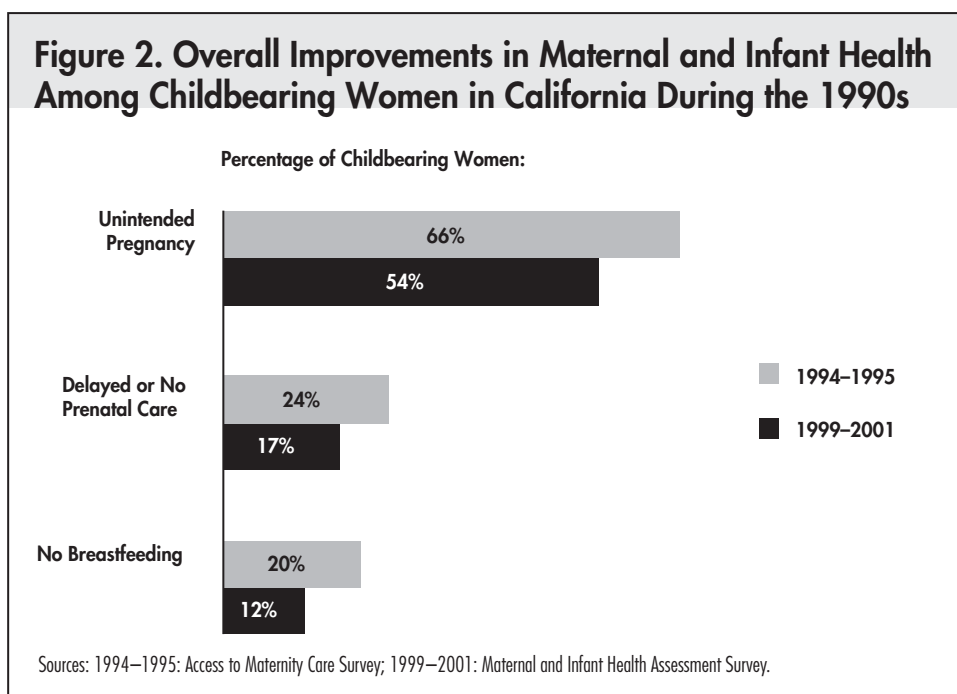
- ◆ **Intended Pregnancies:** Increase the proportion of pregnancies that are intended to 70 percent.
- ◆ **Prenatal Care:** Increase the proportion of childbearing women who begin prenatal care during the first three months (trimester) of pregnancy to 90 percent.
- ◆ **Breastfeeding:** Increase the proportion of mothers who breastfeed their babies in the early postpartum period to 75 percent.

Healthy People 2010 also calls for the elimination of social disparities (between racial/ethnic, income, education, and other social groups) in health, by achieving target rates for each indicator not only overall but in every social group.

Adapted from U.S. Department of Health and Human Services, *Healthy People 2010*, available online at www.healthypeople.gov.

¹ U.S. Department of Health and Human Services, *Healthy People 2010*, available online at www.healthypeople.gov.

This brief focuses on maternal and infant health disparities in California, but the findings have national relevance. One of every eight births in the United States occurs in this diverse state, and California's economic, demographic, and policy experiences often reflect or foreshadow the experiences of other states. This analysis of socioeconomic and racial/ethnic disparities in maternal and infant health was conducted using two statewide-representative maternal surveys linked with birth certificates [see Appendix for description of research methods]. Changes were examined in three key indicators of maternal and infant health and health care—pregnancy intention, timing of prenatal care initiation, and breastfeeding—in California during 1994–1995 and 1999–2001.



Overall, improvements were seen between these two time periods in each of the three indicators (Figure 2). During the later time period, significantly smaller percentages of women overall had unintended pregnancies, lacked early prenatal care, and did not breastfeed their babies. Despite these improvements, only breastfeeding rates met the *Healthy People* objective in either time period.

These global improvements, however, mask persistent disparities between different subgroups of women. While improvements were seen for nearly every subgroup, large gaps between women of different incomes, educational levels and racial/ethnic groups did not diminish. This issue brief focuses on these persistent social disparities in maternal and infant health in California.

A Time of Economic Growth

Following a statewide economic recession earlier in the decade, the California economy grew rapidly throughout the mid- to late 1990s and unemployment and poverty declined. These general economic trends also were seen among California's childbearing women, with upward shifts in the income and education distributions for this population (Table 1). Compared with 1994–1995, during 1999–2001 relatively fewer women who gave birth were poor (family incomes below 100% of the poverty threshold, \$15,150 and \$17,650 for a family of four in 1995 and 2001, respectively) and more had incomes over four times the federal poverty level (\$60,600 and \$70,600 for a family of four in 1995 and 2001, respectively). Higher percentages of childbearing women had attended at least some college during the later period.

Table 1. Distribution of Childbearing Women in California, 1994–1995 and 1999–2001

	Percentage of Total Population	
	1994–1995 ¹ n=10,132	1999–2001 ² n=10,519
Poverty Level (FPL)		
0–100%	45	32
101–200%	18	20
201–300%	12	10
301–400%	9	7
>400%	13	21
Missing ³	3	10
Educational Level		
Did not complete high school	30	24
High school graduate/GED	31	24
Some college	24	30
College graduate	15	23
Race/Ethnicity		
African-American	7	6
Asian/Pacific Islander	10	10
Latina—Foreign-Born	35	30
Latina—US born	13	16
Native American/American Indian	0	1
White	35	37

Note: The federal poverty level was \$15,150 for a family of four in 1995 and \$17,650 in 2001.

¹ Access to Maternity Care survey, an in-person hospital-based statewide survey.

² Maternal and Infant Health Assessment, a mail-telephone statewide survey.

³ Differences in the percentage with 'missing' income are likely due to differences in survey methods.

Local and state funding for services also improved along with the State's economy during the 1990s. Increased provider reimbursement and eligibility expansions implemented in Medi-Cal (California's Medicaid program) from 1988 through 1990 were sustained, and further reforms were implemented in the 1990s to streamline the application process and remove "non-financial" barriers to care among pregnant women with Medi-Cal coverage. The state's Family PACT program was launched in 1997 to cover the costs of family planning services for low-income men and women with incomes up to 200% of the federal poverty level. Healthy Families, California's State Children's Health Insurance Program, also was implemented during the late 1990s, and major public health efforts promoting breastfeeding were launched during the mid- and late-1990s.

Measuring and Understanding the Gaps

Because overall rates can obscure significant disparities between groups, it is therefore important to examine how indicators compare across different social groups defined by income, education, and race/ethnicity. These groups are defined as follows:

- *Income*—mother's self-reported family income, measured as a percentage of the federal poverty threshold and grouped as: 0–100%, 101–200%, 201–300%, 301–400%, or greater than 400% of poverty.
- *Education*—mother's self-reported highest level of completed schooling, categorized as: did not complete high school, graduated from high school, attended but did not complete college, or graduated from college.
- *Race/ethnicity*—mother's self-reported racial/ethnic group, categorized as: African-American, Asian/Pacific Islander, immigrant Latina, U.S.-born Latina, Native American/Alaskan Native, or White.

To examine income, education, and racial/ethnic disparities in each indicator during each time period, we calculated the relative risk of a poor outcome for each social group compared with the most advantaged corresponding group—women with incomes above 400% of poverty, college graduates, or Whites.

We also constructed multivariate analytic models to examine the impact of other factors (such as health insurance coverage or having a regular source of health care, for example) on each of these three indicators. Several of these factors could be addressed directly or indirectly through public policies. Findings from these analyses are summarized in the text for each indicator, but are not displayed in tables.

Data sources and the definitions of the analytic factors are detailed in the Appendix at the end of this paper. Further methodologic details are available on request.

RESEARCH FINDINGS

Unintended Pregnancy

In the United States, half of all pregnancies are unintended. Unintended pregnancy among adult as well as teen women is associated with social, economic, and medical costs. Social costs of unintended births include reduced educational attainment and employment opportunity, greater welfare dependency, and increased potential for child abuse and neglect. Women with unintended pregnancies are less likely to receive timely prenatal care, and their infants are more likely to lack sufficient resources for healthy development.² We defined *unintended pregnancy* (Table 2) as the percentage of childbearing women who reported (a) not trying to get pregnant (1994–95) or (b) not wanting to get pregnant (1999–2001).

Table 2. Rates and Disparities in Unintended Pregnancy in California, 1994–1995 and 1999–2001

	Percentage with unintended pregnancy		Relative risk of unintended pregnancy	
	1994–1995	1999–2001	1994–1995	1999–2001
TOTAL				
Poverty Level (FPL)				
0–100%	74	63*	1.7**	1.8**
101–200%	60	55	1.4**	1.6**
201–300%	57	43*	1.3**	1.2**
301–400%	44	35*	1.0	1.0
Mother's Education				
Did not complete high school	72	58*	1.4**	1.6**
High school graduate/GED	64	58	1.2	1.6** ^
Some college	62	53*	1.2	1.5**
College graduate	52	35*	1.0	1.0
Race/Ethnicity				
African-American	75	70	1.2	1.4**
Asian/Pacific Islander	61	52	1.0	1.1
Latina—Immigrant	68	49*	1.1	1.0
Latina—US born	67	63	1.1	1.3**
Native American/American Indian	70	66	1.2	1.3**
White	60	49	1.0	1.0

Note: The federal poverty level was \$15,150 for a family of four in 1995 and \$17,650 in 2001.
 * Percent for this group in 1999–2001 was significantly different than that in 1994–1995 (alpha = 0.05). Relative Risk > 1 indicates risk is higher than reference group.
 ** Significantly higher relative risk than reference group (301–400% FPL, College graduate, White), alpha = 0.05.
 ^ Relative risk for this group was significantly different in 1999–2001 than in 1994–1995, alpha = 0.05.
 Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

² U.S. Department of Health and Human Services, *Healthy People 2010*, Chapter 9, Family Planning. Available online at www.healthypeople.gov.

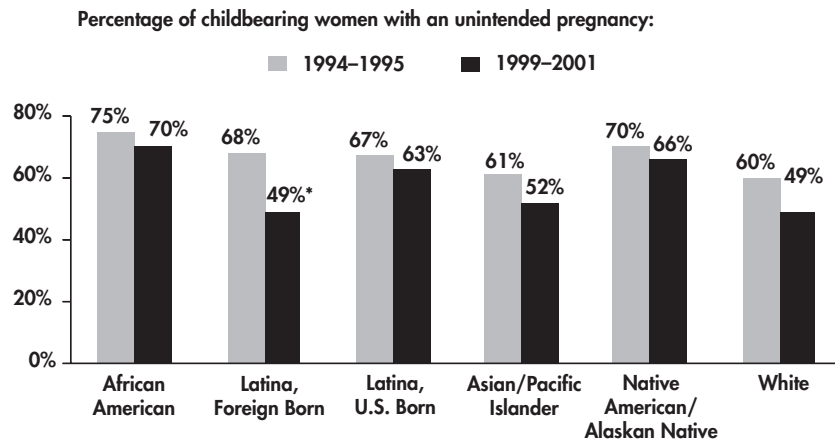
Disparities between income groups: Mirroring the declines seen among women in California overall, rates of unintended pregnancy fell between 1994–1995 and 1999–2001 in every income group. Despite these improvements, the *Healthy People* objective of reducing the proportion of pregnancies that are unintended to 30% was not achieved overall or in any income group. Furthermore, the size of disparities (as shown by relative risks) between income groups did not change significantly. During both time periods, women with incomes up to 300% of poverty were at significantly greater risk of unintended pregnancy than women in the highest income group (301% to 400% of poverty). Even after taking into account a wide range of other characteristics (such as age, total number of births, marital status, smoking during pregnancy, and drinking alcohol during pregnancy; see Methods for full list) that have been found to be associated with pregnancy intention, differences by income continued to be significant.

Disparities by education: Rates of unintended pregnancy had fallen significantly by 1999–2001 for all education groups except high-school graduates. Again, however, rates in every group exceeded 30%, and there was no narrowing in the relative disparities between the different education groups. In fact, the gaps between women without college degrees and those who were college graduates actually appeared wider during 1999–2001. Even after taking into account a wide range of other characteristics (such as age, total number of births, marital status, smoking and drinking alcohol during pregnancy; see Methods for full list) that have been found to be associated with pregnancy intention, differences by maternal education continued to be significant.

Racial/ethnic disparities: Although rates of unintended pregnancy ranged from 60.4% for Whites to 75.2% for African Americans in 1994–95, the differences across racial/ethnic groups were not statistically significant during that time period. Rates of unintended pregnancy appeared to be lower in all racial/ethnic groups during 1999–2001, but the decline was statistically significant only for immigrant Latinas (Figure 3). Indeed, in contrast with the earlier picture, disparities between Whites and African Americans, US-born Latinas, and Native American/Alaskan Natives were statistically significant during the later time period (Figure 4). After controlling for other factors, the differences across racial/ethnic groups narrowed, but the disparities remained significant for African Americans and US-born Latinas relative to White women.

Additional factors deserving particular attention: During 1999–2001, low-income women who were uninsured appeared to be at particularly increased risk for having an unintended pregnancy. Among women with incomes at or below 300% of poverty, those who lacked health insurance coverage before pregnancy were more likely to have an unintended pregnancy even when differences in age, total number of births, income, education, and other characteristics were considered. Although explaining the underlying relationships is beyond the scope of this work, the link between unintended pregnancy and lacking insurance may reflect affordability of and access to contraception.

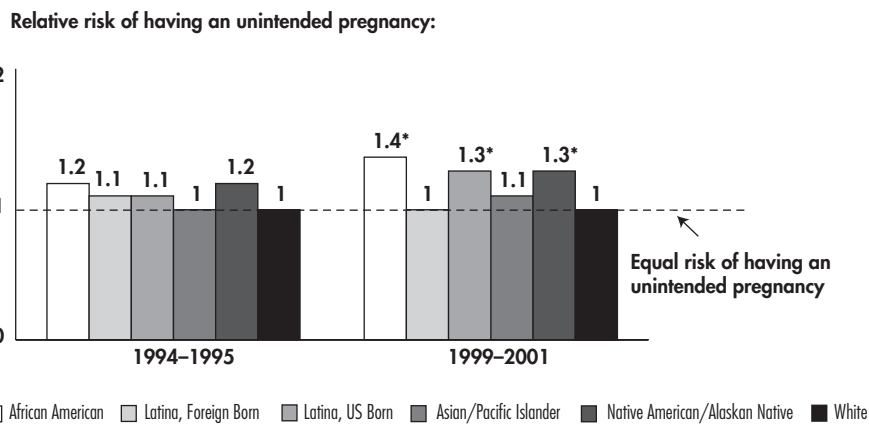
Figure 3. Rates of Unintended Pregnancy in California by Mother's Race/Ethnicity, 1994/1995 and 1999/2001



*Significantly different from 1994-1995 level at $p < .05$.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Figure 4. Disparities in Unintended Pregnancy in California by Racial/Ethnic Group, 1994/1995 and 1999/2001



Relative risk > 1 indicates unintended pregnancy more likely than among White women.

*indicates difference is statistically significant ($p < .05$)

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Prenatal Care

Including early prenatal care as a *Healthy People* objective reflects widespread agreement that initiating care in the first three months of pregnancy is important for timely risk assessment and intervention, including health promotion, that could improve a range of maternal and infant health outcomes. We studied initiation of prenatal care by examining *delayed or no prenatal care*, defined as the percentage of childbearing women who lacked early prenatal care because they either began prenatal care after the first trimester or received no care at all (Table 3).

Table 3. Rates and Disparities in Delayed or no Prenatal Care in California, 1994–1995 and 1999–2001

	Percentage of women with delayed/ no prenatal care		Relative risk of delayed/ no prenatal care	
	1994–1995	1999–2001	1994–1995	1999–2001
TOTAL				
Poverty Level (FPL)				
0–100% FPL	38	28*	9.9**	8.2**
101–200%	18	18	4.7**	5.4**
201–300%	12	13	3.1**	3.8**
301–400%	8	6	2.1	1.8**
>400%	4	3	1.0	1.0
Mother's Education				
Did not complete high school	38	28*	5.8**	4.4**
High school graduate	24	22	3.7**	3.4**
Some college	15	13	2.2**	2.0**
College graduate	7	6	1.0	1.0
Race/Ethnicity				
African-American	22	19	1.4	2.0**
Asian/Pacific Islander	26	18	1.7	1.9**
Foreign-born Latina	32	25	2.1**	2.7**
US-born Latina	24	19	1.6**	2.1**
Native American/Alaskan Native	27	18	1.8	1.9
White	15	9	1.0	1.0

The federal poverty level was \$15,150 for a family of four in 1995 and \$17,650 in 2001.

* Percent for this group in 1999–2001 was significantly different than that in 1994–1995 (alpha = 0.05).

Relative Risk > 1 indicates risk is higher than reference group.

** Significantly higher relative risk than reference group (income > 400% FPL, College graduate, White), alpha = 0.05.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Disparities between income groups: Although a significantly smaller percentage of poor women had delayed or no care in the later time period, the disparities between income groups were not significantly reduced (Figures 5,6). Even with overall improvements in rates of early care, only women with incomes above 300% of poverty had rates of early prenatal care that met the *Healthy People* target of 90%, and there remained an 8-fold disparity between women in the lowest and highest income groups. Compared with the highest income group, rates of delayed or no prenatal care were higher not only for poor and near-poor women but for women with incomes up to 300% of poverty in 1994–95 and up to 400% of poverty in 1999–2001. When income was considered along with other factors (such as age, total number of births, marital status, smoking and alcohol use during pregnancy; see Methods for full list of factors) that may affect whether a woman receives early prenatal care, the disparities by income remained evident.

Disparities by education: Patterns by education were generally similar to those seen by income. Women with lower levels of education were less likely in both time periods to have early prenatal care, and women with the least education (who had not completed high school) experienced significant improvement between 1994/1995 and 1999/2001. The relative disparities between women of different education levels did not change, however, and it is noteworthy that there were persistent disparities across all levels of educational attainment, not just between the least and most educated subgroups. At both times, even women who had attended but not graduated from college had higher rates of delayed or no care than did college graduates—the only group that met the *Healthy People* target.

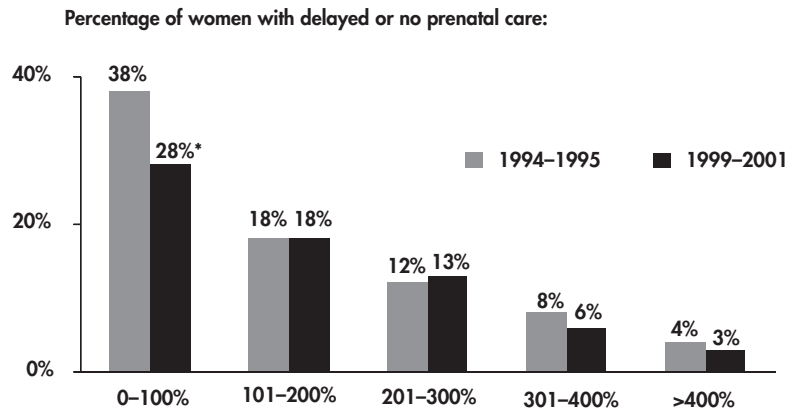
However, additional findings suggest that other factors may play a role in the education disparities in prenatal care. Although there appeared to be differences in initiation of prenatal care between women with different levels of education, these differences were largely explained by other factors (see Methods for full list of factors).

Racial/ethnic disparities: Rates of delayed or no prenatal care were lowest among White women and highest among immigrant Latinas during both time periods. Compared with Whites (the only group that met the *Healthy People* objective), rates of delayed or no prenatal care also were significantly higher for US-born Latinas in both time periods and for African American and Asian/Pacific Islander women in 1999–2001. There were no significant declines between the two time periods, either in the rates of delayed or no care for any racial/ethnic group or in the size of the disparities between the different racial/ethnic groups.

As with the differences by education, however, differences between most racial and ethnic groups in the likelihood of receiving early prenatal care were no longer apparent after other factors, including income and education, were considered. These findings suggest that racial/ethnic gaps could be reduced by focusing on these socioeconomic factors.

Additional factors that deserve particular attention: Our research suggests factors that may contribute to the income disparities in prenatal care initiation: (i) whether a woman had health insurance coverage (including Medi-Cal or private coverage) during the first 3 months of her pregnancy and (ii) whether the pregnancy was intended. For example, in the lower-income subgroups of women at higher risk of delayed or no prenatal care, lack of first-trimester insurance coverage was associated with a 4- to 5-fold increased risk, taking other factors into consideration.

Figure 5. Rates of Delayed/No Prenatal Care in California by Woman's Income, 1994/1995 and 1999/2001

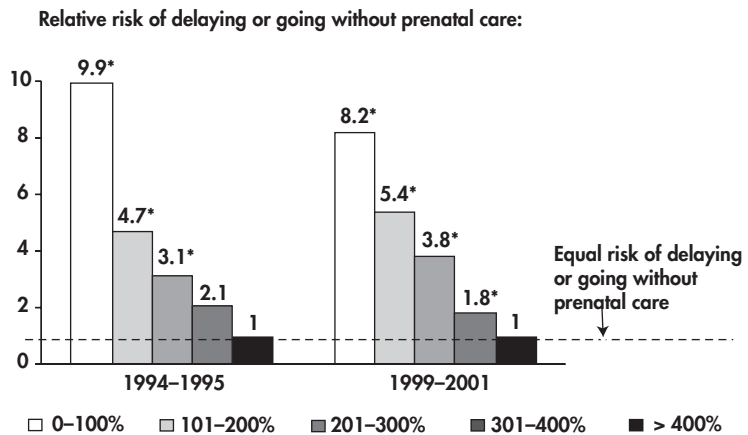


Note: The federal poverty level was \$15,150 for a family of four in 1995 and \$17,650 in 2001.

*Significantly different from 1994-1995 level at $p < .05$.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Figure 6. Disparities in Delayed/Lack of Prenatal Care in California by Family Income, 1994/1995 and 1999/2001



Relative risk > 1 indicates delayed/lack of prenatal care more likely than among women with incomes > 400% of poverty.

*indicates difference is statistically significant ($p < .05$).

Note: The federal poverty level for a family of four was \$15,150 in 1995 and \$17,650 in 2001.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Breastfeeding

The benefits of breastfeeding for infant and maternal health are widely recognized, and the American Association of Pediatrics considers breastfeeding in general to be “the ideal method of feeding and nurturing infants.” In these analyses (Table 4), the indicator was no breastfeeding, defined as the percentage of childbearing women who (a) did not plan to breastfeed when interviewed during their delivery stays (1994–95) or (b) had never breastfed when interviewed two to seven months after giving birth (1999–2001).

Table 4. Rates and Disparities in Breastfeeding in California, 1994–1995 and 1999–2001.

	Percentage who did not breastfeed		Relative risk of not breastfeeding	
	1994–1995	1999–2001	1994–1995	1999–2001
TOTAL				
Poverty Level (FPL)				
0–100% FPL	23	18	2.3**	3.2**
101–200%	17	12*	1.7	2.1**
201–300%	27	13*	2.7	2.3**
301–400%	22	9*	2.2**	1.6**
>400%	10	6	1.0	1.0
Mother's Education				
Did not complete high school	23	17	2.8**	3.8**
High school graduate	22	17	2.6**	3.9**
Some college	20	11*	2.4**	2.5**
College graduate	9	4*	1.0	1.0
Race/Ethnicity				
African-American	34	23*	1.5	2.4**
Asian/Pacific Islander	20	11*	0.9	1.1
Foreign-born Latina	14	9*	0.6**	0.9
US-born Latina	25	20*	1.1	2.0**
Native American/Alaskan Native	20	12	0.9	1.2
White	22	10*	1.0	1.0

The federal poverty level was \$15,150 for a family of four in 1995 and \$17,650 in 2001.

*Percent for this group in 1999–2001 was significantly different than that in 1994–1995, alpha = 0.05.

Relative Risk > 1 indicates risk is higher than reference group.

**Significantly higher relative risk than reference group (income > 400% FPL, College graduate, White), alpha = 0.05.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

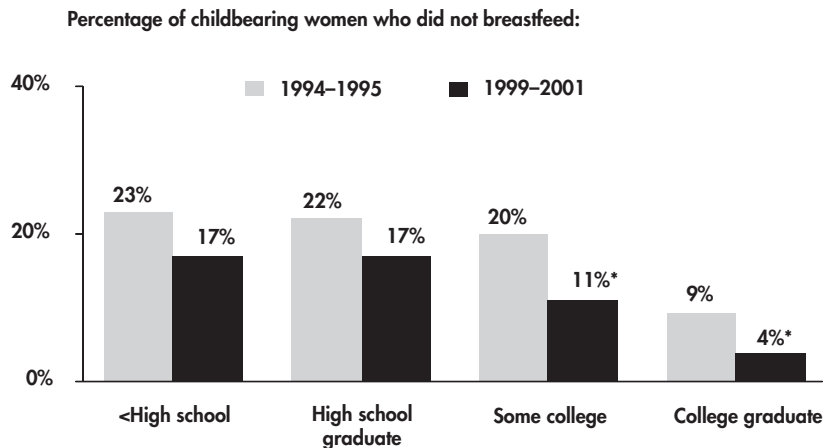
Disparities between income groups: Breastfeeding rates in 1994–1995 were close to the Healthy People target of 75% and appeared to increase among women in every income group by 1999–2001 (table 4). However, the relative disparities between women in different income groups did not narrow over time. In both time periods, women in the highest income group appeared most likely to breastfeed their babies; in 1999–2001, these women were significantly more likely to breastfeed than were women in all groups with lower incomes. However, when considered along with education, race/ethnicity, and other factors (such as age, total number of births, marital status, health behaviors and birth outcomes; see Methods for full list) that may affect whether a woman breastfeeds, the income disparities in breastfeeding appeared to be largely explained by differences in education.

Disparities by education: Significant improvements in breastfeeding rates between 1994–95 and 1999–2001 occurred among women with at least some college education, but the relative disparities in breastfeeding by education were not reduced (Figures 7,8). In both time periods, college graduates were more likely than women with less education to breastfeed their babies. In this study, educational attainment was a strong predictor of breastfeeding. Even after taking into account differences in income and other factors that may affect breastfeeding (see Methods for full list), we found that both the woman’s and her partner’s education played an important role in the likelihood that she will breastfeed.

Racial/ethnic disparities: Although significant improvements in breastfeeding were seen for most racial/ethnic groups between the mid and late 1990s, the gaps between Whites and both African Americans and U.S.-born Latinas appeared to widen. African American women (in both time periods) and US-born Latina women (in 1999–2001) were less likely than White women to breastfeed their babies. When other factors were considered, the disparities in breastfeeding by racial/ethnic group remained significant but appeared to be explained in part by differences in education and income.

Additional factors deserving particular attention: None of the other factors examined in additional analyses (see Methods for full list of factors) appeared to play a significant role in breastfeeding disparities by income, education, or racial/ethnic group.

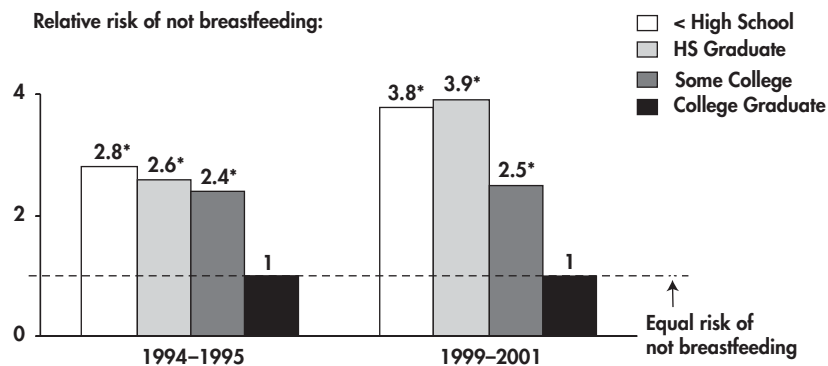
Figure 7. Rates of Not Breastfeeding in California by Mother's Education Level, 1994/1995 and 1999/2001



*Significantly different from 1994-1995 rate at $p < .05$.

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.

Figure 8. Disparities in Breastfeeding in California, by Mother's Education Level, 1994/1995 and 1999/2001



Relative risk > 1 indicates women in this educational group more likely than women who are college graduates to not breastfeed.

*indicates difference is statistically significant ($p < .05$).

Source: UCSF analysis of Access to Maternity Care survey and Maternal and Infant Health Assessment survey.



POLICY IMPLICATIONS

Overall, progress was made in California toward achieving some critical *Healthy People 2000/2010* objectives in maternal and infant health during the 1990s. Between 1994–1995 and 1999–2001, fewer women had unintended pregnancies, more women received early prenatal care, and more women breastfed their infants. Across different income groups, education levels, and racial/ethnic groups, women experienced improvements on these three measures between the two time periods. Despite these improvements, however, disparities by income, education, and race/ethnicity did not diminish in size. Women in more advantaged groups consistently fared better than their less advantaged counterparts.

Nationally, there has been a call for greater attention to health disparities. Disparities in maternal and infant health limit women’s and children’s chances for good health and well-being throughout their lives. While the root causes and underlying factors contributing to disparities are complex, there is considerable evidence that systemic inequities in the health care system are a contributing factor.

Several factors consistently appeared to contribute to disparities in the maternal and child health indicators studied here. For the most part, these factors are reflections of socioeconomic status. For unintended pregnancy, prenatal care, and breastfeeding, significant disparities by income and/or education remained even after taking into account a wide array of other factors, and most racial/ethnic disparities were at least partly explained by socioeconomic differences. Thus, efforts addressing differences in economic resources and other factors closely related to socioeconomic status are likely to be critical for reducing the disparities in each of these three indicators.

In addition, the results reported here point to health insurance coverage as a key factor in disparities in maternal and infant health. They also suggest that increased use of family planning could not only reduce unintended pregnancies but may also lead to more timely prenatal care. Other policies that are likely to affect health and levels of disparity may include the quantity and/or quality of education received by less advantaged groups. These findings underscore how health care policy is intertwined with policy in other sectors, indicating that multi-sectoral efforts are needed to address health disparities.

Despite some differences in the patterns of disparities and in the specific policy contexts for the three indicators of maternal and infant health examined here, the findings overall support the following general recommendations:

Identifying and targeting the vulnerable subgroups is critical for closing the gaps. Consistently, the findings demonstrate that the least-advantaged groups fare worst in maternal and infant health outcomes. For each outcome, there were absolute improvements overall and among women in many social groups between 1994–1995 and 1999–2001. However, without relatively greater improvements among women in the least-advantaged groups, the relative disparities did not diminish, suggesting that targeted efforts that are tailored toward the socioeconomic and racial/ethnic groups at greatest risk will be needed to make significant progress on eliminating disparities. This challenge is bound to grow as all of the states, and particularly California, face severe budget shortfalls that threaten services for vulnerable women and families.

Efforts to eliminate disparities must also reach a broader spectrum of childbearing women.

While certain groups are at greatest risk for poor outcomes, this report shows that even groups that are not the most vulnerable fell short of meeting the *Healthy People* targets for unintended pregnancy and prenatal care. Because most childbearing women in California are in groups at elevated risk, efforts must focus on a broader spectrum of the population. Even women with moderate incomes and those with some college education were found to have higher rates of unintended pregnancy, late prenatal care, and lower rates of breastfeeding than their higher-income and higher-education counterparts.

Continue monitoring disparities to identify groups at risk and assess progress. This research highlights the importance of looking beyond aggregate figures when monitoring health status and outcomes. Overall patterns can obscure significant disparities between subgroups. As shown by the examples in this issue brief, social and economic disparities are complex issues, involving a number of factors that interact in complicated relationships. Looking beneath the overall trends helps reveal the levels of disparity, the subgroups that are at greatest risk, and the different factors that are likely to play a role in health inequities.

Conclusion

The findings reported here demonstrate what can be learned from a practical approach to studying disparities in these and other indicators—an approach that can be adapted with appropriate modifications by other researchers, including those in state health departments. (A more detailed explanation of this approach will be available in the December 2004 issue of the *American Journal of Public Health*.) While monitoring and research are surely not sufficient to eliminate health disparities, they are essential for assessing our progress and helping to identify priority areas. Having information to measure and understand the disparities is critical for formulating effective strategies and targeting limited resources.

The economic recession and budget crises now faced by California and other states are of great concern, threatening severe cuts in services that are likely to have contributed to earlier improvements in maternal and infant health and health care. In California, the Medicaid program faces the possibility of broad-scale reform with unknown consequences for the family planning program, which has been critical in serving low-income women and is often held up as a model for other states. In such an environment, close monitoring of disparities at the state level will be particularly crucial, both to assess and improve the effectiveness of policies and programs and to document needs for additional resources.

APPENDIX: METHODS

A brief summary of methods is given here. More detailed information on the data sources is available from the authors.

Data Sources and Limitations

This report summarizes cross-sectional data from two California statewide-representative postpartum surveys linked with birth certificates. The most recent data were obtained in 1999 through 2001 as part of the Maternal and Infant Health Assessment (MIHA), an ongoing population-based survey of mothers a few months after they deliver liveborn infants in California; MIHA is a collaborative effort of the California Department of Health Services Maternal and Child Health Branch and the University of California, San Francisco, Department of Family and Community Medicine. Modeled on CDC's Perinatal Risk Assessment Monitoring System (PRAMS), MIHA is an annual mail survey with telephone follow-up to non-respondents; approximately 3,500 mothers are surveyed annually, totaling 10,519 in 1999–2001. The Access to Maternity Care Study (ATM), conducted in 1994–95, interviewed 10,132 mothers of liveborn infants during their postpartum stays in a representative sample of California hospitals. Both surveys were linked with birth certificates, and samples were similar to the statewide maternity populations during the corresponding time periods. Response rates for MIHA and ATM were approximately 71% and 86%, respectively.

Although many of the methods and questions used were similar for both surveys, differences in the sampling designs for the two surveys indicate that comparisons between the two time periods should be made with some caution. Because only two time periods were studied, we were unable to estimate actual time trends.

Health indicators, social groups, and explanatory factors examined in this study:

Which maternal and infant health outcome indicators were studied?

Unintended pregnancy: Percentage of childbearing women who reported (a) not trying to get pregnant (1994–95) or (b) not wanting to get pregnant (1999–2001).

Delayed or no prenatal care: Percentage of childbearing women who received no prenatal care during the first three months of pregnancy (first trimester), because they either began prenatal care after the first trimester or received no care at all.

No breastfeeding: Percentage of childbearing women who (a) did not plan to breastfeed when interviewed during their delivery stays (1994–95) or (b) had never breastfed when interviewed 2–7 months after giving birth (1999–2001).

How were social (socioeconomic and racial/ethnic) groups characterized at the individual or household level?

Income: Self-reported family income during pregnancy as a percentage of the federal poverty level (\$17,650 for a family of four in 2001), categorized as 0–100%, 101–200%, 201–300%, 301–400%, or above 400% of poverty. Because nearly 11% of the MIHA sample lacked income data, a category was included for missing income. Unintended pregnancy analyses are limited to women with incomes at or below 400% poverty because women with higher incomes were not asked about pregnancy intention in 1994–1995.

Education: A woman's self-reported highest completed level of education (did not complete high school, high school graduate or received GED, some college, college graduate).

Race/ethnicity: Self-reported race/ethnicity categorized as African American, Asian or Pacific Islander, European American (including women from Spain and the Middle East), Latina, or Native American/Alaskan Native. Latinas were further categorized as foreign- or US-born.

What other potential explanatory factors were examined in relation to each of the three maternal or infant health indicators in 1999–2001?

Based on the literature and our hypotheses, we examined the following factors (listed by indicator) in addition to the woman's family income, education, and racial/ethnic group:

Unintended pregnancy: Education level of baby's father, woman's age, total number of births, marital status, insurance coverage before pregnancy, regular source of care before pregnancy, language spoken at home, smoking during pregnancy, drinking alcohol during pregnancy, and the "sense of control" a woman felt she had over her life.

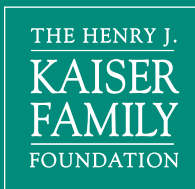
Delayed or no prenatal care: Education level of baby's father, woman's age, total number of births, marital status, insurance during the first trimester, regular source of care before pregnancy, language spoken at home, importance of prenatal care to others, smoking during pregnancy, drinking alcohol during pregnancy, "sense of control," and pregnancy intention.

No breastfeeding: Education level of baby's father, woman's age, total number of births, marital status, insurance during pregnancy, language spoken at home, importance of prenatal care to others, number of prenatal care visits, smoking during pregnancy, whether she took folic acid or multivitamins before pregnancy, "sense of control," feelings about the pregnancy, multiple births, length of hospital stay, low birth weight, cesarean section, whether on WIC during pregnancy, and body-mass-index before pregnancy.

ANALYSES

Descriptive analyses: measuring and tracking social disparities in the three maternal and infant health outcome indicators. We first described the distributions of income, education, and race/ethnicity in each time period. We next determined the prevalence of the maternal and infant health indicators in each income, education, and racial/ethnic group in 1994–1995 and 1999–2001, and calculated the relative risk of a poor outcome in each social group using the most advantaged corresponding group (women with incomes above 400% of poverty, college graduates, or Whites, respectively) as the reference.

Explanatory analyses: examining specific social groups and risk factors. Using 1999–2001 data because they are the most recent, we examined the role of potential explanatory factors in the observed disparities by: (1) in each income, education, and racial/ethnic subgroup, examining the prevalence of and relative risks associated with potential explanatory factors; and (2) multivariate logistic regression analyses of (a) the whole sample, to identify factors associated with significant reductions in the odds ratios reflecting disparities by income, education, or race/ethnicity; and (b) the *at-risk social groups* (those disadvantaged groups with high relative risks of an adverse outcome on a given indicator), to identify significant risk factors for these women.



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