

CENTER FOR LABOR ECONOMICS
UNIVERSITY OF CALIFORNIA, BERKELEY
WORKING PAPER NO. 43

Civil Rights, the War on Poverty, and Black-White Convergence in Infant Mortality in Mississippi*

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September 2001

Abstract

We document a large reduction in the black infant mortality rate (IMR) from 1965 to 1971 relative to pre-existing trends. This six-year reduction accounts for the greatest convergence in black-white IMRs in the entire post-World War II era. While the black-white IMR gap narrowed in all regions of the U.S., the convergence was particularly large in the rural South, where black access to hospital care, as measured by the relative fraction of black births occurring in hospitals, increased the most. Also, the large relative improvements in the rural South were driven by a reduction in deaths among black infants occurring 1-12 months after birth (a.k.a., post-neonatal mortality). Since the changes are largest in rural Mississippi, we further investigate the role of minority medical care access in Mississippi using unique county-level data. The data indicate that before 1965 there was severe racial segregation in medical care access in the predominantly black counties in the Mississippi Delta. After 1965, there appears to have been a dramatic integration of public hospitals and improvements in access for black mothers and infants. The timing and location of these changes correspond well with large reductions in the black IMR. In the Mississippi Delta, for example, while the black IMR increased from 5-in-100 to 6-in-100 from 1955-65, it was cut nearly in half by 1971. This change was driven by a remarkable decrease in causes of post-neonatal death considered preventable by medical treatment, such as diarrhea and pneumonia. We conclude that the integration of hospitals in Mississippi played a causal role.

*We thank David Card, John DiNardo, Michael Grossman, Jon Gruber, Ted Joyce, Allen Lapey, Ellen Meara, Doug Staiger, and participants of the Berkeley Labor Lunch and NBER Summer Institute Child Studies Workshop for helpful comments. We are especially indebted to Dick Johnson and Harold Armstrong of the Mississippi State Department of Health, Joan Exline of the University of Southern Mississippi, and Gary Kennedy of the Bureau of Economic Analysis for their invaluable assistance with some of the data used in this study. Chuan Goh, Heather Royer, Stacy Sneeringer, and Paul Torelli provided excellent research assistance.

Introduction

In 1964 the infant mortality rate of African Americans was twice as high as that of white Americans. Over the next ten years the fraction of black infants who died within a year of birth fell from 40 per thousand – a rate comparable to current levels in China or Peru – to 25 per thousand. The *relative* infant mortality rate of blacks also fell significantly in the late 1960s and early 1970s, in contrast to rises in the years before and after. Indeed, the 10-year period from 1965 to 1975 marked the only decade of sustained improvement in the ratio of black to white infant mortality in the entire second half of the twentieth century.

In this paper we establish that much of the gain in black infant health was driven by a sharp decline in post-neonatal death rates in the South.¹ Figure 1, for example, shows the number of post-neonatal deaths among black and white infants due to diarrhea and pneumonia in the state of Mississippi. In the early 1960s, post-neonatal death rates among blacks for these two causes were 6-7 times higher than the rates for whites, and showed no trend toward relative improvement. Starting in 1965, however, the death rate among black infants plummeted, while the rate for whites remained nearly constant. The dramatic trend shift in mortality rates for these two causes is particularly important because, on one hand, they contributed to a high fraction of overall black infant mortality, and on the other, effective treatments for both diagnoses were well known and widely used.

Rather than representing an innovation in medical technology, or a change in the home environment of black infants, we argue that the trend shift in black infant mortality rates in the South in the mid-1960s was driven by federally mandated desegregation efforts that opened up access to hospital care for black infants. In particular, two key pieces of Civil Rights litigation and legislation -- a 1963 U.S. Appeals Court decision that invalidated a “separate but equal” clause in federal hospital construction funding, and Title VI of the 1964 Civil Rights Act -- led to the opening of previously “white-only” hospital facilities to blacks.

¹ Conventionally, infant mortality is defined as the death rate of infants within their first year of life. Post-neonatal mortality is the death rate in the period from 28 days to 1 year after birth.

Focusing on Mississippi, we study the role of health care access using a newly assembled county-level data set. The data indicate that before 1965 there was severe racial segregation in medical care access in the predominantly black counties in the Mississippi Delta. After 1965, there appears to have been a dramatic integration of public hospitals and improvements in access for black mothers and infants. The timing and location of these changes correspond well with large reductions in the black infant mortality rate. In the Mississippi Delta, for example, while the black infant mortality rate increased from 5-in-100 to 6-in-100 from 1955-65, it was cut nearly in half by 1971. Further, we find that over half of this change was driven by the remarkable decrease in post-neonatal deaths due to diarrhea and pneumonia. We conclude that the integration of hospitals in Mississippi resulting from compliance with Title VI played a causal role.

Together with the evidence from the relative earnings literature, it appears that the Civil Rights legislation of the mid-1960s led to significant improvements in the overall well being of African Americans in the South. In particular, the dramatic reduction in the black-white earnings gap from 1965 to 1975 represented the most significant period of black economic progress in the post-World War II era. After twenty-five years of contentious research, economists have arrived at a consensus that Title VII of the 1964 Civil Rights Act, which outlawed employment discrimination, was a major factor underlying the post-1965 trend break in relative earnings (Donohue and Heckman 1991, Card and Krueger 1993). A key piece of supporting evidence is that most gains were concentrated among black workers in the South, where Title VII had its biggest impact (e.g., Heckman and Payner 1989, Chay 1995).

Post-War Infant Mortality and the Treatment of Post-Neonatal Infant Afflictions

Before the mid-1960s, the years immediately after World War II were the last period witnessing major improvements in black infant mortality. The improvements in infant health were similar in all regions in the U.S. and secular across races, with the black-white infant mortality gap remaining relatively constant. The overall decline in infant mortality during this period has generally been attributed to the wider availability of antibiotics following the war (Shapiro, et al. 1968). Supporting this explanation is

the fact that infant mortality declines were largest among afflictions that tend to respond to antibiotics, including pneumonia and infections of the digestive system.

While the gains in overall infant health continued from 1947 to 1960, they were less dramatic. In addition, white infants enjoyed the lion's share of the gains. For example, the 1947-1960 reduction in the white infant mortality was two times greater than the reduction in black infant mortality. This relative improvement for white infants was concentrated in causes of death that tend to respond to antibiotics. For example, while white infant death due to pneumonia and influenza continued to fall, black infant deaths attributable to these causes increased between 1949-1951 and 1959-1961. In addition, there was a dramatic decrease in white infant mortality due to gastritis and duodenitis, falling by two-thirds during the 1950s. Black infants, on the other hand, experienced a much more modest improvement in death rates due to these causes.

As a result of these changes, influenza and pneumonia remained the leading cause of death for nonwhite infants in 1960, but had fallen to the fifth leading cause of death for white infants (U.S. Dept. of Health and Human Services 1993:16). From 1959-1961 post-neonatal death due to influenza and pneumonia was 3.4 times greater among nonwhite infants than white infants, and death due to gastritis and duodenitis was 5.6 times greater among non-white infants. Together these causes accounted for half of all nonwhite deaths in the post-neonatal period. Thus, the primary factor underlying the widening black-white infant mortality gap after 1947 was the divergence in black and white experiences with these two afflictions.

It is also important to consider the geographic distribution of the infant health improvements before 1960. While the 1940s improvements were equally shared across the country, the changes during the 1950s were more uneven. The regions with the highest infant mortality rates between 1949-1951 (e.g., the East South Central and West South Central regions) experienced the largest declines in infant mortality, resulting in a convergence in infant mortality rates across the nine geographic divisions during the 1950s. Despite this concentration of improvements in regions with large black populations, black infant mortality did not contribute to the geographic convergence. In fact, in the South Atlantic and East

South Central states, nonwhite infant mortality was essentially unchanged over the 1950s, while white infant mortality fell substantially (Shapiro, et. al 1968).

The geographic differences in post-neonatal mortality changes for black and white infants were even larger. In the 1950s, white post-neonatal mortality decreased 30 percent in the South Atlantic states and 39 percent in the East South Central states. At the same time, nonwhite post-neonatal mortality was unchanged in the South Atlantic region and actually increased in the East South Central region. In addition, the racial disparity in infant deaths due to treatable afflictions grew more in regions where black infant mortality rates stagnated during the 1950s. For example, the white post-neonatal mortality rate due to gastritis and duodenitis in the South fell to levels close to those in the Northeast and North Central regions. At the same time, improvements in the black infant mortality rate due to these causes halted in the South, remaining substantially above the rates in the North. By 1959-1961 black infants in the South were five times more likely than their white counterparts to die from gastritis and duodenitis in the post-neonatal period.

The evolution of post-neonatal mortality rates over the late 1940s and the 1950s strongly suggests that hospital care was inferior or unavailable for many black infants, particularly in the South. First, differences in post-neonatal death rates accounted for the majority of the overall black-white gap in infant mortality in the South. In addition, declines in white post-neonatal mortality during this period were largely driven by changes in the incidence of relatively treatable causes of death, such as gastroenteritis, influenza and pneumonia. However, black infants in the South continued to experience extremely high rates of death due to these causes. These particular conditions were often fatal if left untreated, but prognosis was good if prompt medical attention, generally in a hospital, was received.

The relative treatability of various causes of death can first be understood by differentiating deaths that occur in the neonatal (first 28 days after birth) and post-neonatal (1-12 months after birth) periods. The initial health at birth is generally much better among infants who die in the post-neonatal period than among infants dying in the first month of life. For example, while 72 percent of all neonatal deaths had a low birth weight (below 2500 grams), only 20 percent of all post-neonatal deaths were low birth weight infants (Starfield 1985). Further, post-neonatal deaths tend to be caused by negative events

after birth, most often by infectious diseases and accidents (Grossman and Jacobowitz 1981). Aggressive medical intervention can often prevent these negative events from leading to death relative to the generally more intractable circumstances that lead to neonatal death.²

Pneumonia and influenza are by far the leading cause of death in the post-neonatal period. Pneumonia deaths dominate this category. For example, during the period of interest infant deaths due to pneumonia were twenty times as common as deaths due to influenza in Mississippi. Moreover, pneumonia is a “potentially lethal condition for which treatments are available” where “prognosis depends upon how early a diagnosis is made and how soon adequate treatment is commenced” (Emery 1976:208-209).

There are generally two types of pneumonia, bacterial and viral. In the more serious case of bacterial pneumonia, antibiotics, including penicillin, are critical to recovery. One of the most common types of bacterial pneumonia (staphylococcal) was described in a standard medical text in 1964 as “the most important pulmonary bacterial pathogen encountered in pediatric practice” (Nelson 1964:847). This text also states, “The outcome is dependent upon early diagnosis and the appropriateness of treatment. The case fatality rate is high, especially in newborn infants, but recently has been less than 10 percent in some series” (Nelson 1964:848). Infants with either type of pneumonia often required oxygen, intravenous fluids, and aerosols to assist with breathing. In the case of bacterial pneumonia, antibiotics would have been administered intravenously. Each of these elements in the effective treatment of pneumonia would have been available only in hospitals.

The next leading cause of post-neonatal infant death during this period was gastroenteritis. Most infant deaths due to this cause are the result of diarrhea and dehydration (U.S. Dept. of Health and Human Services 1993:17). The incidence rate of these causes of death depends heavily on sanitary conditions, particularly those involving food preparation and feeding. As with pneumonia, medical treatment is highly effective in preventing deaths of this type. Babies with gastroenteritis rapidly lose fluids and at the

² According to Starfield (1985:37), findings of “diverse studies strongly suggest that access to and use of medical care, particularly in the case of families at increased social and biological risk, is associated with reductions in postneonatal mortality.”

same time have great difficulty rehydrating orally. Thus, dehydration progresses rapidly. “Fluid resuscitation” is critical and would normally have been carried out intravenously. With regard to gastroenteritis, Emery (1976:204) writes that the mortality rate relates to “the earliness [or] lateness of diagnosis and admission to hospital.” Given that intravenous fluids were required for illnesses of this type and IV’s were only available in hospitals, hospital care was again critical to an infant’s recovery.³

Figure 2 shows trends in nonwhite and white infant mortality rates within a year of birth (per 1,000 live births) for the United States from 1950-1990.⁴ It also shows the nonwhite-white infant mortality rate (IMR) ratio. In 1950, about 2.5 percent of white infants and 4.5 percent of black infants died within a year of birth. Since 1950 there has been a secular increase in the black-white IMR ratio with one notable exception. From 1965 to 1971 the black infant mortality rate and the black-white ratio declined sharply relative to pre-existing trends. While relatively stable from 1961-65, the black infant mortality rate fell 30 percent from 40 per 1,000 live births in 1965 to 28 in 1971. At the same time, the black-white ratio fell from 1.9 to 1.65, the only prolonged convergence in the post-World War II era.

Figure 3 shows trends in black and white post-neonatal mortality rates from 1941-1971 for Mississippi, Alabama, Illinois, and New York; states with large African-American populations. Before 1965 post-neonatal mortality rates were highest among black infants in Mississippi. In 1965 the black post-neonatal death rate in Mississippi was 26 per 1,000 live births -- 30 percent greater than the black rate in Alabama, 2-2.5 times greater than the black rates in Illinois and New York, and five times the rates for white infants in all four states. However, Mississippi also experienced the sharpest decline in black post-neonatal mortality after 1965, with the black infant death rate falling over 50 percent from 1965 to 1971. In this study, we argue that these dramatic changes in Mississippi were largely the result of the federal antidiscrimination effort during the mid-1960s.

³ Along with severe malnutrition, pneumonia, diarrhea, and dehydration are the leading causes of infant death in less developed countries (Preston 1980; Terra de Souza, et al. 2000).

⁴ The data are from the Vital Statistics of the United States annual publications. In 1965, black births accounted for 92 percent of all nonwhite births in the U.S. and 99.5 percent of nonwhite births in Mississippi.

The Convergence in Black-White Infant Mortality during the Civil Rights Era

Figures 2 and 3 show that 1965-71 is the key period for improvements in the relative health of black infants over the past 50 years. The mid-1960s also witnessed a dramatic shift in federal policies regarding access to medical care. This culminated in the passage of Title VI of the 1964 Civil Rights Act, which prohibited discrimination in all institutions receiving federal funding, including public hospitals. Surprisingly, there are few studies that focus on long-run trends in the relative health of black infants over time. In addition, the existing research is based on highly aggregated data, both across regions and over time, that provide little information on the precise location and timing of infant mortality changes by race (Starfield 1985). Consequently, the evidence on the specific factors underlying significant changes in black-white infant health outcomes is sparse and often anecdotal. Here, we discuss some of the federal interventions of the mid-1960s and summarize the timing and location of relative improvements in black infant health during this period.

Overview of Federal Interventions in the 1960s

The federal programs implemented during the mid-1960s could explain the significant convergence in black-white infant mortality rates after 1965. Health care expenditures accounted for the largest and fastest-growing share of the War on Poverty and Great Society programs (Davis and Schoen 1978). Major initiatives to improve the health of poorer people, such as the Medicaid program, were initiated in the mid-1960s, leading to dramatic changes in the provision of health services. The two most notable federal interventions though were Title VI of the 1964 Civil Rights Act and the 1963 and 1965 expansions to the maternal and infant care component of Title V of the 1935 Social Security Act.

Title V of the 1935 Social Security Act established the Maternal and Child Health (MCH) Services Program. The Maternal and Infant (M&I) Care component of MCH targeted federal dollars to improve the health of mothers and infants from families with low income levels and diverse racial and ethnic heritages and those living in rural areas without access to care. In 1963 and 1965, amendments to Title V resulted in dramatic increases in MCH funding of maternal and infant care projects (Davis and Schoen 1978). An expressed purpose of the amendments was to reduce infant mortality rates among the

poor in central cities and rural areas by improving prenatal and postpartum care.⁵ Although the MCH program attempted to allocate more funds to states with low incomes, “Southern states with high incidence of poverty and large rural populations, such as Mississippi, Louisiana, Texas, and Georgia, received one-fourth to one-tenth the average expenditure per poor child of [certain areas in the North]” (Davis and Schoen 1978:147-148). Further, “specific projects funded under the 1963 and 1965 [MCH] amendments benefit[ed] urban areas almost exclusively” (Davis and Schoen 1978:143).⁶

The other major intervention of the mid-1960s was Title VI of the 1964 Civil Rights Act, which prohibited discrimination and segregation in institutions receiving federal financial assistance, including all public hospitals. One goal of Title VI was to eliminate racial discrimination in access to medical care, particularly in the South. Although the original enforcement of Title VI by the Department of Health, Education, and Welfare was weak and disorganized, there is a consensus that the 1965 Medicare Act gave Title VI real bite. First, the Act withheld Medicare certification and funding from all hospitals that could not provide evidence of integrated facilities and equality of care. Second, Title VI enforcement was now under the purview of the Office of Equal Health Opportunity (OEHO) in the Surgeon General’s Office, which took an aggressive approach to auditing hospitals in the South (Smith 1999:128). The combination is believed to have resulted in a dramatic integration of Southern hospitals in the last half of 1966 (Smith 1999 and Quadagno 1999). Below, we discuss how Title VI, in conjunction with a 1963 Appeals Court ruling, led to the integration of hundreds of racially segregated hospitals in the South.

Trends in Black-White Infant Mortality, 1955-1975

The federal interventions in 1965 should have induced increased integration of hospitals and greater M&I access in the rural South and improved M&I care in the urban centers of the North. Although the reductions in discrimination in the South are race-specific, improvements in the care for

⁵ Several case studies have found that local M&I projects have been effective in reducing infant mortality rates in areas as diverse as New York City (Gold, et al. 1969), Cleveland (Sokol, et. al 1980), rural North Carolina (Peoples and Siegel 1983), and Denver (Chabot 1971).

⁶ Starting in the mid-1970s, MCH funding devolved into block grants to the states, which some believe is associated with the widening racial disparity in infant health over the last 25 years (Davis and Schoen 1978).

disadvantaged mothers and infants resulting from the MCH expansions will be secular and should impact both races. To document the location of the improvements in infant health, we collected data by race at the state and rural-urban levels, which has not been previously done.

The data are from the 1955-1975 publications of the Vital Statistics of the United States. Drawn from standard certificates of live birth, death, and fetal death, they cover the universe of births and deaths in the U.S. in each year. Annual, race-specific (white and nonwhite) information was collected for metropolitan and nonmetropolitan counties in each state.⁷ The database includes the number of live births, the number of births attended by a physician in a hospital, the number of infant deaths within a year of birth, and the number of neonatal and post-neonatal infant deaths.⁸ Counties are classified as “metropolitan” if they are included in the Census Bureau-defined Standard Metropolitan Statistical Area (SMSA).⁹ We refer to the nonmetropolitan and metropolitan counties as the rural and urban areas of a state. The data are used to calculate the infant mortality rate, which is the ratio of infant deaths to live births in a given year, and the fraction of births occurring in a hospital with a physician present.

Panels A and B of Figure 4 present black and white infant mortality rates in the urban and rural South and in the “Rust Belt” from 1955-75. The Rust Belt states are Illinois, Michigan, New York, Ohio, and Pennsylvania. They are a point of focus due to their large black populations, a result of the great Northern migration of African-Americans during the 1940s and 1950s.¹⁰ The series are weighted averages across the states in each area, with the number of (black or white) births in each state used as weights. Before 1965 black infant mortality rates were very high relative to white rates, particularly in the rural South. In the rural South, about five percent of all black infants died within a year of birth, which was two times greater than the rate of their white counterparts. Further, the black infant mortality

⁷ Since machine-readable data are unavailable for the period of interest, the information was hand entered twice by two different research assistants and checked against each other for mistakes.

⁸ We also collected data on the number of fetal deaths and the number of births at a weight of 2500 grams or less.

⁹ Except in New England, an SMSA is a county or a group of contiguous counties containing at least one city or “twin cities” with a combined population of at least 50,000.

¹⁰ Almost 80 percent of all nonwhite births from 1955-75 were in either the South or the urban counties of the Rust Belt states. Less than 5 percent of nonwhite births were in the rural counties of the non-Southern states. During the period, 28 and 26 percent of all births in the rural and urban South, respectively, were nonwhite; compared to 17 percent in the urban Rust Belt and 11 percent in all other urban counties.

rate in the rural South in 1965 was 20 percent higher than the rates in the urban South and Rust Belt, and comparable to the current rate in South Africa.

Relative to pre-existing trends, the black infant mortality rate declined sharply from 1965-75. While there are reductions in the infant mortality rates of both blacks and whites, there is a clear convergence in the black-white gap after 1965. The gains are particularly large for blacks in the rural South, with the black rate falling by 20 deaths per 1,000 live births. Although not as large, blacks in the urban Rust Belt also experienced noticeable reductions in infant mortality. Overall, there was a substantial narrowing in the black-white gap in all areas after 1965, with the largest convergence occurring in the rural South.

Figure 5 shows trends in neonatal (Panel A) and post-neonatal (Panel B) mortality rates for black and white infants in the South and Rust Belt. From the figure, it is apparent that all of the larger reduction in black infant mortality in the rural South after 1965 is due to the greater decline in post-neonatal mortality. Before 1965, the black post-neonatal mortality rate in the rural South was 50-percent greater than the black rate in the urban South; over two-times greater than the black rate in the urban North; and four-times greater than the rate for whites everywhere. In the ten years following 1965, the black post-neonatal mortality rate in the rural South was halved, from over 20 to 10 deaths per 1,000 live births, and converged to the black rates in the urban South and North. On the other hand, the black neonatal mortality rate fell less in the rural South than in the urban Rust Belt after 1965.

To summarize the size and significance of the post-1965 improvements, we fit simple trend break regression models to the state-level data by race and region. The explanatory variables are a time trend and an indicator variable equal to one if the year is after 1965 interacted with a post-1965 time trend equal to $(t - 1965)$. The coefficient on the first variable measures the average 1955-65 trend in the infant mortality rate across states. The coefficient on the second variable is the parameter of interest and measures the average slope change in the IMR trend that occurred after 1965. All specifications include state-level fixed effects, which account for permanent differences across states. The numbers of births in each race-state-year cell are used as weights in the regressions.

Table 1 presents the trend break regression results for infant, neonatal, and post-neonatal mortality rates in the three sets of columns. Within each set of columns, results for black and white mortality rates and the black-white ratio are shown. The rows of the table correspond to the rural South, urban South, urban Rust Belt, and all other urban areas in the U.S., respectively. Focusing first on all infant deaths within a year of birth, the estimates in the first column show that there was no reduction in the black infant mortality rate in the rural South from 1955-65. However, there was a highly significant trend break after 1965 of about 2.2 deaths (per 1,000 live births) per year. This implies that the black infant mortality rate in the rural South was about 22 deaths per 1,000 births lower in 1975 than it would have been if the pre-1965 trends had prevailed. There were also significant trend breaks in the black infant mortality rate in the urban counties of the South and non-South, but these were 40-50 percent smaller than the improvements in the rural South.

The third column of the table shows that there were significant declines in the black-white infant mortality gap in all regions of the U.S. relative to pre-existing trends. However, the greatest racial convergence by far occurred in the rural South. The estimates imply that while the black-white gap in the rural South expanded from 1955-65, the black-white ratio in 1975 was -0.64 points lower than it would have been in the absence of the trend break. This reduction is about 2.5 times greater than the convergence that occurred in the nation as a whole. The second column shows that there were also significant improvements in white infant mortality rates after 1965. The trend break patterns for whites are similar across the regions and suggest that some of the causal factors underlying the changes after 1965 are secular (e.g., improved care for disadvantaged mothers of both races). On the other hand, the results for the rural South imply that race-specific factors also played an important role.

The remaining columns of Table 1 show that all of the greater racial convergence in infant mortality in the rural South can be explained by a much larger reduction in black post-neonatal death rates. The estimates in the final set of columns imply that the black post-neonatal mortality rate in the rural South was over 15 deaths per 1,000 births lower in 1975 than it would have been in the absence of the trend break. This reduction is over two-times greater than the reduction in the urban South and 4-6 times larger than the declines in the rest of the country. Further, these changes account for 70 percent of

the overall death rate decline for black infants in the rural South and virtually all of the racial convergence. This pattern is reversed for blacks in the urban areas outside the South, with reductions in neonatal mortality accounting for 70 percent of the overall decline in infant mortality after 1965. For whites in all areas of the U.S., declines in neonatal mortality account for the vast majority of the post-1965 trend break in infant mortality.

Correlation with Changes in Hospital Births

The fraction of births attended by a physician in a hospital is one measure of the hospital care provided to mothers and infants that is available in the U.S. Vital Statistics. Figure 6 presents trends in hospital birth rates for blacks and whites in the South from 1955-1975. In the late 1950s, only 50-60 percent of all black infants in the rural South were born in a hospital. Even in the urban South, the hospital birth rate for blacks was over 90 percent. In the urban counties of non-Southern states, the rates were 97-98 percent for blacks and over 99 percent for whites. This provides clear evidence of substantial racial inequality in access in the rural South, which correlates with the disparity in infant mortality rates. While there is an upturn in black hospitalization rates in the rural South after 1965, the rate also increased substantially before 1965. Consequently, while correlated with the patterns in Figures 4 and 5, their correspondence is not strong.¹¹

However, a more powerful association emerges when one focuses on rural Mississippi, the area in the South with the lowest fraction of black births occurring in hospitals in the early 1960s. Figure 7 compares trends in infant mortality rates (Panel A) and the fraction of births in a hospital (Panel B) for blacks and whites in rural Mississippi versus rural Georgia -- the Southern state with the next lowest black hospitalization rate in 1955. The graphs show a strong correspondence between the divergence in black hospitalization rates in Mississippi and Georgia from 1960 to 1965 and the divergence in black infant mortality rates. Also, after 1965 there is a noticeable convergence between Mississippi and

¹¹ The estimated post-1965 trend break for blacks in the rural South is significant. Also, there is a stronger time-series correspondence when black-white ratios of infant mortality rates and hospitalization rates are plotted.

Georgia in both series. Appendix Figure 1 shows similar results when rural Mississippi is compared to rural South Carolina, the state with the third lowest hospital birth rate for blacks in the South.

To gauge the statistical significance of these associations, we estimated fixed-effects regression models for each region that relate changes in infant mortality to changes in the proportion of births in a hospital at the state-level. By comparing differences across states in changes over time, the analysis controls for all permanent statewide factors, by race and metropolitan status, that are correlated with infant mortality. For example, the association in the rural South is identified from differences in changes between rural Mississippi and rural Alabama. Table 2 presents the fixed-effects regression results for infant, neonatal, and post-neonatal mortality rates. The first column in each set of columns contains the results for black mortality. The specification in the second column relates changes in the black-white mortality ratio to changes in the hospitalization rate ratio.

In the South, differences across states in black-white convergence in hospitalization rates are strongly correlated with differences in the convergence of infant mortality rates. The estimated coefficient is larger for the urban South since its hospital rate convergence is smaller than in the rural South (Figure 6). By contrast, in the urban areas of the non-Southern states, the associations between the relative changes are insignificant. Further, the estimates in the final column of the table imply that the correlation between racial convergence in post-neonatal mortality and convergence in hospital birth rates drive the overall association in the South.

These results should not be given a causal interpretation. However, they do suggest that while improved care for the disadvantaged was a factor in improving infant health in the urbanized North, increased access to hospital care for blacks was important in narrowing the black-white infant mortality gap in the South.¹² A comparison of Figures 6 and 7 shows that before the Civil Rights era Mississippi lagged far behind the rest of the rural South in providing hospital care to black mothers and infants. In 1965 only 50 percent of black births in rural Mississippi occurred in a hospital while this figure was over

¹² In other words, secular, prenatal interventions targeted at the disadvantaged may be more relevant in the urban North, while race-specific intrapartum and postpartum events are more important in the rural South. For example, fetal death and low birth weight rates for blacks also exhibit large trend breaks after 1965 that lead to significant black-white convergence. The gains were largest in the urban Rust Belt (results available from authors).

70 percent for the rural counties in the rest of the South. This gap corresponds with the fact that Mississippi had the highest rates of infant death among blacks in the entire country. Further, Figure 8 shows that 70 percent of the overall decline in black infant mortality in rural Mississippi from 1965 to 1971 was due to the striking reduction in post-neonatal mortality, which was cut in half. As discussed above, black post-neonatal mortality at this time was mostly the result of ailments for which effective treatments were available in hospitals. This suggests that before the federal antidiscrimination effort, racial segregation in hospital care was particularly pervasive in Mississippi.

Mississippi before the Civil Rights Era

Before the Civil Rights and War on Poverty era of the mid-1960s, the state of infant health in Mississippi was extremely poor, particularly among African-Americans. Mississippi had the highest infant mortality rate in the nation -- 25 percent higher than the next highest state. Black infants born in Mississippi were more than twice as likely to die in their first year after birth than white infants and 4-5 times more likely to die in the post-neonatal period.

Most of the black-white infant health gap in Mississippi was driven by differences in post-neonatal mortality, and, in turn, most of the post-neonatal mortality gap was driven by two causes of infant death: gastrointestinal diseases and pneumonia/influenza. Despite comparable numbers of births for blacks and whites in Mississippi in the early 1960s, about 140-160 black post-neonate infants died of gastrointestinal disease per year compared to only about 10 per year for white post-neonates. With respect to pneumonia and influenza, 170-200 black post-neonates died per year in the early 1960s compared to about 25 white post-neonates per year. Mississippi's racial gap in infant deaths due to these afflictions was large even compared with the massive gaps that existed in the rest of the South.

Segregation and Scarcity

[I]n all important areas of citizenship, a Negro in Mississippi receives substantially less than his due consideration as an American and as a Mississippian. This denial extends from the time he is denied the right to be born in a nonsegregated hospital, through his segregated and inferior school years and his productive years when jobs for which he can qualify are refused, to the day he dies

and is laid to rest in a cemetery for Negroes only. (Mississippi Advisory Committee to the U.S. Commission on Civil Rights 1963:4)

In the early 1960s, black Mississippians were routinely denied the most basic rights. The 1963 Report of the Mississippi Advisory Committee to the U.S. Commission on Civil Rights states that “the extent and the manner of apparent denials of equal protection of the law on the basis of color...has been a profound shock to us.” (MS Committee Report 1963:3)¹³ Mississippi and the South generally were highly segregated societies in the 1950s and early 1960s. Segregation extended to all areas of life, including the provision of health services. A *Journal of the National Medical Association* survey of 523 hospitals administered in 1955-1956 found that while 87 percent of hospitals in the North had a “policy of integration”, only 10 percent of hospitals in the South had one.

These policies were not merely historical vestiges but enjoyed continued support at all levels. A 1956 survey of 2400 Southern hospital administrators found that only 17 percent were willing to accept desegregation, with 62 percent adamantly opposed, 10 percent favoring separate hospitals, and 11 percent unwilling to respond (Seham 1964). Little changed through the early 1960s. A 1963 national survey by the Civil Rights Commission found that 85 percent of southern hospitals reported “some type of racial segregation or exclusion” compared to less than 2 percent in northern and western states (U.S. Commission on Civil Rights 1963:141). The pattern of discrimination, according to the Commission, “consisted of a separate wing or floor for Negro patients” in single-building hospitals (U.S. Commission on Civil Rights 1966:10).

Although data on the extent of hospital segregation in Mississippi are not available, it appears that Mississippi was one of the most segregated states in the South. Through 1964, Mississippi State law required that in hospitals “maintained by the State for treatment of white and colored patients”, hospital administrators must provide separate entrances for whites and blacks and that the entrances “shall be used by the races only for which they are prepared.” Further, the Governor of Mississippi was empowered to remove any administrator failing to comply with this law (Dept. of Health Education and Welfare memo, June 26, 1964:6). Mississippi was the only state in the nation that required segregation in state-run

¹³ Fact-finding by the committee was actively opposed by the Mississippi State government, which apparently altered state law in order to discourage testimony before the committee (MS Committee Report 1963:3).

hospitals (DHEW memo, January 31, 1956).¹⁴ Appendix Figure 2 shows the floor plan for all “Diagnostic Health Centers” in Mississippi, published in the 1959-1961 Mississippi State Board of Health Biennial Report. It clearly indicates racial segregation in these facilities, with separate entrances and treatment rooms. With respect to the construction of diagnostic health centers and health clinics, more than three-quarters of the predominantly white counties in Mississippi added a facility between 1959 and 1960, while less than one-third of predominantly black counties did.

Federal Complicity in Segregated Hospitals

The practice of strict racial segregation in health care was well known and continued to flourish well after the 1954 *Brown vs. Board of Education* decision. Surprisingly, however, hospital segregation was actually codified into federal law. Federally sponsored segregation in health care began with the Hospital Survey and Construction Act of 1946, also known as the Hill-Burton Act. This legislation provided funds to build health facilities, which were in short supply following the Great Depression and World War II.¹⁵ Through the Hill-Burton program, the federal government became the single largest investor in hospitals, supplying one-third of the \$5-billion spent on facility construction between 1948 and 1963 (Seham 1964). By May 1966, the 8,194 projects that had been approved for federal funding provided 350,000 hospital beds or approximately half of the existing beds in the U.S. (DHEW 1966).

A primary goal of the Hill-Burton program was to eliminate inequality in the distribution of hospital beds in the U.S. Before Hill-Burton, hospital construction had generally been financed by private funds (DHEW 1966:9). Under Hill-Burton, matching funds for hospital construction were administered through State agencies based on “State Plans” that assessed where additional beds were needed. The matching formula for construction funds was based on per-capita income in the state. As a result, poorer states were major beneficiaries of the construction programs. From 1945-1956, only 20 percent of all

¹⁴ As a result, before 1965 the Mississippi Commission on Hospital Care’s annual list of hospitals broke down the beds in each hospital (both public and private) into those intended for whites and those intended for the “colored”. We use this data in the analysis below.

¹⁵ For example, it was found that 195,000 additional general hospital beds were needed in order for adequate medical care to be available (DHEW “Hill-Burton Program 1946-1966” 1966:9-10).

hospital construction projects undertaken in the wealthiest regions received federal assistance through the Hill-Burton program, while nearly all of the projects undertaken in the lowest income regions received Hill-Burton funding (DHEW 1958:29). Between 1948 and 1963 states in the Southeast nearly doubled the number of hospital beds “acceptable” to the Hill-Burton program and had the greatest growth in beds per capita in the country (DHEW 1963:8). From 1948-1956, Mississippi received more Hill-Burton funds per capita than any other state -- more than twice the national average. By 1970, 81 of Mississippi’s 82 counties had at least one Hill-Burton funded construction project.

However, Senator Lister Hill of Alabama added a key provision to the original Hill-Burton legislation that allowed racial segregation and even exclusion in federally funded facilities.¹⁶ The provision allowed separate facilities by race within funded hospitals. Further, a hospital constructed with Hill-Burton money could exclude a race outright if it had indicated in its application that “certain persons in this area will be denied admission to the proposed facilities as patients because of race, creed, or color” and reported to the Surgeon General that other facilities for the excluded race were available (U.S. Court of Appeals Fourth Circuit 1963:7). This was the only time that racial segregation and exclusion had been codified into federal legislation in the entire 20th century (Smith 1999:47). Also, the legality of “separate-but-equal” hospitals survived ten years after *Brown vs. Board of Education* established that separate education facilities were “by definition” unequal.

As a result, 89 construction projects in 14 states were approved on an explicitly “separate-but-equal” basis stipulating that only one race would be admitted to the facility (U.S. Commission on Civil Rights 1963:130-131). Ninety percent of the funds for these discriminating facilities went to all-white facilities. Among the projects that did not receive Hill-Burton funds under this “separate-but-equal” basis, racial segregation within the hospital was allowed.¹⁷ The 1963 Report of the U.S. Commission on

¹⁶ Senator Hill added language stating that facilities “will be made available to all persons residing in the territorial area of the applicant without discrimination on account of race, creed or color, but an exception shall be made in cases where separate hospital facilities are provided for separate population groups, if the plan makes equitable provision on the basis of the need for facilities and services of like quality for each such group.”

¹⁷ A February 1963 memo from the General Counsel at the Department of Health, Education, and Welfare to the Assistant Surgeon General states, “The acceptance of internal segregation at institutions which admit both races is also, I believe, in accord with the intent of Congress at the time when the legislation was enacted, and in this respect also Congress has made no change to the law” (DHEW memo February 12, 1963:1).

Civil Rights notes that “Negroes are denied access to or are segregated in many of the medical care facilities which have received Federal grants under the Hospital Survey and Construction Act of 1946” (p. 129) and that the “nature of discrimination encountered by physicians and by persons in need of care includes total exclusion from and segregated accommodations” (p. 142). The report concludes that the racial exclusion and segregation practices permitted by the Hill-Burton program “adversely affect the Nation’s health standards.”

Appendix Figure 3 shows the location of new diagnostic health centers constructed with Hill-Burton money between July 1959 and June 1960 for the 82 Mississippi counties, while Appendix Figure 4 shows the proportion of births in each county that are black from 1959-63 (data described below).¹⁸ It is apparent that very few new facilities were located in the heavily black counties along the Mississippi Delta. Further, the few facilities constructed in predominantly black counties were segregated, with the same floor plans depicted in Appendix Figure 2.

The Federal Intervention

The House of Hippocrates needs more sociology and less technology.

-Max Seham in “Discrimination Against Negroes in Hospitals” (1964 NEJM article)

The federally sponsored discrimination in hospital care was challenged in court in 1963. Dr. George Simkins, a black dentist in Greensboro, North Carolina, joined with black patients and other physicians in suing two hospitals which denied blacks admission and staff privileges. These private non-profit hospitals had received Hill-Burton construction funds that were administered by a North Carolina State agency. In November 1963, the Fourth Circuit Court of Appeals decided the *Simkins v. Moses H. Cone Memorial Hospital* in favor of the plaintiffs. Due to the involvement of the State of North Carolina, the “equal protection” clause of the Fourteenth amendment could be applied to these private hospitals. The court declared that the section of the Hill-Burton legislation permitting “separate-but-equal” health facilities was unconstitutional.

¹⁸ The Hill-Burton program paid for two-thirds of the total construction costs of diagnostic health centers.

In March 1964, the Supreme Court declined to review the Appeals Court decision, leaving it in place. The immediate effects of the ruling were changes in the administration of the Hill-Burton program. On March 9, 1964, the Department of Health, Education and Welfare permanently ceased processing “separate-but-equal” construction fund applications. Also, pending projects were required to provide assurance of nondiscrimination in admissions and staff privileges as well as assurance that “all portions of the facilities be made available without discrimination on account of race, creed, or color” (Smith 1999:107). Since half of all Hill-Burton grantees were private, non-profits (DHEW February 12, 1963), these initial changes reached beyond public hospitals to all health facilities seeking Hill-Burton funding.

At the time, many thought that the *Simkins* ruling would have far-reaching consequences.¹⁹ Moreover, physicians believed that the lack of medical care available to blacks in the South was responsible for their high infant mortality rates (Seham 1964). The court adjudicating the hospital segregation case believed so as well. The majority opinion stated that “Racial discrimination in medical facilities is at least partly responsible for the fact that in North Carolina the rate of Negro infant mortality is twice the rate for whites and maternal deaths are five times greater.” Finally, lawmakers cited the *Simkins* case as demonstrating the need for more definitive federal legislation. In July 1964, Congress passed Title VI of the Civil Rights Act, which prohibited discrimination and segregation in any institution receiving federal funds. According to the U.S. Commission on Civil Rights, “Seldom has any piece of legislation been so broad in scope, sweeping across departmental, geographical and political lines, as Title VI of the Civil Rights Act of 1964.” (U.S. Commission on Civil Rights 1966:1)

Although the extent, location, and timing of changes “on the ground” are difficult to assess, it appears that a substantial integration of hospitals in the South took place after 1964. For example, in July through October of 1965, the Commission on Civil Rights visited southern hospitals to review progress in desegregation. At that time, written assurances of desegregation had been obtained from most hospitals in the South. The Commission members found that most overt signs of segregation had been eliminated

¹⁹ For example, the day after the Supreme Court decision, *The New York Times* wrote that it was “all but certain that the effect would be a new and broad assault on the racial practices in the South.”

in the 39 hospitals visited, including those in Mississippi.²⁰ However, some noncompliance with Title VI statutes remained.²¹ The Commission further noted additional progress in desegregation was made in the fall of 1965.

In early 1966, a large-scale effort was undertaken to evaluate and ensure hospital compliance with Title VI. The inception of the Medicare program on July 1, 1966 provided an additional lever by which Title VI could have substantial financial bite. To receive Medicare funding, hospitals had to be certified as being racially integrated. In March 1966, all hospitals were sent letters requesting details on nondiscrimination in practices that went well beyond the most overt signs of desegregation, for which substantial progress had already been made. In particular, the requirements included that “All patients are being assigned to all rooms, wards, floors, sections and buildings without regard to race, color, or national origin. In communities with non-white population, this results in biracial occupancy of multi-bed rooms and wards and use of single bed rooms on a nondiscriminatory basis” (Smith 1999:130). Further, in the months leading up to July, a “Children’s Crusade” of 750 federal employees under the Office of Equal Health Opportunity worked on assuring hospital compliance with Title VI through on-site inspections (Smith 1999:113). By June 30th, 92 percent of all hospital beds were in strict compliance with Title VI (Smith 1999:141). In July and through the Fall of 1966, the Office of Equal Health Opportunity worked to secure compliance in the remaining hospitals.

In the more complete integration required for Medicare certification, Mississippi hospitals lagged behind those in other states. As late as June 1966, compliance with Title VI had been certified in only 20 percent of Mississippi hospitals. Non-complying hospitals were pursued in July and through the Fall of 1966. According to the *Journal of the American Hospital Association 1967 Guide*, nearly half of Mississippi’s hospitals had received Medicare certification by February 1967. Thus, there was substantial progress in ensuring hospital compliance with the stricter provisions of Title VI in the second half of 1966. In the remaining hospitals progress continued in subsequent years, with 60 percent of Mississippi

²⁰ For example, exclusively-black wings or floors in hospitals had been eliminated in “all but a few” cases.

²¹ The commission found that the “integration of patients within wards was less frequent, and biracial assignments to two-bed rooms was the most difficult step for administrators to take.” (Commission on Civil Rights 1966:14)

hospitals receiving Medicare certification by February 1968. These figures were 67 and 77 percent by October 1968 and October 1969, respectively.²² Appendix Table 1 provides a timeline of the key events of the Civil Rights era.

The Convergence in Black-White Infant Mortality in Mississippi

From the previous discussion, racial segregation in hospital care was particularly pervasive in Mississippi before the mid-1960s, and Mississippi was a target of the massive federal desegregation effort that occurred after passage of Title VI of the 1964 Civil Rights Act. Here, we document the large changes in access of black infants and mothers to hospitals in Mississippi after 1965, and their association with striking reductions in black infant deaths attributable to illnesses typically treated in hospitals.

Data Sources

We bring together a new database containing rich information by race for each of the 82 counties in Mississippi. From the annual publications of the U.S. Vital Statistics, we calculated infant, post-neonatal, and neonatal mortality rates and the fraction of births occurring in a hospital with a physician present, by race, in each county in Mississippi from 1955-1975.²³ Further, the Mississippi State Department of Health provided administrative data for counties in Mississippi from 1959-1970.²⁴ Importantly, this data set contains the county-level counts of white and nonwhite neonatal and post-neonatal deaths by cause of death, including deaths due to pneumonia, influenza, and gastrointestinal disease.²⁵ In addition, there is race-by-county level information on the number of births, fraction of male

²² Reports at aggregated geographic levels published by the Department of Health, Education, and Welfare also suggest that black access to hospital care improved dramatically. For example, the 84 percent black-white gap in hospital discharge rates for children under age 15 in 1963-64 (DHEW June 1966, Table 2) was cut by a factor of five by 1969 (DHEW April 1972, Number 70, Table E).

²³ As above, this information was hand entered twice by two different research assistants and checked against each other for mistakes.

²⁴ We are very grateful to Dick Johnson at the Mississippi State Department of Health for providing this data.

²⁵ Details on the administrative data and on the cause of death categories are provided in the Data Appendix. We cross-checked the MSDH data against our hand entered data from the U.S. Vital Statistics and against the Natality and Mortality Detail microdata electronic files available from 1968 on. The reliability of the data appears to be quite high. For example, the R-squareds from regressions of infant birth and death data from the U.S. Vital Statistics and the MSDH from 1959-1970 are all above 0.996. The R-squareds from regressions of birth and death data from

births, age distribution of mothers, number of “illegitimate” live births and their distribution by age of the mother, the distribution of gestation lengths, and the distribution of birth weights.

In addition to the key infant health data, we compiled a variety of other county-level data. Per-capita income data for 1959, 1962, and 1965-1969 come from the *1972 Mississippi Statistical Abstract*. The Bureau of Economic Analysis provided microfiche of their Regional Economic Information System data that contain the county-level breakdown of government transfer payments for 1959, 1962, and 1965-1968, including Food Stamp payments, Aid to Families with Dependent Children (AFDC), General Assistance payments, and Unemployment Insurance benefits.²⁶ Hospital facility-level data on the number of hospital beds by race come from the Mississippi Commission on Hospital Care’s *List of Mississippi Hospitals with License Status and Governing Bodies*. From this, we calculated the county-level allocation of hospital beds by race for 1960, 1962, 1963, and 1964.²⁷ Finally, the years in which each Mississippi hospital became certified for participation in the Medicare program come from the *Journal of the American Hospital Association* annual guides. More details on the data sources and variables are contained in the Data Appendix.

Segregation of Hospital Care before 1964

In the following analysis, counties within Mississippi are divided into two categories; those with over two-thirds of all births occurring to blacks between 1959 and 1963, and those with less than a two-thirds black share of births.²⁸ Appendix Figure 4 provides a map of these counties. From the figure, it is clear that the vast majority of the counties in the first group are located in the Mississippi Delta, while the predominantly white counties are located in the northeast and southeast corners of Mississippi. Below, we refer to the predominantly black counties in Mississippi as being in the Mississippi Delta, with the

the electronic files and the MSDH from 1968-1970 are all above 0.998.

²⁶ We are grateful to Gary Kennedy of the Bureau of Economic Analysis for providing this data.

²⁷ We are indebted to Joan Exline of the University of Southern Mississippi and Harold Armstrong of the Mississippi State Department of Health for their assistance in obtaining this data. Mississippi stopped recording the breakdown of hospital beds by race in 1964, when Title VI made segregation in federally funded institutions illegal.

²⁸ The overall black shares of births in the former and latter categories in 1959-1963 were 78.4 percent and 43.4 percent, respectively. From 1959-1963, there were a total of 67,992 black births in the predominantly black group of counties and 90,586 black births in the remaining counties.

remaining counties constituting the rest of Mississippi. From Appendix Figure 3, it appears that the provision of health services was particularly poor in the Mississippi Delta in the early 1960s. Thus, comparing differences between these two county groups in changes in black infant mortality and access to hospitals during the 1960s may provide useful evidence on the role of hospital integration in Mississippi.

Figure 9 presents the fraction of black and white births occurring in a hospital in the Mississippi Delta counties and in the rest of the state from 1955-1975. It is clear that before 1965 the access of blacks to hospitals in the Mississippi Delta lagged far behind black access in the rest of the state. In 1965, only 40 percent of all black births in the Delta occurred in a hospital, while this figure was 70 percent for blacks outside of the Delta counties. However, there was a sharp increase in black hospital birth rates in the Delta after 1965, with the black hospitalization rate reaching 90 percent by 1972. The strong convergence in black hospitalization rates towards the white rate provides evidence that the federal movement to integrate hospitals in the South after 1965 was largely successful in Mississippi.

Table 3 further documents the segregation in hospital care that existed in the Mississippi Delta before 1965. Panel A presents the ratio of the total number of hospital beds allocated for blacks to the number of black births, as well as the black-white gap in this ratio, separately for the two groups of counties in 1960, 1962, 1963 and 1964. This measure of access to hospital care is particularly relevant since, as discussed above, effective treatments for illnesses such as pneumonia and gastroenteritis were only available in hospitals (e.g., intravenous administration of antibiotics and fluids) and, presumably, would require an infant to stay overnight in a hospital. The number of hospital beds per birth was appallingly low among blacks in the Mississippi Delta before 1965 – about 6-times lower than the black rate in the rest of the state. Further, the black-white relative access rate was about four times lower in the Delta than in the rest of Mississippi and showed no improvement in the years leading up to Title VI.

Panel B presents the association between our measures of black access to hospitals and the fraction of births that are black across Mississippi counties before 1965. Not surprisingly, the first column shows that there is a significant negative correlation between per-capita income in a county and the black share of births. However, in the remaining columns, controlling for per-capita income has little effect on the substantial association between black hospital access before 1965 (measured by the fraction

of black births in a hospital and the black-white ratio of hospital beds per birth) and the black share of births across counties.²⁹ The estimates imply that as the black share of births in a county increases, black access to hospitals decreases at a rapid rate. We conclude that hospital segregation in Mississippi was in full force before Title VI of the 1964 Civil Rights Act.

Changes in Black-White Infant Mortality Rates

Figure 10 shows 1955-1975 trends in neonatal (Panel A) and post-neonatal (Panel B) mortality rates for black and white infants in the Mississippi Delta and the rest of Mississippi. It is apparent that while black neonatal mortality rates were similar in both areas over this period, post-neonatal mortality for blacks diverged before 1965. By 1965, the black post-neonatal mortality rate was 20 percent greater in the Delta than in the rest of the state. However, there was a particularly sharp reduction in black post-neonatal mortality in the Delta from 1965-1968, with the rate falling by 35 percent. White rates, on the other hand, were relatively constant during this period. In both areas, post-neonatal mortality declines account for the vast majority of the overall reduction in black infant mortality from 1965 to 1970.

Figure 11 presents the post-neonatal death rates due to gastrointestinal disease, pneumonia, and influenza from 1959 to 1970, based on the administrative data provided by the Mississippi State Department of Health. The patterns are striking and confirm the impression left by Figure 1. The white rate of infant death due to these causes was around 1-1.5 per 1,000 live births during most of the period. Before 1965, the black rate of death in the counties outside the Delta was 7-10 times greater than the white rate. More disturbingly, from 1959 to 1965 the black rate in the Delta grew from 9.8 to 14.5 deaths per 1,000 live births -- nearly 50 percent greater than the black rate in the rest of the state and 10-15 times greater than the white mortality rates. The divergence in these causes of death accounts for most of the divergence in overall post-neonatal mortality shown in Figure 10B. However, by 1968 diarrhea- and pneumonia-induced post-neonatal death among blacks in the Delta had been more than halved to 6.2 per

²⁹ The regressions that adjust for per-capita income are only based on the cross-section of counties in 1962 since this is the only year in which county-level data on per-capita income for Mississippi are available.

1,000 births. This decline accounts for 85 percent of the 1965-68 post-neonatal mortality reduction for Delta blacks shown in Figure 10B.

To summarize the contribution of different causes of death to the changes shown in the figures, we fit simple trend break regression models to the 1959-70 county-level administrative data by race, for the Delta and the rest of the state. Again, the explanatory variables are a time trend and an indicator variable equal to one if the year is after 1965 interacted with a post-1965 time trend equal to $(t - 1965)$. All specifications include county-level fixed effects, which account for permanent differences across counties, and are weighted by the numbers of births in each race-county-year cell. Table 4 presents the trend break regression results for infant, neonatal, short gestation neonatal, post-neonatal, and diarrhea/pneumonia post-neonatal mortality rates in the columns. The rows of the table correspond to blacks in the Delta counties, blacks in the rest of Mississippi, and whites in all counties, respectively.

The estimates in the first column of the table show that the black infant mortality rate in the Delta increased from 1959-65. However, there was a highly significant trend break after 1965 of about 4.6 deaths (per 1,000 live births) per year – about twice the rate in the rest of the rural South (Table 1). Blacks in the rest of the state also experienced a substantial, though smaller, break in trend of 2.8 deaths per year. Whites in the state, on the other hand, did not have a systematic reduction in infant mortality after 1965 relative to pre-existing trends.

The remaining columns of Table 4 show that post-neonatal mortality reductions account for two-thirds of the infant mortality decline among blacks in the Delta after 1965. Further, reductions in deaths due to diarrhea and pneumonia account for 80 percent of the overall decline in black post-neonatal death in the Delta. These causes are a smaller share of the post-neonatal mortality changes for blacks in the rest of the state and account for none of the changes in white post-neonatal mortality. Short gestation accounts for all of the post-1965 decline in neonatal deaths for blacks outside the Delta and whites in all counties. However, this cause accounts for only 60 percent of the neonatal changes for blacks in the Delta, with reductions in deaths due to diarrhea and pneumonia during the neonatal period accounting for most of the remaining changes (results available from authors). Thus, reductions in diarrhea and

pneumonia related deaths account for almost two-thirds of the overall decline in black infant mortality (in the neonatal and post-neonatal periods) in the Delta from 1965 to 1970.

An advantage of the administrative data is that it contains county-by-race information on other time-varying risk factors, such as the age of the mother at birth, marital status, and fetal health (e.g., gestation length and birth weight). This allows us to account for some competing explanations for the dramatic changes documented above, such as changes in the composition of births after 1965. Figure 12 shows trends by race for two particularly important risk factors – the fraction of births in a county to unmarried mothers (Panel A) and proportion of births to teenagers (Panel B). It is clear from the figure that, if anything, the socioeconomic characteristics of black mothers relative to white mothers giving birth in Mississippi worsened after 1965.

Table 5 presents the estimates from the trend break regression models for infant mortality, adjusted for the time-varying risk factors. The first column of each set of columns controls for the marital status and age distribution of the mother and the gender of the infant, while the second column also adjusts for the distributions of gestation lengths and birth weights and the fetal death rate (see Data Appendix). Not surprisingly, the estimated trend breaks documented in Table 4 are relatively insensitive to regression adjustment for mother’s characteristics and indicators of fetal health. Indeed, the estimated importance of reductions in post-neonatal death due to gastrointestinal disease and pneumonia increases for blacks in the Mississippi Delta. This pattern does not hold for blacks outside of the Delta. Along with the evidence of improved hospital access for blacks in the Delta documented in Figure 9, these results are consistent with the hypothesis that hospital integration, induced by enforcement of Title VI, led to substantial improvements in black infant health in Mississippi after 1965.

Validity of the Integration Hypothesis

We evaluate the validity of the integration hypothesis using the data on the federal certification dates for the Medicare program of each hospital in the Mississippi Delta. In particular, we compare changes in black post-neonatal mortality due to pneumonia and gastrointestinal disease in Delta counties that did and did not contain at least one hospital that received Medicare certification by February 1969. If

Medicare certification is a valid proxy for whether a hospital had integrated, then there should be larger reductions in black infant mortality after 1965 in counties containing such a hospital. Of the 24 counties in the Mississippi Delta, 15 contained Medicare-certified hospitals and 9 did not.

Figure 13 shows the results of this comparison. Panel A presents trends from 1959-1970 in black post-neonatal mortality due to diarrhea and pneumonia in the Delta counties with and without hospitals that were Medicare certified by February 1969.³⁰ The patterns are consistent with the hospital integration explanation. In the Delta counties that did not contain hospitals receiving Medicare certification soon after Title VI, the black rate of death due to treatable causes was relatively stable from 1959-1968, before declining in 1969 and 1970. On the other hand, after increasing steadily from 1959-1965, the black death rate due to pneumonia and diarrhea fell by 64 percent from 1965 to 1968 in the Delta counties containing Medicare certified hospitals. From 1965 to 1968, the black mortality rate due to these causes fell by 7.5 per 1,000 births more in “integrating” counties than in “non-integrating” counties. It appears that nearly all of the 1965-68 reduction in black infant death due to preventable causes in the Delta was concentrated in counties containing hospitals that were in compliance with Title VI.

While black infant mortality in the Delta counties with “non-complying” hospitals fell in 1969 and 1970, Panel B of Figure 13 provides evidence that black mothers living in these counties may have sought hospital care in counties with integrated hospitals. The MSDH administrative data contain information by race and county of residence of the mother on the number of births to residents that occurred in each of the other 81 counties in Mississippi. From this, we calculated the fraction of births occurring in counties with Medicare certified hospitals among mothers residing in the nine Delta counties without certified hospitals. The patterns in Panel B show a clear shift up in the likelihood that black mothers living in “non-integrated” counties gave birth in “integrated” counties in the late 1960s.³¹ White mothers residing in the non-integrated Delta counties, on the other hand, do not exhibit any change in

³⁰ Results from comparing counties with hospitals certified by February 1967 to counties without hospitals certified before 1970 are very similar.

³¹ Unfortunately, the MSDH data do not contain information on whether the birth occurred in a hospital. Thus, we cannot determine whether the black births occurring in “integrated” counties among those living in “non-integrated” counties actually took place in a Medicare certified hospital. However, the figure is suggestive at the least.

behavior after 1965. Again, this is consistent with the hypothesis that hospital integration was a causal factor in reducing black infant mortality rates in Mississippi.

Alternative Explanations

The evidence points to hospital desegregation as the most plausible explanation for the dramatic decreases in black post-neonatal mortality in Mississippi after 1965. Further, the above analysis rules out some of the most obvious competing hypotheses, such as changes in the relative risk characteristics of black women giving birth. Now we discuss the other possible explanations for our findings, in particular the major changes in social welfare and public health programs resulting from the War on Poverty.

The Medicaid program, initiated in 1966, provided money to poorer families for medical care. However, Mississippi did not begin its participation in Medicaid until January 1, 1970, after most of the reductions in black post-neonatal mortality in Mississippi had already occurred. Similarly, over this period the AFDC program appears to have played a much smaller role in Mississippi than in other states. For example, caseloads in Mississippi grew at less than half the national rate between 1965 and 1970 (Department of Health and Human Services 1998:22).³² Federal expenditures on food stamps did grow more rapidly in the Delta region than in the rest of Mississippi after 1965. However, it seems likely that any resulting improvements in infant health would have been most pronounced in the neonatal period and not concentrated among reductions in post-neonatal deaths due to gastrointestinal disease and pneumonia. Also, medical insurance payments and total federal transfer payments actually increased less in the Delta counties than in the non-Delta counties after 1965 (results available from authors).

The increased spending on public health also may not be very relevant in the case of Mississippi. First, real federal spending under the Maternal and Child Health program increased only 17 percent in Mississippi between 1965 and 1970 (DHHS 2001:80), and MCH expenditures (per poor child) in Mississippi were less than half the national average in 1969 (Davis and Schoen 1978:146).³³ Also, while

³² According to the BEA's government transfer payments data in the REIS file, there were no payments from the AFDC program to Mississippi until after 1968.

³³ Refers to "Title V Health Program totals or the MCH Block Grant totals."

the proliferation of community health centers during the 1970s have been found to decrease infant mortality, especially among blacks, there were only 51 such centers in the entire nation as of 1968 (Goldman and Grossman 1988). Further, community health centers did not provide the aggressive medical treatment that would have been required by infants with pneumonia and diarrhea.

Finally, changes in birth technology do not coincide with the timing of the infant mortality reductions for blacks in Mississippi. The two most notable changes in technology of the past 40 years were the advent of respiratory therapy techniques and improvements in mechanical ventilation in 1974 and the introduction of surfactant therapy in October 1989.³⁴ In addition, technological innovations are widely thought to impact early infant death resulting from premature and low birth weight births, which is not consistent with the striking reduction in post-neonatal infant deaths due to pneumonia and diarrhea among blacks in Mississippi.

Conclusion

This study shows that 1965-1971 is the key period for improvements in the relative health of black infants over the past 50 years. We find that although the black-white infant mortality gap narrowed in all regions of the United States, the convergence was particularly large in the rural South, where black access to hospital care, as measured by the relative fraction of black births occurring in hospitals, increased the most. We document a strong correlation between the sharp changes in the relative mortality rates of black infants and changes in the relative fraction of black births that occurred in hospitals across the states of the South. Also, the large relative improvements in the rural South were driven mostly by a reduction in black infant deaths occurring in the post-neonatal period.

We further investigate the role of minority medical care access in Mississippi using unique county-level data. The data indicate that before 1965 there was severe racial segregation in medical care access in the predominantly black counties in the Mississippi Delta. After 1965, there appears to have been a dramatic integration of public hospitals and improvements in access for black mothers and infants.

³⁴ Also, most of the diffusion of local specialized neonatal intensive care units (NICUs) occurred in the 1980s.

The timing and location of these changes correspond well with large reductions in the black infant mortality rate. In the Mississippi Delta, for example, while the black infant mortality rate increased from 5-in-100 to 6-in-100 from 1955-65, it was cut nearly in half by 1971. This change was driven by a remarkable decrease in causes of post-neonatal death considered preventable by medical treatment, such as diarrhea and pneumonia. We conclude that the integration of hospitals in Mississippi resulting from compliance with Title VI played a causal role.

Several different factors may be driving the varying regional patterns documented in this study. For example, our findings suggest that while race-specific postpartum events are important in the rural South, secular prenatal interventions targeted at the disadvantaged may be relevant in the central cities of the North. Future work should focus on evaluating the impact of diverse programs at more local levels. Micro-level case studies could provide convincing evidence on the factors underlying changes in infant health by race and socioeconomic status.

DATA APPENDIX

County-level Data Sources

The primary dataset used for this project is the vital statistics data prepared and provided by the Mississippi State Department of Health (MSDH). The MSDH data contain detailed information on all births in Mississippi from 1959-1970, including counts of births by race and year for each of Mississippi's 82 counties. County counts are further broken down by mother's age, mother's marital status, mother's marital status by mother's age, as well as the gender, gestational age and birth weight of the infant. The average age of mothers and the fraction of mothers aged <15, 15-19, 20-29, 30-34, 35+ are provided, as well as average weeks of gestation and the fraction of births with gestation <20, 20-30, 31-35, 36-38, 39-40, 41, and 42+ weeks. The data also contain the fraction of births with birth weight <500 grams, 500-999 g, 1000-1499 g, 1500-1999 g, 2000-2499 g, 2500-2999 g, 3000-3499 g, 3500-3999 g, 4000-4499 g, 4500-4999 g, and 5000+ grams.

Detailed death information on maternal and infant deaths in Mississippi are available for 1958-1970: County-level counts are provided on the year and race of maternal deaths, neonatal deaths, and infant deaths (and thus postneonatal deaths). Infant and neonatal deaths by county, year and race are further categorized by the precise cause of death. Ten causes of infant death are distinguished:

- Congenital Anomalies
- Disorders relating to short gestation and unspecified low birth weight
- Intrauterine hypoxia and birth asphyxia
- Accidents and adverse events
- Pneumonia and influenza
- Certain gastrointestinal disease
- Hemolytic disease of newborn, due to isoimmunization and other perinatal jaundice
- Symptoms and ill-defined conditions
- Influenza
- Birth trauma

(Between 1967 and 1968, the national coding system for causes of death, the International Classification of Diseases, was revised. A discussion of these changes follows at the end of the data appendix.)

Per-capita income data by county is taken from the *1972 Mississippi Statistical Abstract*. These data were collected by the Department of Commerce and are available for 1959, 1962, 1965-1969.

Data on Transfer Payments at the county level were collected by the Bureau of Economic Analysis (BEA). BEA provided a microfiche of their Regional Economic Information System data from 1959 to 1968. Included are county-level breakdown of government transfer payments for 1959, 1962, 1965, 1966, 1967, and 1968. Categories of transfer payments include:

- Food Stamp Payments
- Aid to Families with Dependent Children (AFDC)
- General Assistance Payments
- Supplemental Security Income (SSI) Payments
- State Unemployment Insurance Compensation
- Federal Education and Training Assistance Payments
- Payments to Nonprofit Institutions

Various issues of the Mississippi State Board of Health Biennial Reports provide county-level information on additional local health services that might affect infant health. These data are available for 1959-1960, 1961-1962, 1963-1964, 1965-1966, and 1967-1968. Local health services data include counts

of maternity care visits, broken down by counts of medical visits, nursing visits, and number of midwives supervised by county. The reports also provide the number of immunization visits, subdivided into medical visits, nursing visits, and number of immunizations for Smallpox, Diphtheria, Whooping Cough, Tetanus, Polio, and Typhoid. Finally, the reports give counts of infant and pre-school care visits, divided in to counts of medical visits, nursing visits, dental exams, child guidance services, and “physical defects corrected.”

Facility-level Data Sources for Mississippi

Data on the number of hospital beds by race were taken from the Mississippi Commission on Hospital Care’s *List of Mississippi Hospitals with License Status and Governing Bodies*. Directories were obtained for 1953, 1960, 1962, 1963, 1964, 1965, 1966, 1968, 1971. However, the breakdown of beds by race is provided through 1964 only, when Title VI made segregation in federally-funded institutions illegal.

Information on whether hospitals were certified for participation in the Medicare program was obtained from the *Journal of the American Hospital Association* annual guides issues for 1955-1975. Medicare certification status was taken from the approval code section which indicates “Certified for participation in the Health Insurance for the Aged (Medicare) Program by the Department of Health, Education, and Welfare.” Hospital ownership is based on the control classification code from the annual guides.

Each of construction project that received Hill-Burton funds is listed in the *Hill-Burton Project Register*, U.S. Department of Health, Education, and Welfare, Public Health Service, Health Care Facilities Service, Rockville, MD. The *Project Register* includes a short description of each project approved between July 1, 1947 and June 30, 1971. For analysis purposes, information on these construction projects were aggregated to the county level in the year projects were initially approved. The construction of Hill-Burton Outpatient Facilities and Public Health Centers was determined by the “Category of Facility” indicator.

Coding of Causes of Death

As noted above, the coding system used to define causes of infant death changed from the 7th Revision of the International Classification of Diseases to the 8th Revision in 1968. The cause-of-death groupings in the Mississippi Department of Health data were defined so as to maintain as much consistency across the 1967-1968 changeover as possible. The National Center for Health Statistics publishes a mapping of ICD Codes across successive revisions to the system for certain common causes of infant death. NCHS also assesses the quality of the mapping by computing “comparability ratios” that indicate how much the common causes of death definitions change over time.

To construct the comparability ratios between the 7th and 8th ICD revisions, deaths in 1966 are coded according to both classification systems. The comparability ratio is then computed as the number of deaths coded as a given cause using the 8th revision divided by the number of deaths using the 7th revision. For both “Pneumonia and influenza” and “Certain Gastrointestinal Diseases” the comparability ratio between the 7th and 8th ICD systems is 1.075. In addition to indicating relatively good correspondence across revisions, the change in systems would tend to understate the decrease in deaths attributable to these causes. According to NCHS, a ratio of more than one usually “results from an increase in assignments of deaths to a cause in the Eight revision as compared with the Seventh.”³⁵

³⁵ Comparability of Mortality Statistics, page 3.

In addition to revisions to the ICD system over time, different studies may define cause of death groupings differently. The ICD-7 cause of death groupings used with the Mississippi Department of Health data and by the U.S. Department of Health and Human Services (1993) are slightly different from the groupings Shapiro et. al used in their discussion of national and regional infant mortality trends.

For the “Pneumonia and Influenza” grouping, the Shapiro, et al. definition also includes ICD-7 codes 484-489 which were excluded from the grouping used in the MSDH data. The additional causes of death included in the Shapiro definition are very rare. In fact, no deaths were coded 484-489 with the ICD-7 system from 1962 to 1967 in Mississippi.

For the “Gastritis, duodenitis, etc.” category, our definition includes dysentery while Shapiro does not. Dysentery is similar to the types of diarrhea that fall under “Gastritis, duodenitis, etc.”. Dysentery so defined is also quite rare, composing only about 5 percent of infant deaths due to “Gastritis, duodenitis, etc.” in Mississippi (1965).

REFERENCES

- Card, David and Krueger, Alan B. "Trends in Relative Black-White Earnings Revisited." American Economic Review, May 1993 (Papers and Proceedings), 83(2), pp. 85-91.
- Chabot, André. "Improved Infant Mortality Rates in a Population Served by a Comprehensive Neighborhood Health Program." Pediatrics, June 1971, 47(6), pp. 989-94.
- Chay, Kenneth Y. "Evaluating the Impact of the 1964 Civil Rights Act on the Economic Status of Black Men Using Censored Longitudinal Earnings Data." Mimeo, Princeton University, October 1995.
- Cornely, Paul B. "Trend in Racial Integration in Hospitals in the United States" Journal of the National Medical Association, January 1957, 49, pp. 8-10.
- David, Richard J. "Did Low Birthweight among US Blacks Really Increase?" American Journal of Public Health, April 1986, 76(4), pp. 380-4.
- David, Richard J., and Siegel, Earl. "Decline in Neonatal Mortality, 1968 to 1977: Better Babies or Better Care?" Pediatrics, April 1983, 71(4), pp. 531-40.
- Davis, Karen and Schoen, Cathy. Health and the War on Poverty: A Ten-Year Appraisal. Washington, DC: The Brookings Institution, 1978.
- Donohue, John J. and Heckman, James J. "Continuous Versus Episodic Change: The Impact of Affirmative Action and Civil Rights Policy on the Economic Status of Blacks." Journal of Economic Literature, December 1991, 29(4), pp. 1603-44.
- Emery, J.L. "Unexpected Death in Infancy" in Recent Advances in Pediatrics David Hull, editor, New York: Churchill Livingstone, 1976.
- Gold, Edwin M., Stone, M.L., and Rich, Herbert. "Total Maternal and Infant Care: An Evaluation." American Journal of Public Health, October 1969, 59(10), pp. 1851-6.
- Goldman, Fred and Grossman, Michael. "The Impact of Public Health Policy: The Case of Community Health Centers." Eastern Economic Journal, January-March 1988, XIV(1), pp. 63-72.
- Grossman, Michael and Jacobowitz, Steven. "Variations in Infant Mortality Rates among Counties of the United States: The Roles of Public Policies and Programs." Demography, November 1981, 18(4), pp. 695-713.
- Heckman, James J. and Brook Payner. "Determining the Impact of Federal Antidiscrimination Policy on the Economic Status of Blacks: A Study of South Carolina." American Economic Review, March 1989, 79(1), pp. 138-77.
- Jaynes, Gerald David and Williams Jr., Robin M. A Common Destiny: Blacks and American Society. Washington, DC: National Academy Press, 1989.
- Lave, Judith R., and Lave, Lester B. "The Hill-Burton Hospital Construction Act." American Enterprise Institute for Public Policy Institute for Public Policy Research, Washington DC: 1974.

- Meltsner, Michael. "Equality and Health." University of Pennsylvania Law Review, November 1966, 115(1), pp. 22-38.
- Nelson, Waldo E., editor Textbook of Pediatrics. Philadelphia: W.B. Saunders Company, 1964.
- Peoples, Mary Dennis, and Siegel, Earl. "Measuring the Impact of Programs for Mothers and Infants on Prenatal Care and Low Birth Weight: The Value of Refined Analysis." Medical Care, June 1983, 21(6), pp. 586-605.
- Preston, Samuel II. "Causes and Consequences of Mortality Declines in Less Developed Countries During the Twentieth Century." In: Richard S. Eaterlin (ed.): Population and Economic Change in Developing Countries. National Bureau of Economic Research, The University of Chicago Press, Chicago, 1980, 289-341.
- Quadagno, Jill. "How Medicare Promoted Racial Integration in the Health Care System: Explaining Variation in Social Movement Outcomes." Mimeo, Florida State University, 1999.
- Reynolds, Preston P. "Hospitals and Civil Rights, 1945-1963: The Case of *Simkins v Moses H. Cone Memorial Hospital*." Annals of Internal Medicine, June 1997, 126, pp. 898-906.
- Seham, Max. "Discrimination Against Negroes in Hospitals." The New England Journal of Medicine, October 1964, 271(18), pp. 940-943.
- Shapiro, Sam, Schlesinger, Edward R., and Nesbitt Jr., Robert E. L. Infant, Perinatal, Maternal, and Childhood Mortality in the United States. Cambridge: Harvard University Press, 1968.
- Singh, Gopal K., and Yu, Stella M. "Infant Mortality in the United States: Trends, Differentials, and Projections 1950 through 2010." American Journal of Public Health, July 1985, 85(7), pp. 957-964.
- Smith, David Barton. Health Care Divided: Race and Healing a Nation. Ann Arbor: University of Michigan Press, 1999.
- Sokol, Robert J., Woolf, Ralph B., Rosen, Mortimer G., and Weingarten, Kenneth. "Risk, Antepartum Care, and Outcome: Impact of a Maternity and Infant Care Project." Obstetrics and Gynecology, August 1980, 56(2), pp. 150-6.
- Starfield, Barbara. "Postneonatal Mortality." Annual Review of Public Health, 1985, 6, pp. 21-40.
- Terra de Souza, A.C., et al. "Circumstances of Post-Neonatal Deaths in Ceara, Northeast Brazil: Mothers' Health Care-Seeking Behaviors during Their Infants' Fatal Illness." Social Science Medicine, December 2000, 51(11), pp. 1675-93.
- Journal of the National Medical Association. "The Hill-Burton Program and Civil Rights." January 1965, 57(1), pp. 59-61.

Citations for Government Reports, etc.

- American Hospital Association. American Hospital Association Guide to the Health Care Field. Chicago: American Hospital Association, 1955-1975.
- College of Business and Industry, Mississippi State University. Mississippi Statistical Abstract. Jackson: Mississippi State University, 1972.
- United States Commission on Civil Rights. Civil Rights '63. Washington, DC: U.S. Government Printing Office, 1963.
- United States Commission on Civil Rights. Title VI...One Year After. Washington, DC: United States Commission on Civil Rights, 1966.
- United States Court of Appeals Fourth Circuit: Court Opinions. *Simkins v Moses H. Cone Memorial Hospital*. Lexis 3837, November 1, 1963.
- U.S. Department of Health, Education, and Welfare: Memo from Gladys Harrison to Parke M. Banta. "Hospital survey and construction—Nondiscrimination requirements under present statute—Possible modification of regulations." January 31, 1956.
- U.S. Department of Health, Education, and Welfare. The Nation's Health Facilities. Washington, DC: U.S. Government Printing Office, 1958.
- U.S. Department of Health, Education, and Welfare: Memo from Alanson W. Wilcox to Dr. Jack C. Haldeman. "Letter of February 4 from Senator Harrison A. Williams Jr." February 12, 1963.
- U.S. Department of Health, Education, and Welfare: Memo from Donald J. Dawidoff. "Conduct Required Under State Statutes Which Is Inconsistent with the Nondiscrimination Assurance in the Hill-Burton, Mental Retardation Facilities and Community Mental Health Centers Construction Programs." June 26, 1964.
- U.S. Department of Health, Education, and Welfare. Hill-Burton State Plan Data. Washington, DC: U.S. Government Printing Office, 1964.
- U.S. Department of Health, Education and Welfare. Volume of Physician Visits. National Center for Health Statistics, Series 10, Number 18, June 1965.
- U.S. Department of Health, Education and Welfare. Characteristics of Patients of Selected Types of Medical Specialists and Practitioners. National Center for Health Statistics, Series 10, Number 28, May 1966.
- U.S. Department of Health, Education and Welfare. Hospital Discharges and Length of Stay. National Center for Health Statistics, Series 10, Number 30, June 1966.
- U.S. Department of Health, Education, and Welfare. Hill-Burton Program 1946-1966. Washington, DC: U.S. Government Printing Office, 1966.
- U.S. Department of Health, Education and Welfare. Age Patterns in Medical Care, Illness, and Disability. National Center for Health Statistics, Series 10, Number 70, April 1972.

U.S. Department of Health, Education and Welfare. Physician Visits. National Center for Health Statistics, Series 10, Number 75, July 1972.

U.S. Department of Health and Human Services. Trends in Infant Mortality by Cause of Death and Other Characteristics, 1960-88. Hyattsville, MD: National Center for Health Statistics, 1993.

U.S. Department of Health and Human Services. Aid to Families with Dependent Children: The Baseline. Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, 1998.

U.S. Department of Health and Human Services. Celebrating 65 Years of Title V: The Maternal and Child Health Program. Rockville, MD: Maternal and Child Health Bureau, 2001.

Mississippi Advisory Committee to the United States Commission On Civil Rights. Report on Mississippi. Washington, DC: General Services Administration, 1963.

Mississippi Medicaid Commission. First Annual Report. Jackson: Mississippi Medicaid Commission, 1970.

The New York Times. "Hospitals Built with Federal Aid Must Integrate." March 3, 1964.

State Board of Health of the State of Mississippi. Biennial Report. Jackson: Mississippi State Board of Health, 1959-1968.

Table 1: Summary of Trends in Black-White Infant Mortality Rates, 1955-1975

	Infant Deaths (per 1,000 births)		Neonatal Deaths (per 1,000 births)		Post-Neonatal Deaths (per 1,000 births)		Ratio (1/10)
	Black	White	Black	White	Black	White	
<u>Rural South</u>							
1955-65 Trend	-0.018 (0.065)	-0.283 (0.026)	0.184 (0.034)	-0.150 (0.018)	0.048 (0.032)	-0.133 (0.017)	0.658 (0.085)
Post-1965 Trend Break	-2.225 (0.124)	-0.460 (0.049)	-0.638 (0.065)	-0.322 (0.035)	-0.103 (0.061)	-0.138 (0.031)	-2.153 (0.164)
R-squared	0.84	0.87	0.53	0.82	0.32	0.80	0.68
<u>Urban South</u>							
1955-65 Trend	-0.364 (0.059)	-0.254 (0.024)	0.039 (0.035)	-0.188 (0.020)	0.027 (0.035)	-0.066 (0.011)	-0.108 (0.222)
Post-1965 Trend Break	-1.328 (0.103)	-0.523 (0.042)	-0.242 (0.061)	-0.436 (0.035)	-0.001 (0.061)	-0.087 (0.020)	-0.946 (0.390)
R-squared	0.85	0.89	0.49	0.88	0.36	0.70	0.25
<u>Urban Rust Belt</u>							
1955-65 Trend	-0.147 (0.083)	-0.184 (0.019)	0.082 (0.041)	-0.138 (0.018)	0.047 (0.042)	-0.046 (0.008)	0.230 (0.073)
Post-1965 Trend Break	-1.249 (0.147)	-0.487 (0.035)	-0.170 (0.073)	-0.396 (0.034)	-0.127 (0.074)	-0.091 (0.015)	-0.365 (0.129)
R-squared	0.85	0.96	0.23	0.94	0.23	0.88	0.47
<u>Urban Elsewhere</u>							
1955-65 Trend	-0.404 (0.059)	-0.254 (0.018)	0.010 (0.031)	-0.209 (0.016)	0.005 (0.035)	-0.045 (0.008)	-0.016 (0.139)
Post-1965 Trend Break	-1.003 (0.100)	-0.523 (0.033)	-0.125 (0.053)	-0.404 (0.029)	-0.107 (0.059)	-0.119 (0.014)	-0.025 (0.235)
R-squared	0.85	0.91	0.73	0.89	0.62	0.74	0.33

Notes: Estimated standard errors are shown in parentheses. All specifications include state fixed effects. The "Elsewhere" states are those outside of the South and Rust Belt. The sample sizes of the regressions for each area are 336, 357, 105, and 487 (i.e., the number of state-years), respectively. The regressions in the "Black" and "White" columns are weighted by the number of nonwhite and white births in the nonmetropolitan or metropolitan counties of each state and year. The regressions in the "Ratio" column are weighted by the number of nonwhite births.

Table 2: Fixed Effects Correlation between Fraction of Births in Hospital and Infant Mortality

Hospital Coefficient	<u>Infant Mortality Rate</u>		<u>Neonatal Mortality Rate</u>		<u>Post-Neonatal Mortality</u>	
	Black	B-W Ratio	Black	B-W Ratio	Black	B-W Ratio
<u>Rural South</u>	-0.37 (0.02)	-0.36 (0.08)	-0.15 (0.01)	0.04 (0.06)	-0.23 (0.01)	-1.08 (0.21)
R-squared	0.63	0.36	0.62	0.32	0.61	0.48
<u>Urban South</u>	-0.86 (0.07)	-0.87 (0.21)	-0.46 (0.04)	0.28 (0.20)	-0.41 (0.03)	-6.01 (1.33)
R-squared	0.35	0.45	0.32	0.36	0.45	0.21
<u>Urban Rust Belt</u>	-1.75 (0.28)	0.19 (0.74)	-1.15 (0.22)	0.28 (0.75)	-0.59 (0.07)	0.82 (1.33)
R-squared	0.33	0.19	0.26	0.20	0.61	0.42
<u>Urban Elsewhere</u>	-3.55 (0.34)	-1.74 (1.25)	-2.51 (0.27)	-0.82 (1.39)	-1.04 (0.12)	-3.60 (5.44)
R-squared	0.49	0.72	0.45	0.61	0.46	0.33

Notes: Estimated standard errors are shown in parentheses. All specifications include state fixed effects. The explanatory variable is the fraction of live births of a given race attended by a physician in a hospital. In the "Ratio" column, the independent variable is the ratio of nonwhite to white births in a hospital. The weights for the regressions are the same as in Table 1.

Table 3: Black Access to Hospital Care in Mississippi, 1960-1964

Panel A: Rate of Hospital Beds per Birth 1960-64, Mississippi Delta versus the Rest of Mississippi

	Counties in the Mississippi Delta			Counties outside the Mississippi Delta		
	Black Bed	White Bed	B-W Ratio	Black Bed	White Bed	B-W Ratio
1960	0.040	0.232	0.172	0.231	0.340	0.680
1962	0.037	0.228	0.164	0.238	0.355	0.670
1963	0.042	0.239	0.176	0.247	0.380	0.650
1964	0.041	0.242	0.170	0.269	0.396	0.679

Notes: The table entries are the ratios of the number of hospital beds allocated to a race to the number of births for that race in a county. The data sources are described in the Data Appendix.

Panel B: County-Level Association of Black Hospital Access with the Black Fraction of Births, 1960-64

	Per-Capita Income	Percentage of Black Births in Hospital with Physician		Black-White Ratio of Hospital Beds per Birth	
Constant	5313.4 (346.5)	95.7 (3.91)	75.4 (16.1)	0.854 (0.047)	0.806 (0.165)
Black Fraction Of Births	-2267.8 (580.4)	-69.7 (6.10)	-62.7 (14.6)	-0.911 (0.075)	-0.748 (0.146)
Per-Capita Income (÷1000)			3.32 (2.44)		-0.020 (0.025)
R-squared	0.17	0.29	0.31	0.34	0.31
Sample Size	77	320	75	286	68

Notes: Estimated standard errors are shown in parentheses. The county-level per-capita income data are described in the Data Appendix and are only available for 1962. The other explanatory variable is the fraction of births in a county that are black.

Table 4: Trends in Black and White Infant Mortality Rates in Mississippi Counties, 1959-70

	Infant Mortality Rate (per 1,000 live births)				
	All Infant	Neonatal	Short Gestation	Post-Neonatal	Diarrhea, Pneumonia
Black MS Delta					
1959-65 Trend	1.02 (0.38)	0.51 (0.28)	-0.13 (0.17)	0.52 (0.27)	0.52 (0.18)
Post-1965 Trend Break	-4.56 (0.79)	-1.68 (0.58)	-0.96 (0.36)	-2.88 (0.56)	-2.25 (0.37)
R-squared	0.39	0.29	0.29	0.30	0.40
Sample Size	300	300	297	300	297
Black Rest of MS					
1959-65 Trend	0.25 (0.30)	0.05 (0.23)	-0.07 (0.14)	0.20 (0.20)	0.17 (0.13)
Post-1965 Trend Break	-2.82 (0.62)	-0.54 (0.47)	-0.56 (0.29)	-2.28 (0.41)	-1.45 (0.27)
R-squared	0.30	0.21	0.38	0.30	0.32
Sample Size	684	684	633	684	633
White All of MS					
1959-65 Trend	-0.14 (0.16)	-0.11 (0.14)	-0.10 (0.07)	-0.02 (0.08)	-0.08 (0.04)
Post-1965 Trend Break	-0.58 (0.32)	-0.22 (0.28)	-0.24 (0.15)	-0.36 (0.16)	0.04 (0.08)
R-squared	0.16	0.14	0.20	0.16	0.15
Sample Size	984	984	896	984	896

Notes: Estimated standard errors are shown in parentheses. All specifications include county fixed effects. The explanatory variables are a time trend and an indicator variable equal to one if the year is after 1965 interacted with a post-1965 time trend equal to $(t-1965)$. The regressions are weighted by the number of nonwhite and white births, respectively.

Table 5: Trends in Black and White Infant Mortality in Mississippi, Adjusted for Characteristics of Mother and Birth

	Infant Mortality Rate (per 1,000 live births)										
	All Infant Death		Neonatal Death		Short Gestation		Post-Neonatal Death		Diarrhea, Pneumonia		
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	
<u>Black MS Delta</u>											
1959-65 Trend	0.92 (0.52)	0.90 (0.52)	0.43 (0.37)	0.48 (0.34)	-0.27 (0.23)	-0.27 (0.21)	0.50 (0.37)	0.42 (0.39)	0.47 (0.24)	0.48 (0.26)	
Post-65 Trend Break	-4.53 (0.88)	-4.29 (1.52)	-1.78 (0.64)	-1.59 (0.99)	-1.13 (0.39)	-0.93 (0.63)	-2.75 (0.63)	-2.71 (1.15)	-2.41 (0.41)	-2.79 (0.76)	
R-squared	0.41	0.51	0.32	0.53	0.35	0.53	0.30	0.36	0.42	0.45	
Sample Size	300	297	300	297	297	294	300	297	297	294	
<u>Black Rest of MS</u>											
1959-65 Trend	0.19 (0.36)	0.05 (0.36)	-0.19 (0.27)	-0.30 (0.25)	-0.23 (0.17)	-0.40 (0.16)	0.38 (0.24)	0.35 (0.25)	0.30 (0.16)	0.28 (0.17)	
Post-65 Trend Break	-2.67 (0.68)	-3.56 (1.16)	-0.66 (0.51)	-1.53 (0.79)	-0.68 (0.32)	-0.51 (0.53)	-2.00 (0.45)	-2.04 (0.81)	-1.27 (0.30)	-0.96 (0.56)	
R-squared	0.31	0.41	0.22	0.44	0.39	0.52	0.31	0.34	0.33	0.34	
Sample Size	684	637	684	637	633	602	684	637	633	602	
<u>White All of MS</u>											
1959-65 Trend	-0.13 (0.19)	0.02 (0.19)	-0.06 (0.17)	0.06 (0.16)	-0.08 (0.09)	-0.01 (0.09)	-0.06 (0.09)	-0.03 (0.10)	-0.09 (0.05)	-0.10 (0.05)	
Post-65 Trend Break	-0.65 (0.34)	-0.78 (0.50)	-0.39 (0.30)	-0.83 (0.43)	-0.31 (0.16)	-0.26 (0.23)	-0.26 (0.17)	0.04 (0.28)	0.05 (0.09)	0.05 (0.14)	
R-squared	0.17	0.35	0.15	0.37	0.20	0.37	0.17	0.19	0.16	0.18	
Sample Size	984	838	984	838	896	785	984	838	896	785	
<u>Controls for</u>											
Age, marital status, etc.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Fetal deaths, gestation, Birth weight	N	Y	N	Y	N	Y	N	Y	N	Y	

Note: Estimated standard errors are shown in parentheses. All specifications include county fixed effects. The explanatory variables are a time trend and an indicator variable equal to one if the year is after 1965 interacted with a post-1965 time trend equal to $(t-1965)$. The control variables include indicators for marital status and age categories of the mother, indicators for length of gestation and birth weight categories, and fetal deaths. The regressions are weighted by the number of nonwhite and white births, respectively.

Appendix Table 1: Key Dates in the Civil Rights of Health Care

Date	Event
1946	Passage of Hill-Burton Hospital Construction Act
1954	<i>Brown vs. Board of Education</i> Decision
November 1963	Appeals Court rules in <i>Simkins vs. Moses Cone Memorial Hospital</i> that “separate-but-equal” clause in Hill-Burton Act is unconstitutional.
March 1964	Supreme Court lets Appeals Court ruling stand.
March 9, 1964	“Separate-but-equal” construction applications ceased being processed, nondiscrimination assurances required of pending Hill-Burton projects.
July 1964	Title VI of Civil Rights Act
Summer 1965	US Commission on Civil Rights notes substantial progress in elimination of flagrant segregation practices in Southern hospitals
March 1966	Letter sent to all hospitals detailing Title VI compliance requirements for Medicare participation.
July 1, 1966	Medicare program begins, compliance with Title VI in Mississippi hospitals around 20 percent.
February 1967	Medicare certification in nearly 50 percent of Mississippi Hospitals

**Figure 1: Number of Post-Neonatal Infant Deaths due to Diarrhea and Pneumonia by Race
All of Mississippi, 1955-1975**

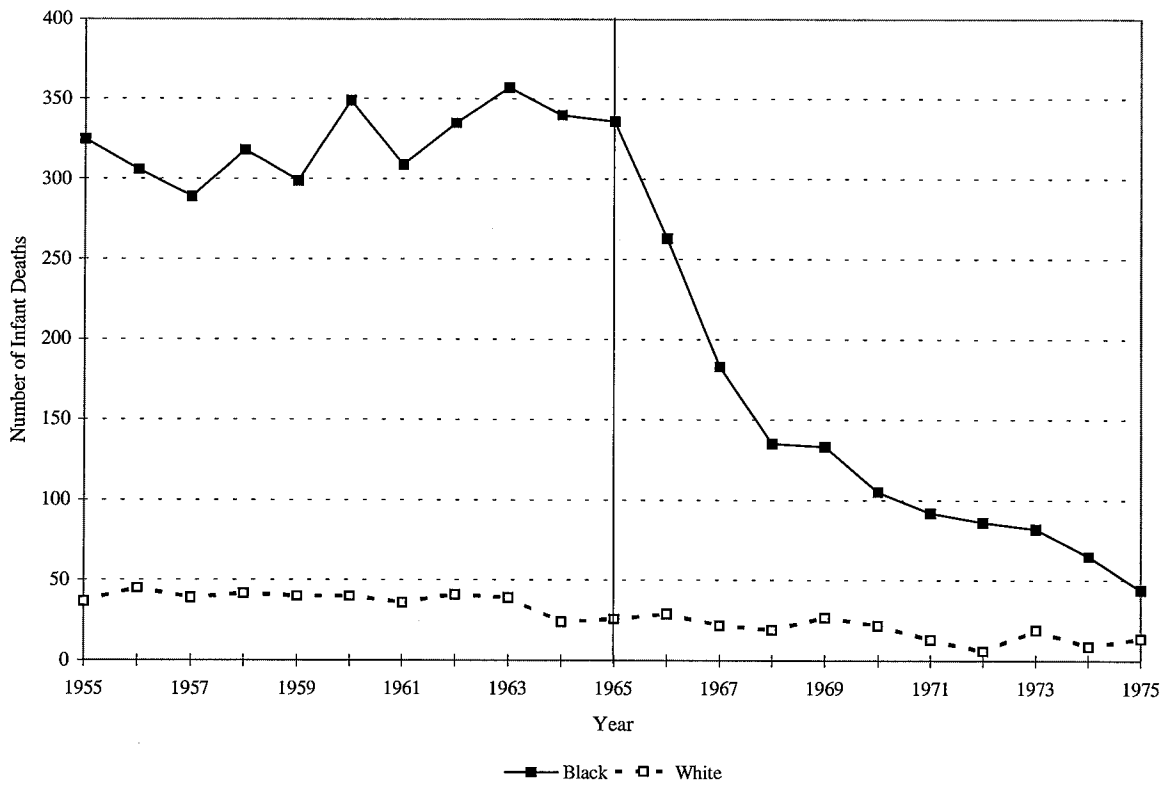
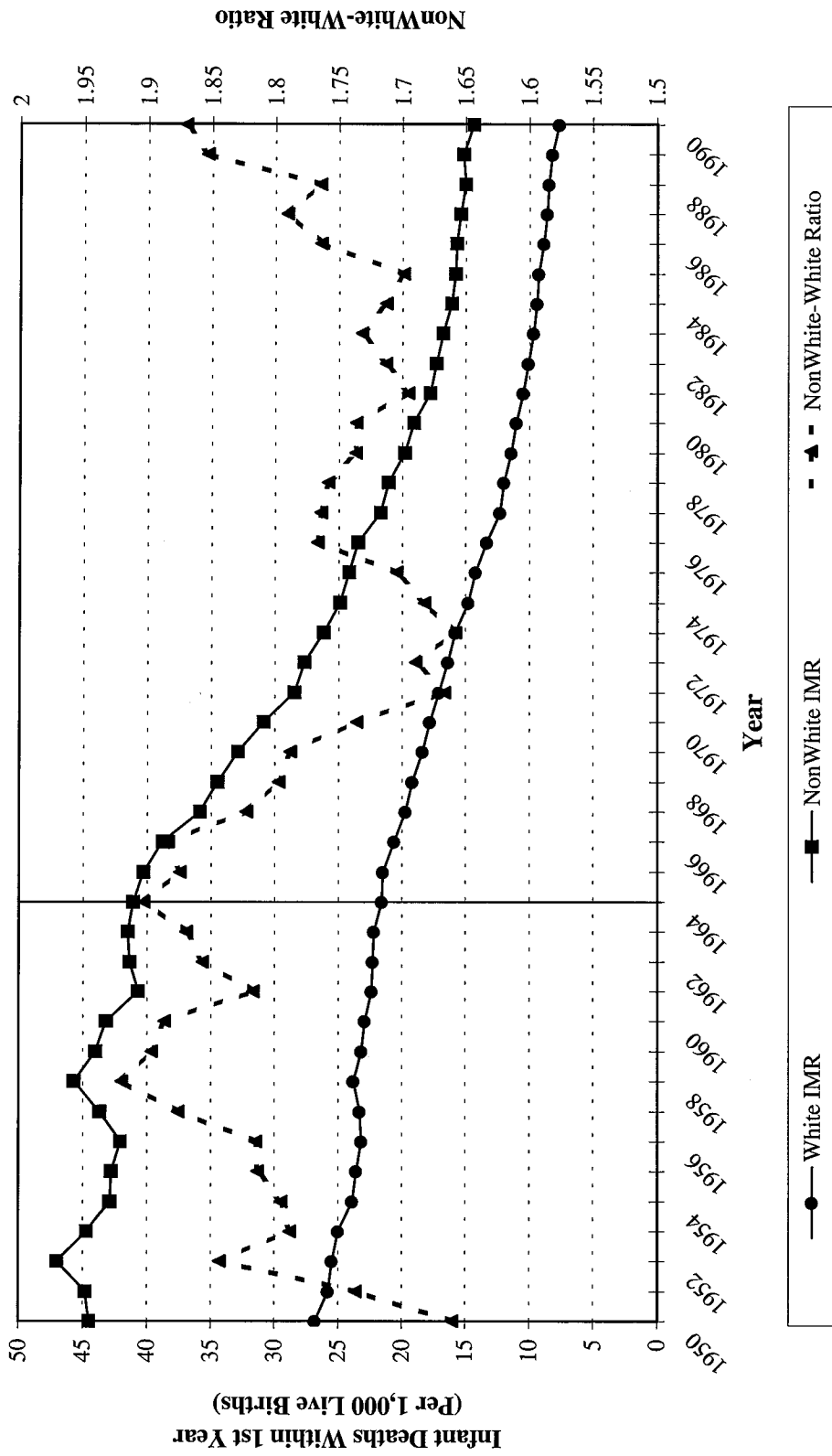


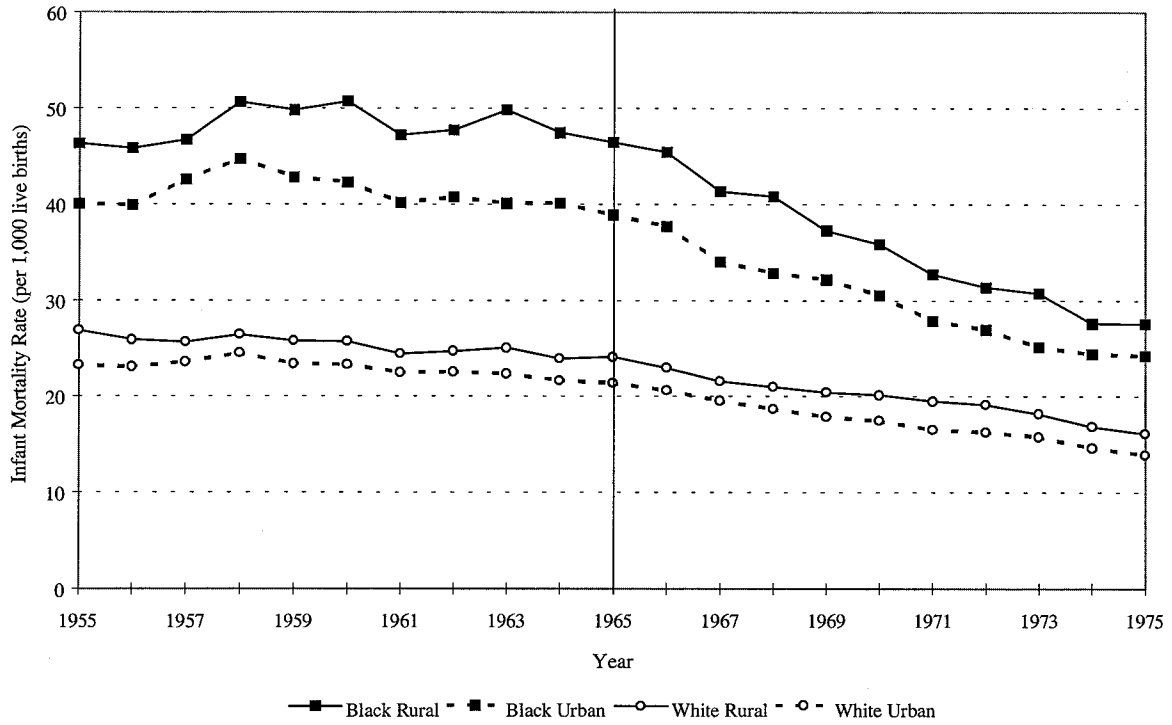
Figure 2: Trends in the Infant Mortality Rate by Race, 1950-1990



Note: Alaska included in 1959 and Hawaii in 1960.
 Source: Various Issues of *Vital Statistics of the United States*.

Figure 4: Black and White Infant Mortality Rates in the South and Rust Belt, By Metropolitan Status, 1955-1975

A. Trends in the South, by Race and Metropolitan Status



B. Trends in the Rust Belt, by Race and Metropolitan Status

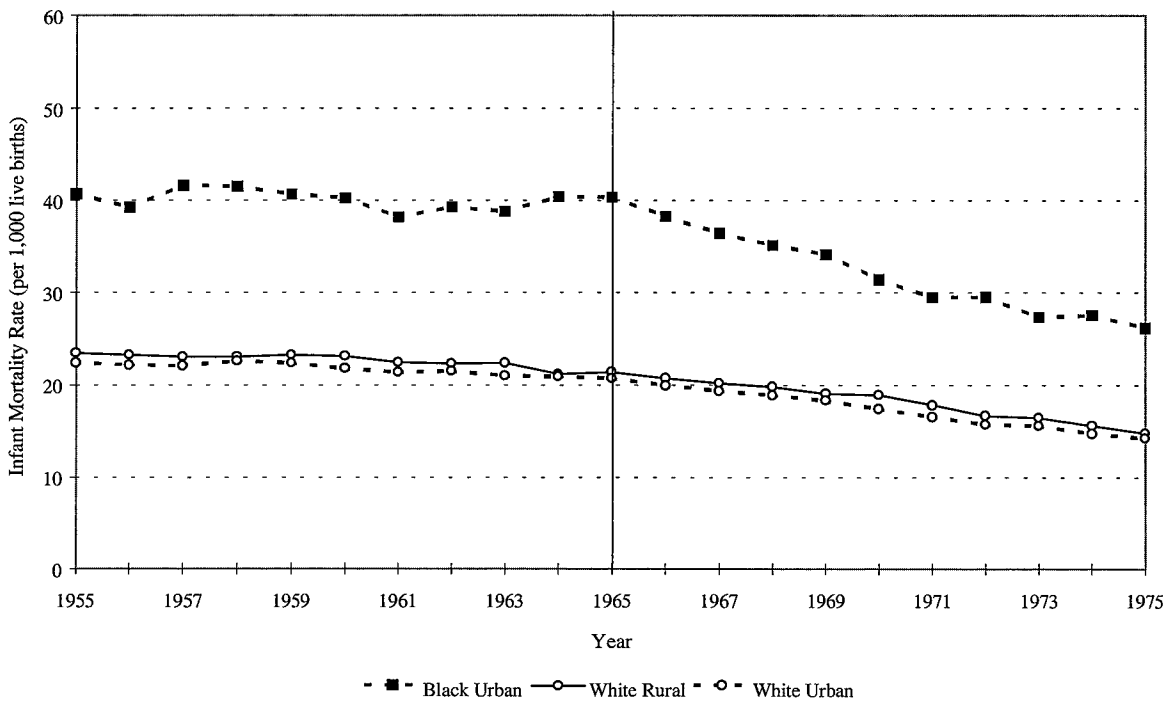
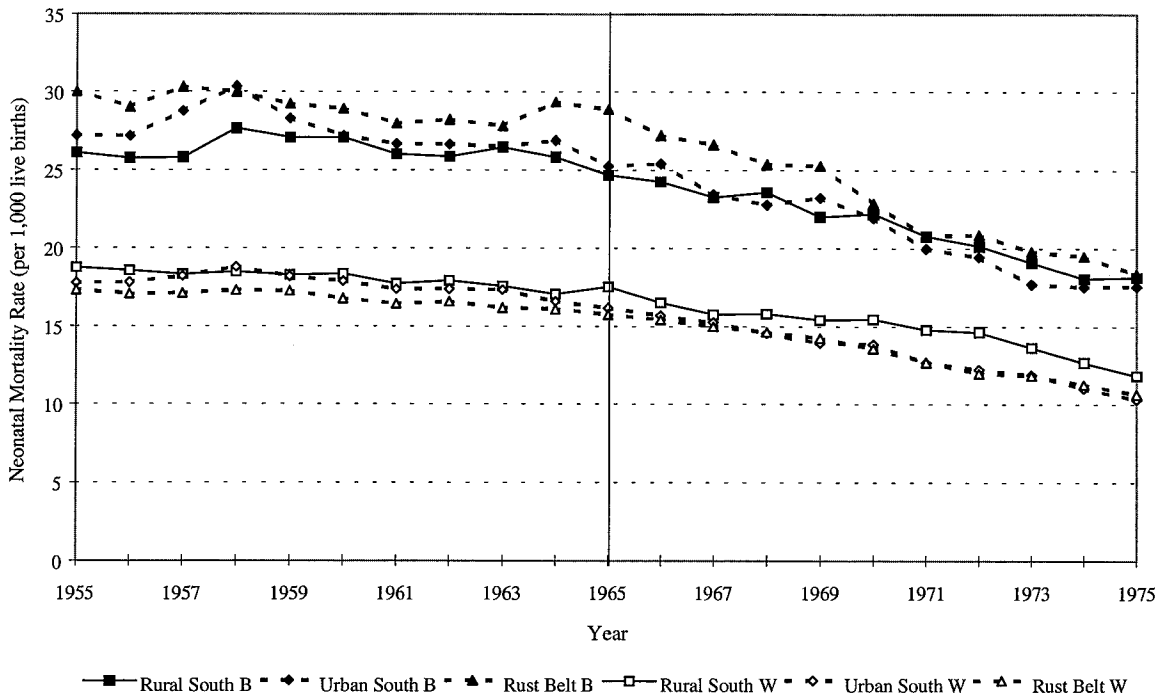


Figure 5: Black and White Neonatal and Post-Neonatal Infant Mortality Rates, By Region and Metropolitan Status, 1955-1975

A. Neonatal Mortality Rate, by Race



B. Post-Neonatal Mortality Rate, by Race

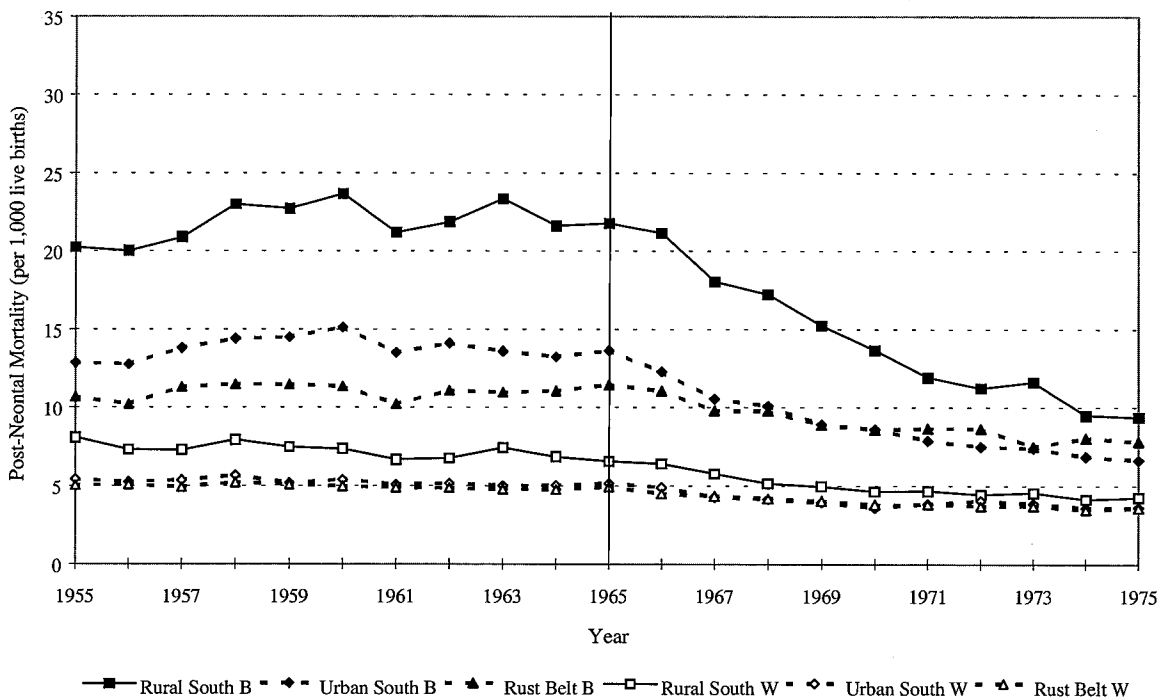


Figure 6: Fraction of Births in a Hospital with a Doctor Present in the South, By Race and Metropolitan Status

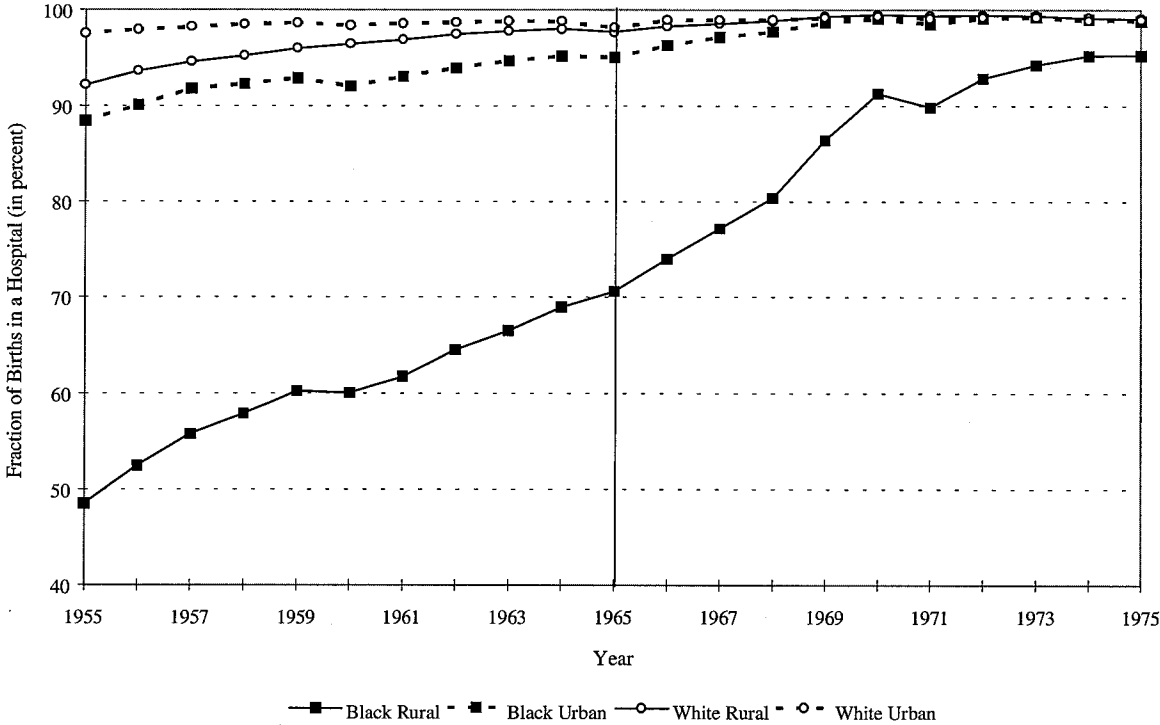
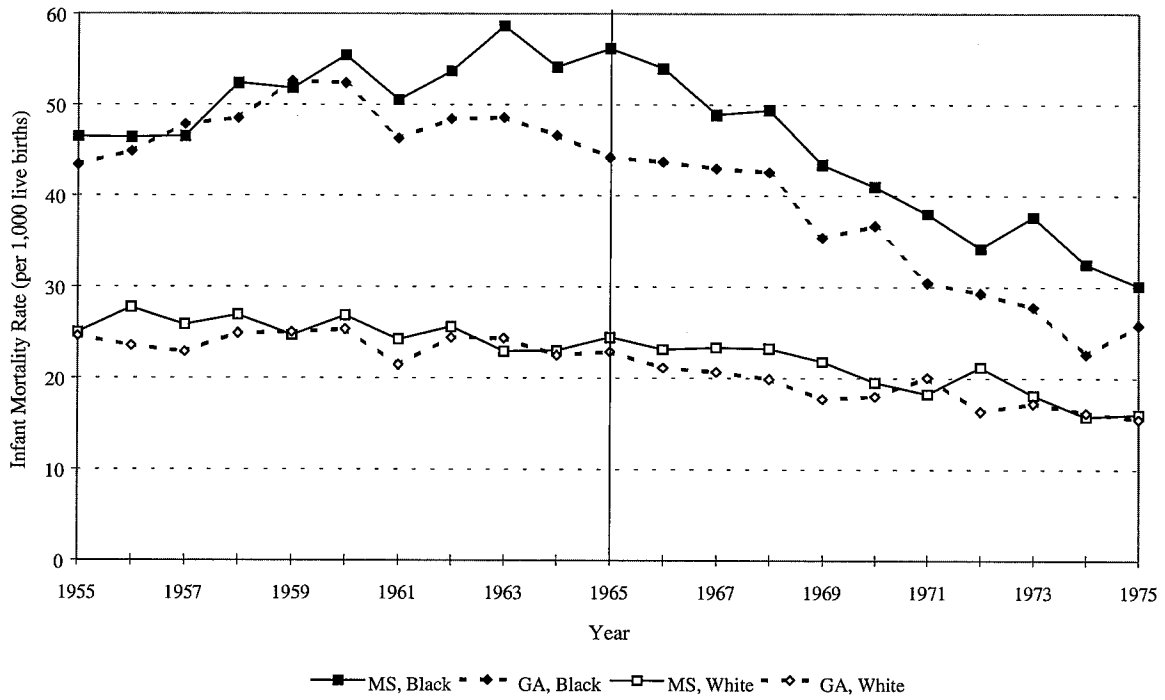


Figure 7: Trends in Rural Mississippi versus Rural Georgia

A. Infant Mortality Rates, by Race



B: Fraction of Births in a Hospital, by Race

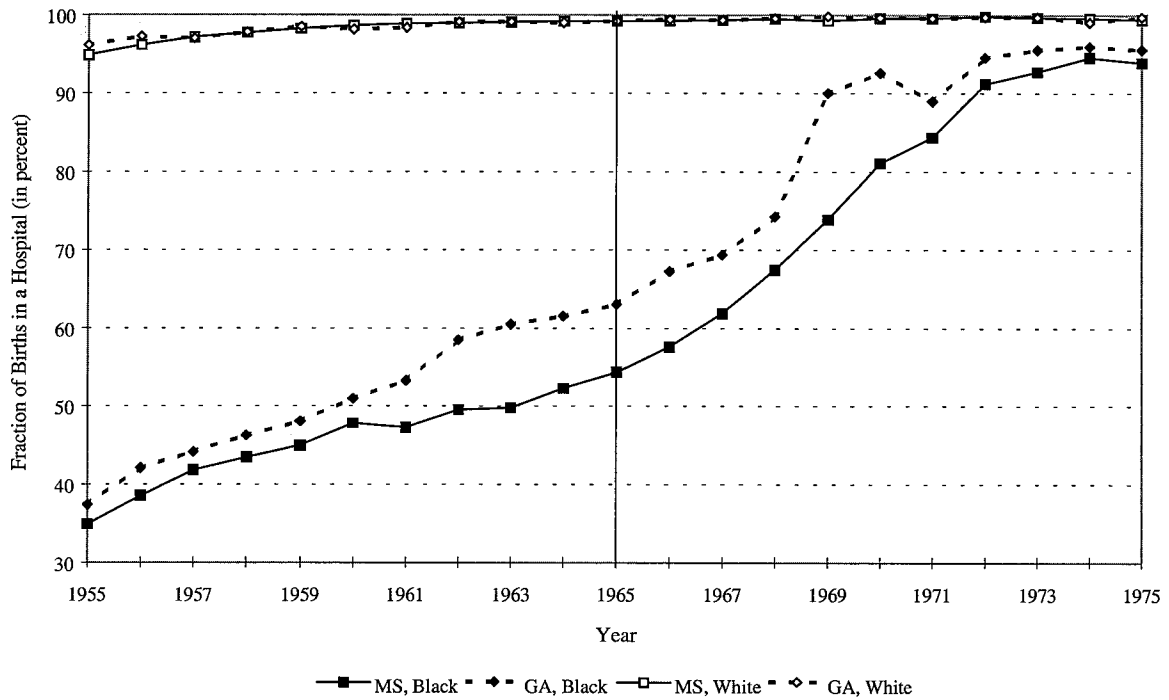


Figure 8: Neonatal and Post-Neonatal Mortality Rates in Rural Mississippi, by Race

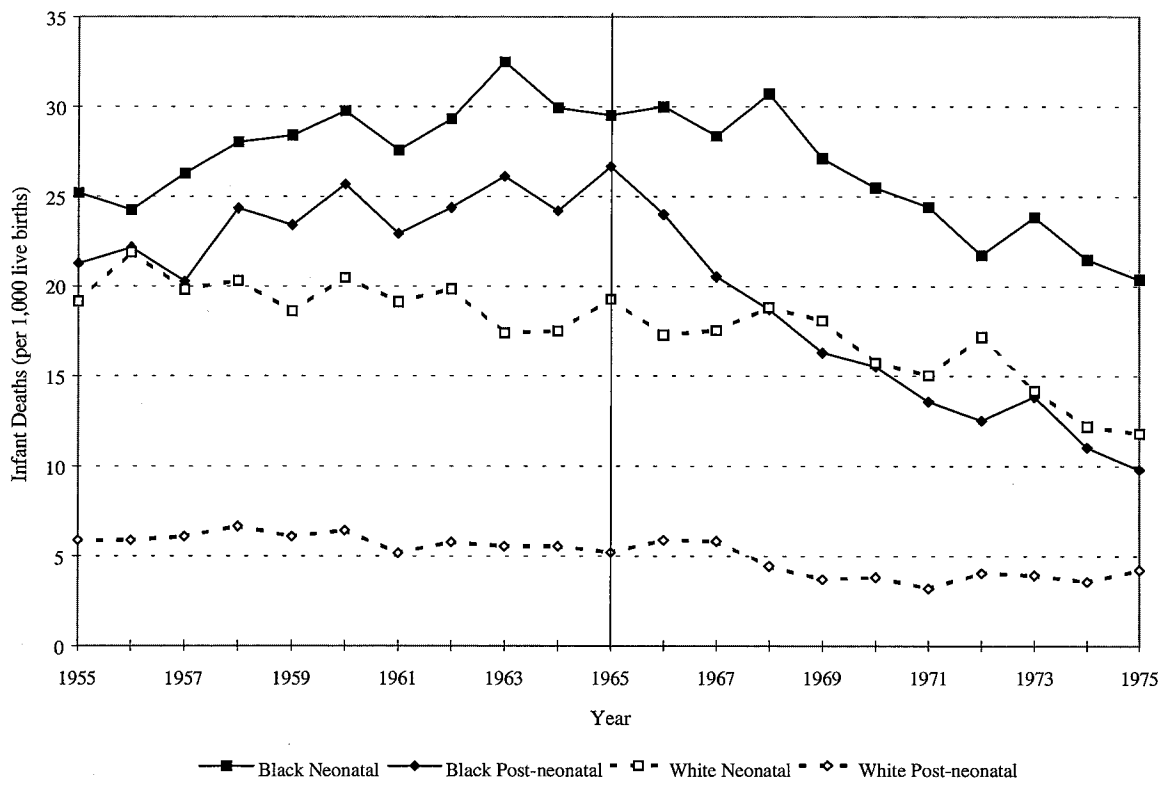


Figure 9: Fraction of Births in a Hospital, Mississippi Delta versus the Rest of Mississippi

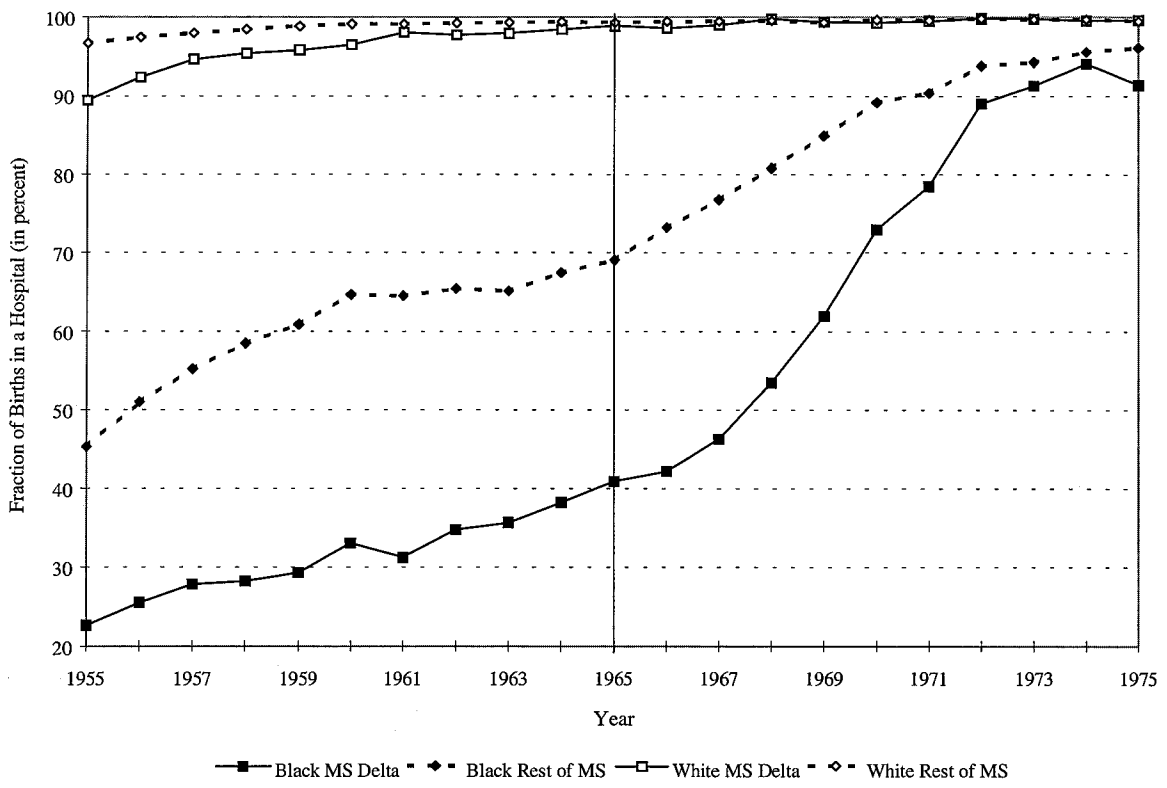
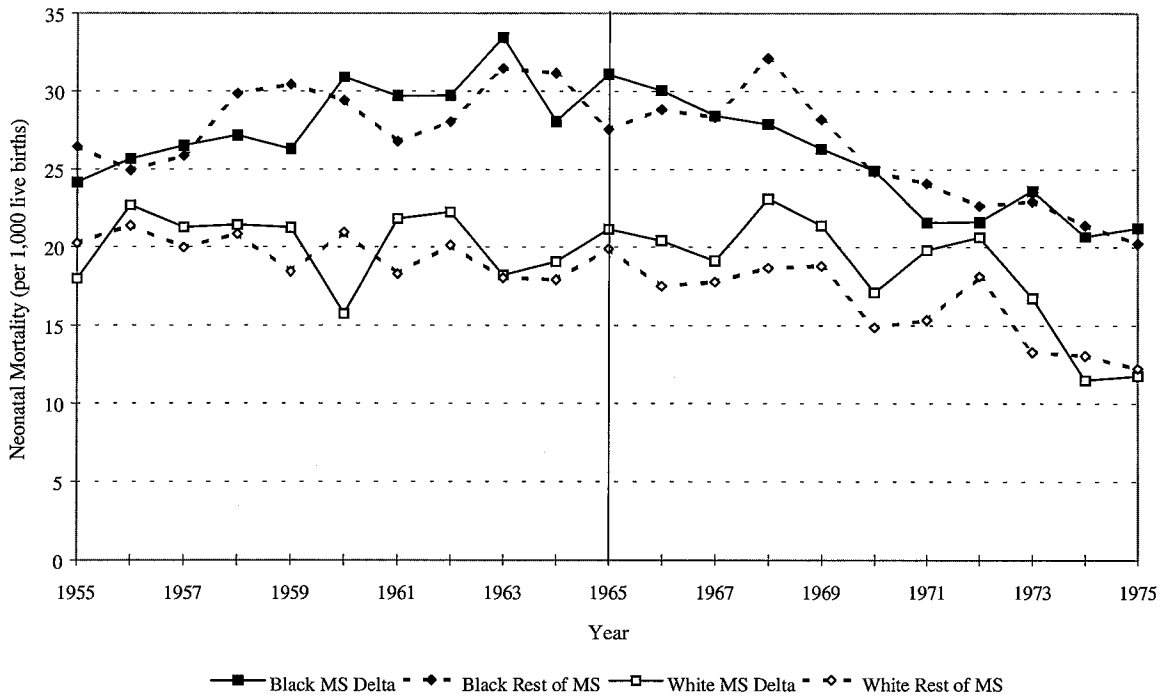
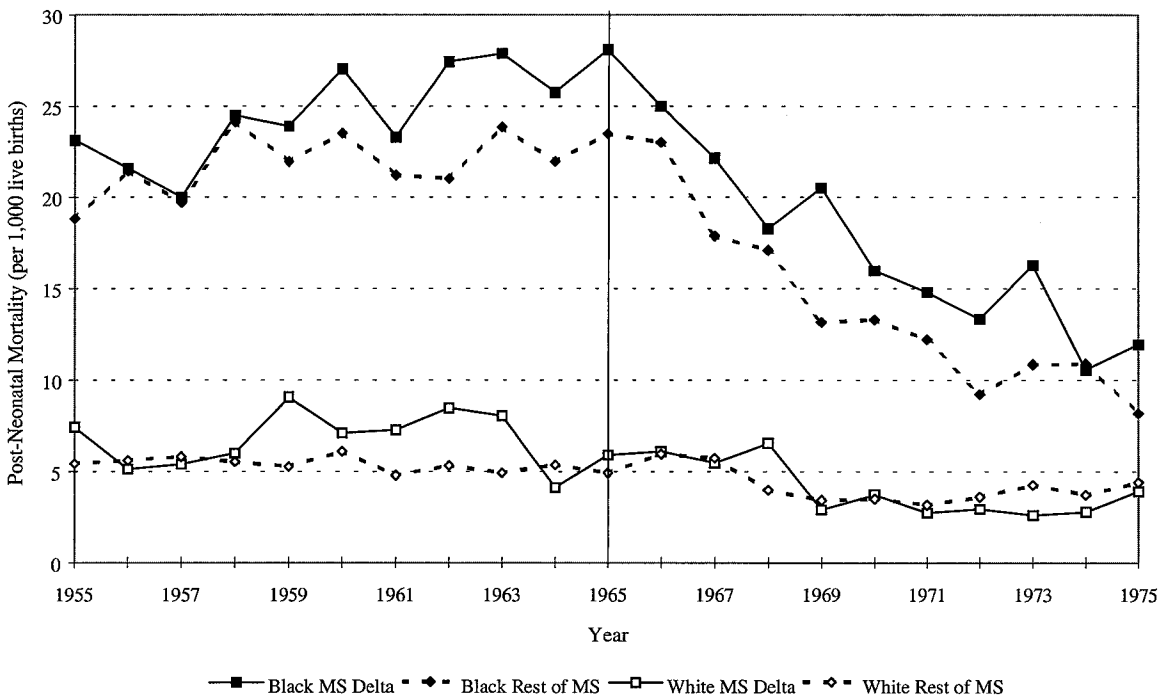


Figure 10: Infant Mortality Rates by Race, Mississippi Delta versus the Rest of Mississippi

A. Neonatal Mortality Rates



B. Post-Neonatal Mortality Rates



**Figure 11: Diarrhea and Pneumonia Related Post-Neonatal Mortality Rate by Race
Mississippi Delta versus Rest of Mississippi**

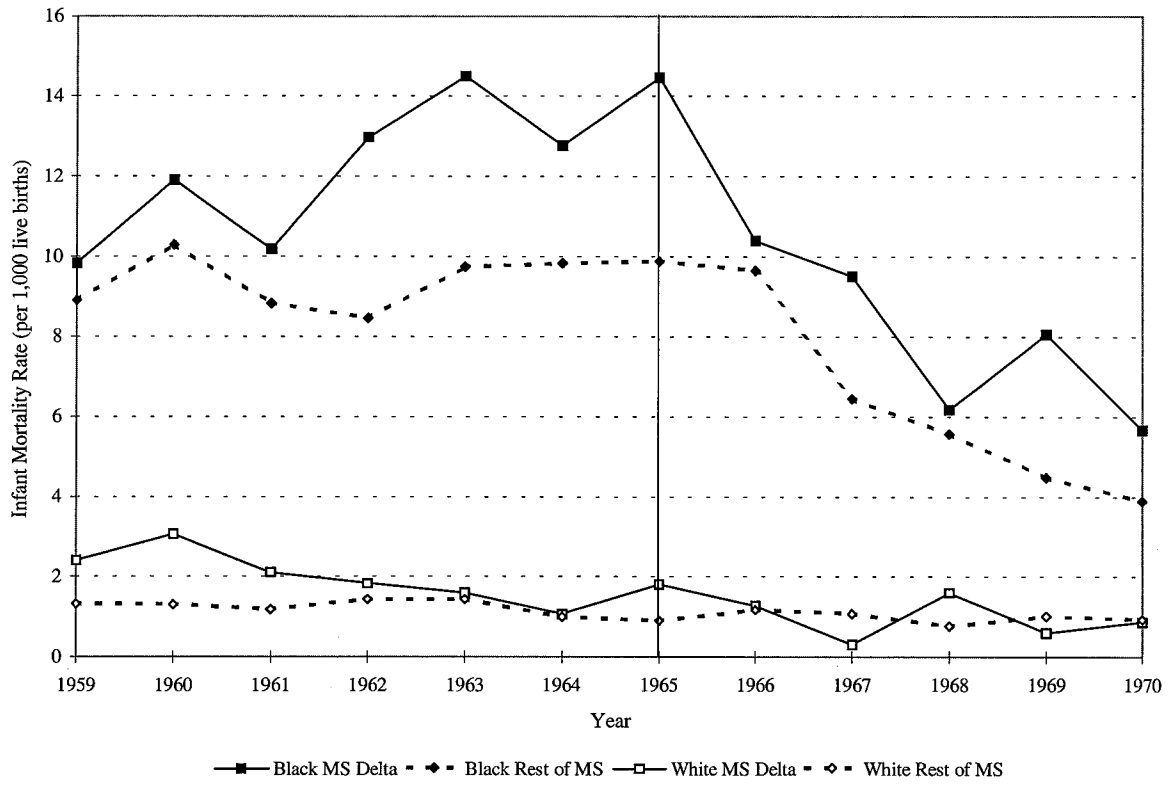
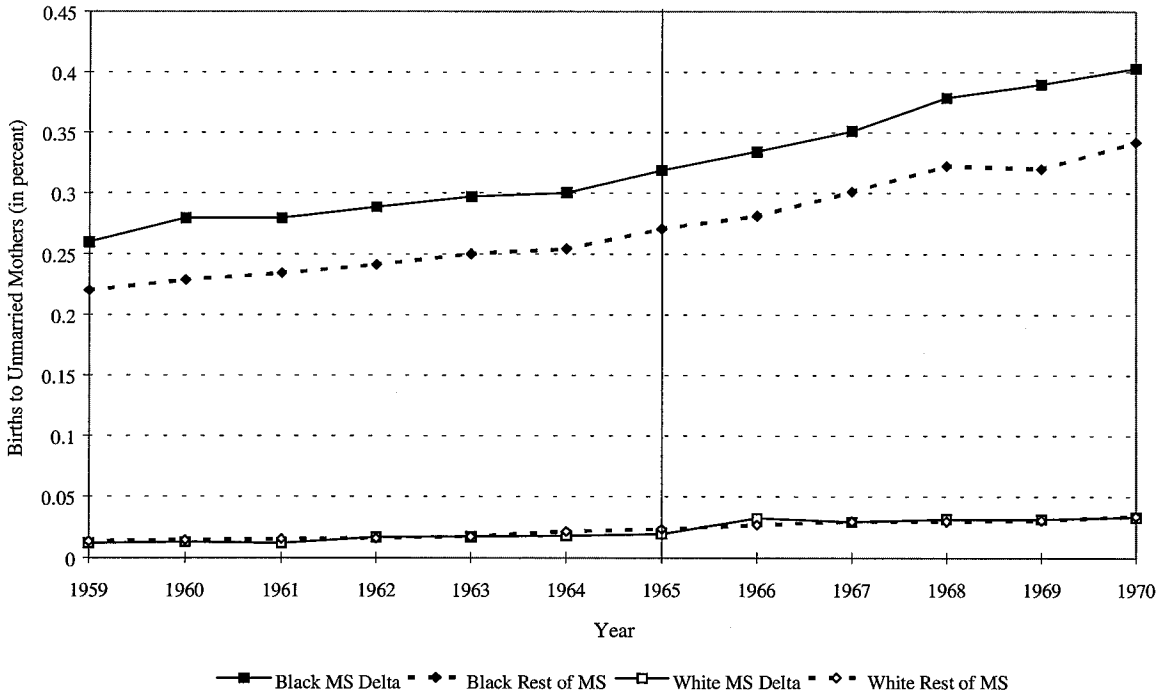


Figure 12: Characteristics of Mothers by Race, Mississippi Delta versus the Rest of Mississippi

A. Fraction of Births to Unmarried Mothers



B. Fraction of Births to Teenagers

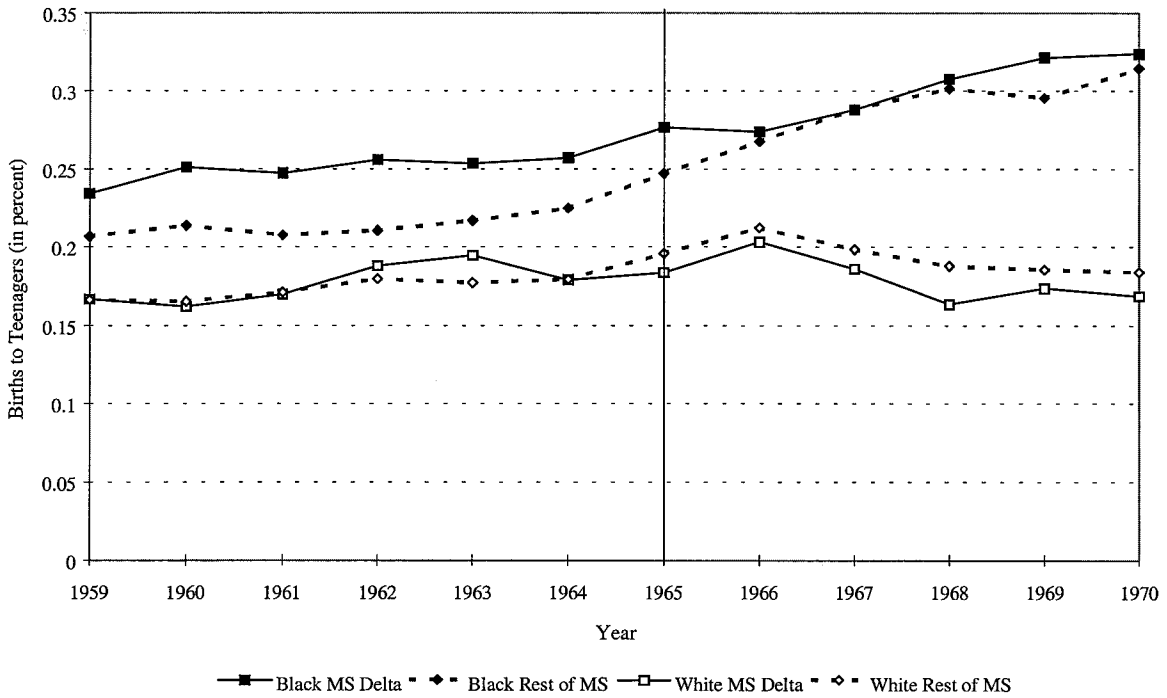
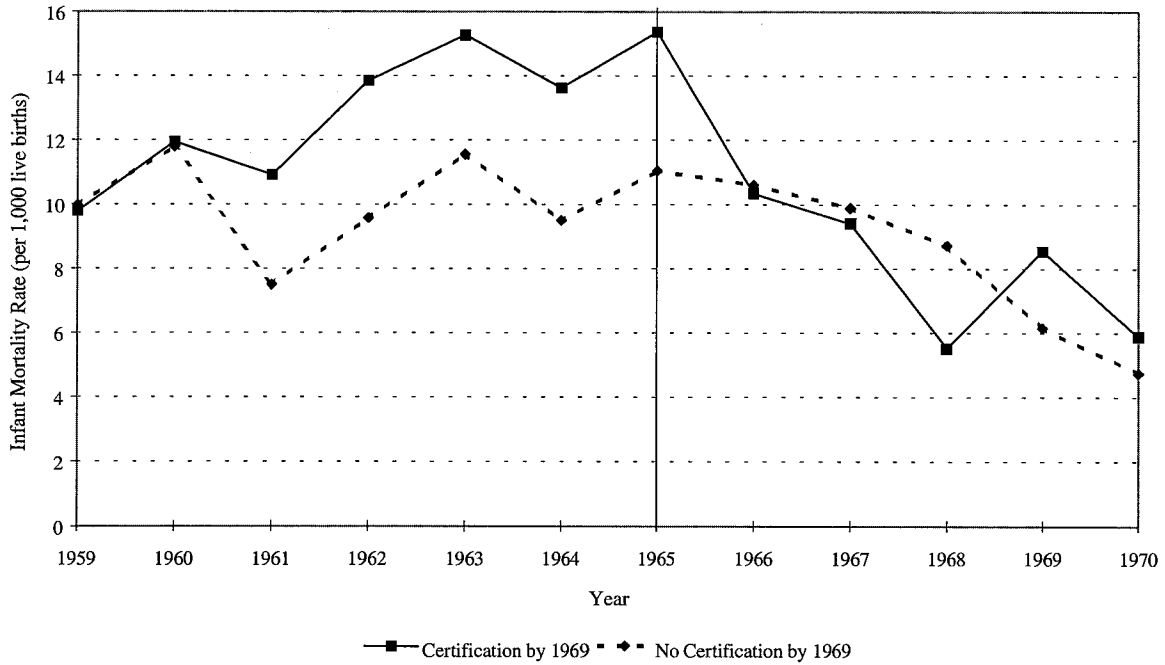
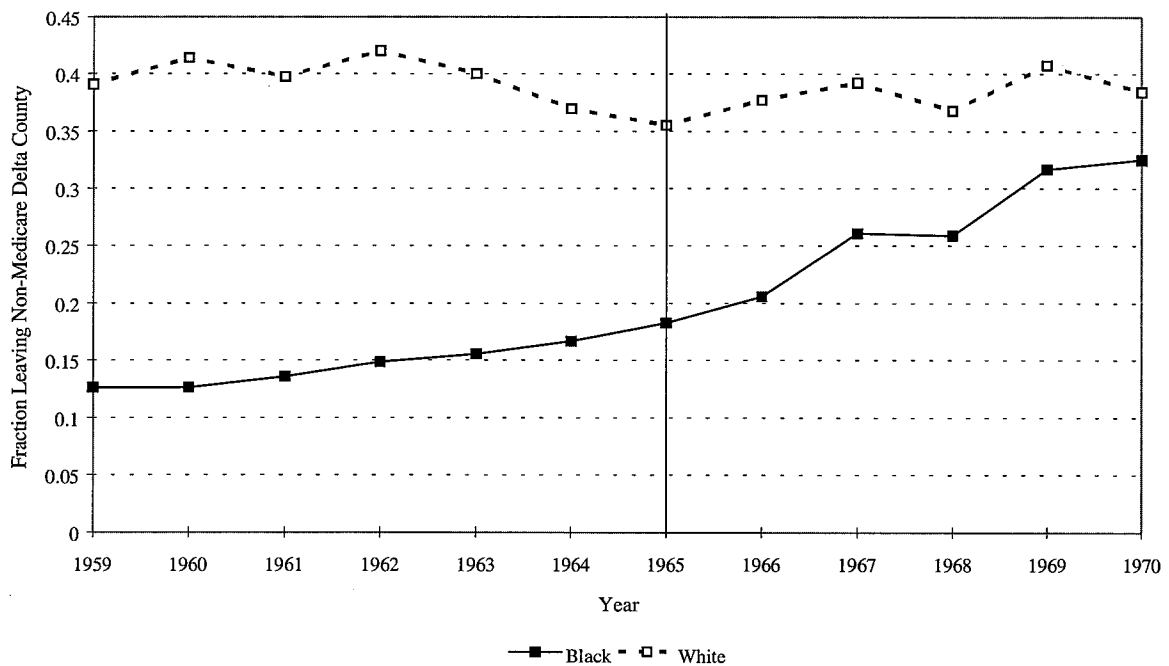


Figure 13: Mortality and Birth Rates for Blacks in the Delta, by Whether Mother's Residence County Contains a Hospital Receiving Medicare Certification by February 1969

A. Diarrhea and Pneumonia Post-Neonatal Mortality Rate for Blacks in Delta, by Medicare Certification Status of Hospitals in County

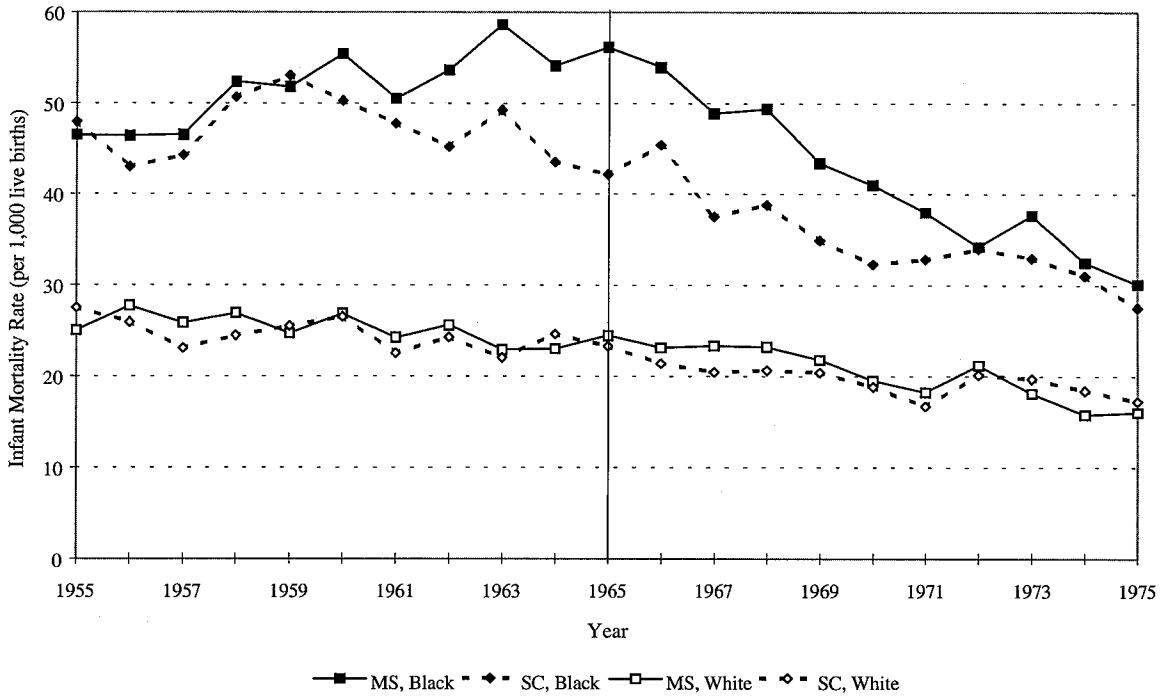


B. Fraction of Births Occurring in Counties with Medicare Certified Hospital among Mothers Residing in Delta Counties without Certified Hospital

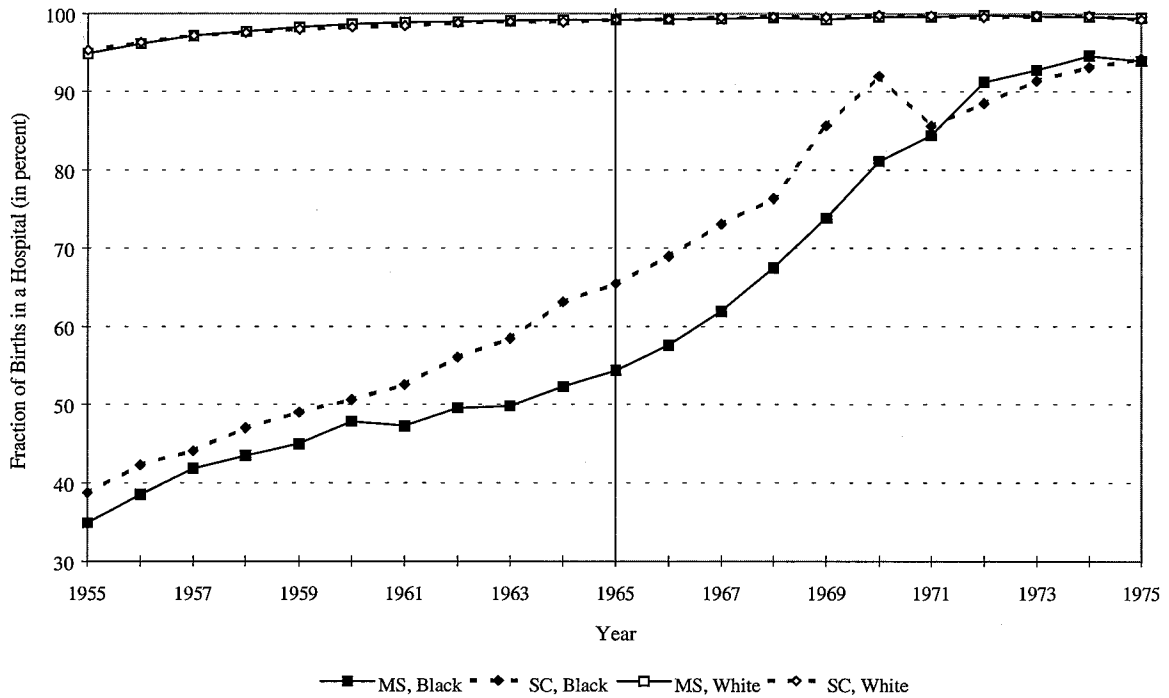


Appendix Figure 1: Trends in Rural Mississippi versus Rural South Carolina

A. Infant Mortality Rates, by Race



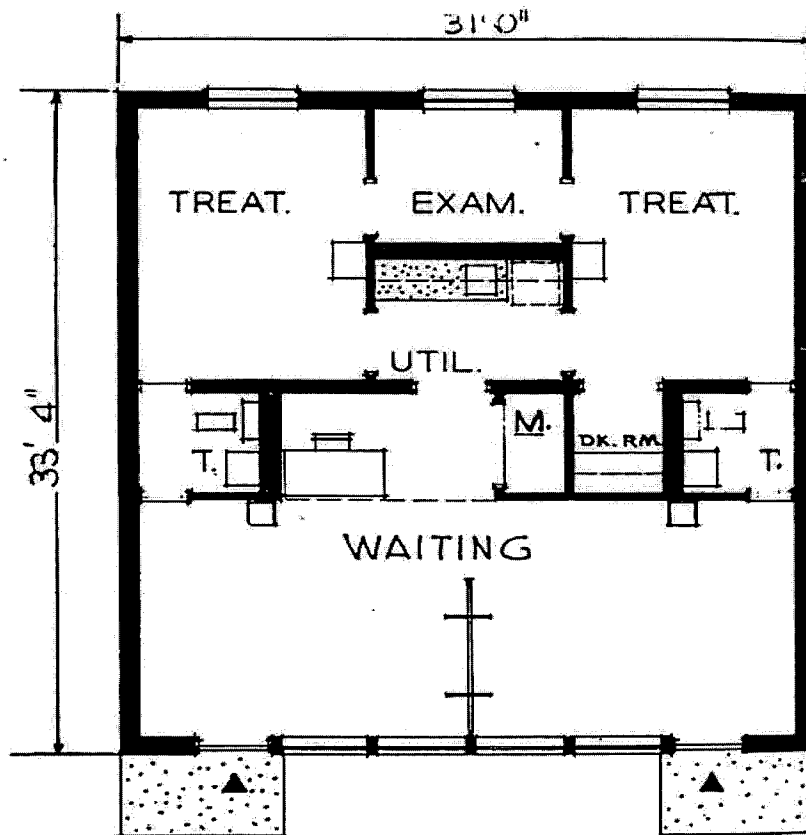
B. Fraction of Births in a Hospital, by Race



Appendix Figure 2:
Floor Plan of Diagnostic Health Center

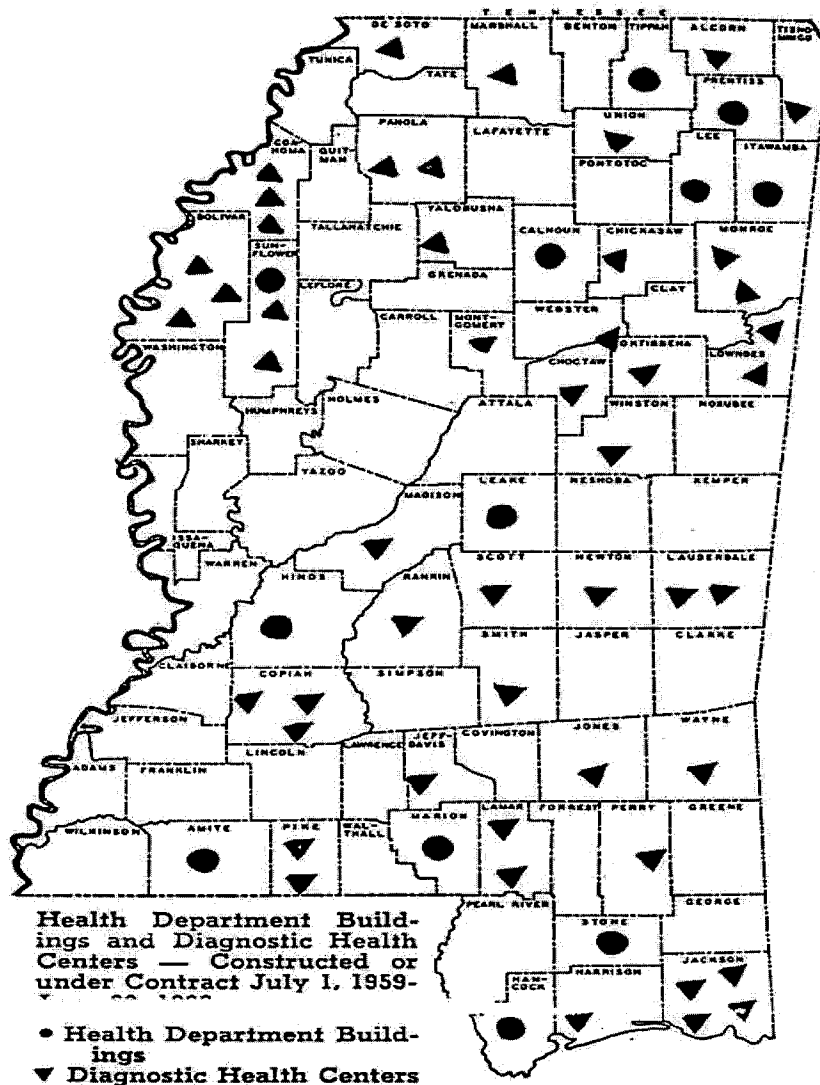
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MISSISSIPPI STATE BOARD OF HEALTH



**Appendix Figure 3:
Location of New Health Department Buildings and Diagnostic Health Centers
July 1959-June 1960**

Map No. 2



**Appendix Figure 4:
Proportions of Births in Each Mississippi County that are Black
1959-1963**

