

# Race and pregnancy-related care in Brazil and South Africa

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## Abstract

This study examines women's use of pregnancy-related medical care in Brazil and South Africa, two multiracial societies with very different histories of race-related legislation that could affect medical care utilization. The analysis uses nationally representative household-level data to show that inequality in the distribution of socioeconomic resources across racial groups and differences in the sociodemographic conditions surrounding individual pregnancies explain much of the racial difference in women's use of prenatal and delivery care in both countries. Even if these characteristics and resources were equalized across women however, the results suggest that non-White South African women would still be less likely than Whites to initiate prenatal care in the first trimester or to have a doctor present at the time of delivery. The mechanisms through which race works to influence the use of care are examined, and the Brazilian and South African contexts are discussed. These findings suggest that although state-sanctioned racism may help to explain the greater racial inequality in stunting in South Africa than in Brazil, reducing the disadvantage for non-Whites in South Africa and Brazil will depend on reducing fundamental inequalities in the distribution of socioeconomic resources and medical services that characterize many nations.

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## Introduction

Maternal and child health is a priority in many countries because it reflects the general level of living in a society, and comparison of maternal and child health outcomes across groups reveals important fault lines of inequality. Racial group inequalities in children's health-related conditions before and after birth are important because health deficits experienced early in life can influence later life socioeconomic achievement (Richards, Hardy, Kuh, & Wadsworth, 2002) and health outcomes in adulthood (Frankel, Elwood, Sweetnam, Yarnell, & Davey Smith, 1996; Huxley, Shiell, & Law, 2000; Law et al., 2001; Rich-Edwards et al., 1997), maintaining or exacerbating multiple forms of disparity throughout the life course in racially stratified societies. Brazil and South Africa are multiracial societies with

among the highest levels of inequality in the world, but have very different histories of race-related legislation that could influence maternal and child health. Previous studies have shown racial group disparities in child health in Brazil (Wood & Carvalho, 1988; Wood & Lovell, 1992) and South Africa (Chaning-Pearce & Solomon, 1986), but have not focused specifically on the avenues through which race affects health, and have not explored whether racial inequality works similarly across multiracial societies.

One potential source of inequality in maternal and child health is variation in women's use of pregnancy-related medical care. Services including prenatal and delivery care are frequently an emphasis in national health programs, based on their positive association with birth outcomes and the perception that many infant and maternal deaths in countries like Brazil and South Africa are preventable (Mahler, 1987). Early and repeated prenatal care visits increase the potential amount and quality of care received, help to identify

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women at increased risk of adverse pregnancy outcomes, and help to establish good relations between women and health care providers (Magadi, Madise, & Rodrigues, 2000; World Health Organization, 1994). Adequate delivery care can reduce the risk of child deaths due to anoxia, hypoxia, and other respiratory conditions, reduce neonatal infections, and improve the survival of preterm and low birth weight babies (Victora & Barros, 2001). Delivery assistance from a trained and well-equipped medical provider may also reduce the risk of maternal mortality (Maine & Rosenfeld, 1999). It is difficult to demonstrate conclusively that pregnancy-related medical care improves health outcomes, because positive outcomes associated with the use of medical care may occur if women who are generally healthier and more likely to have good pregnancy outcomes are also more likely than others to obtain pregnancy-related medical care (Jeffery, Tsuari, Pistorius, Makin, & Pattinson, 2000). However, even beyond a possible positive effect on infant survival or other infant health outcomes, medical care during pregnancy can increase a woman's knowledge about pregnancy, labor, delivery, and postnatal care, and can identify women with pregnancy-related or other morbidities (Alexander, Kogan, & Himes, 1999). The focus of this study is to determine whether there are inequalities in utilization, and the mechanisms by which these inequalities are created, rather than to explore the outcomes of pregnancy-related medical care.<sup>1</sup>

In this analysis I use large-scale survey data to examine women's utilization of pregnancy-related medical services in mid-1990s Brazil and South Africa, two multiracial countries identified as among the most inequitable in the world (Lam, 1999). I examine the extent to which we can explain racial group differences in the use of medical prenatal and delivery care by accounting for dramatic differences in socioeconomic resources at the household and community level for different racial groups. This will provide some insight into which factors could be most effectively targeted to rectify existing differentials, and whether these vary across countries with very different histories of race-related legislation. I compare two different forms of pregnancy-related medical care to explore whether different factors are determinants of the use of separate

services, or if changes in a few major determinants could equalize the use of both of these forms of care. This study differs from most other analyses of maternal and child health services because the major focus is the mechanisms that create racial inequality in utilization, and the analysis is not hospital-based or focused on a specific geographic region, as are many previous studies of Brazil and South Africa. The study can further our understanding of the nature of racial group disparity in children's health in Brazil and South Africa, which has been explored using a measure of child growth faltering (Burgard, 2002). The underlying objective of this comparative analysis is to explore whether racial disparities in health may have distinctive manifestations across social and historical contexts, even if some of the fundamental causes of disparity are more universal.

### **Race and inequality in Brazil and South Africa**

In this analysis, race is treated as a sociopolitical construct that has been used in part to justify the exploitation of groups classified as inferior (Williams, 1997). In both Brazil and South Africa, race has played a central role in determining life chances and health outcomes, even though only South Africa legally institutionalized racial discrimination and forcibly maintained inequality in life chances at the expense of non-White groups. Both of these multiracial societies had colonial pasts, but the apartheid system in South Africa, in place from 1948 until the early 1990s, overtly shaped both individual opportunity and the provision of health services on the basis of race, whereas in Brazil there has been little race-related legislation since the abolition of slavery in 1888. Brazil and South Africa provide a useful comparison for the analysis of mechanisms generating and perpetuating inequality across all multiracial societies, as well as showing whether state intervention matters for racial group inequalities in health. Because apartheid institutions did, in fact, create racial inequality in the provision of health-promoting infrastructure and individual opportunity, racial differences in women's use of pregnancy-related medical care may be sharper in South Africa than in Brazil. On the other hand, de facto, rather than de jure, patterning of racial inequality may be similar in both countries, leading to little difference in the extent of racial group disparity in prenatal and delivery care utilization.

#### *Brazil*

Centuries of miscegenation between dominant White colonialists, Africans brought to Brazil to work as slaves, and indigenous Brazilians has led to a racial spectrum with many shades of Brown between

<sup>1</sup>In this study, I use the terms utilization and access when discussing prenatal and delivery care. There are important differences between utilization, which implies that women are choosing to use care, and access, which may be more reflective of women's ability to obtain care at all. However, it is not possible to distinguish between the two meanings in the present study, because measures of women's proximity to medical prenatal and delivery care are not available. In any case, it is important to know who is using pregnancy-related care, even aside from questions of choice and availability.

endpoints of White and Black.<sup>2</sup> Although there have been no official racially-discriminatory legal institutions since slavery was abolished, racial inequality in socio-economic standing has persisted since the colonial era, with Whites more likely than others to be at the top of the distribution. In a recent study of women in a southern Brazilian city, Black and Brown women had less schooling, lower family income, and poorer housing conditions than White women (Olinto & Olinto, 2000). The geographic history of slavery and European immigration led to the concentration of Whites in more metropolitan areas, especially in the more developed South and Southeast regions, while Non-Whites are more likely to live in the poor Northeast (Silva, 1999),<sup>3</sup> and in rural areas, places that are relatively underserved by medical care facilities (Weyland, 1996).

Officially, access to maternal and child health care was defined as a universal right in the 1988 Brazilian constitution, and the Unified Health System (*Sistema Unico de Saude*, or SUS) has brought about the expansion of primary care clinics and *de jure* universal access to free services since then (Barros et al., 2001; Buss & Gadelha, 1996). However, comparison of consecutive surveys collected in the mid-1980s and mid-1990s in the city of São Paulo showed that while there was continuing universal birth coverage and immunization outreach, there was insufficient increase in the availability or quality of prenatal care (Monteiro, Franca, & Conde, 2000). Expensive curative services in urban centers have been emphasized at the cost of more widespread provision of universalized primary care, and there is a heavy concentration of human resources in the most developed Southern regions of the country. More than one-third of all Brazilian municipalities, generally those that are rural and have fewer than 5000 inhabitants, lack hospitals or even simple clinics (Buss & Gadelha, 1996). There is some evidence that utilization of pregnancy-related medical care varies by race; a 1993 study showed that non-White mothers had fewer prenatal visits and were less likely to receive caesareans or episiotomies, and non-White children were less likely to be immunized than White children (Barros, Victora, & Horta, 2001).

<sup>2</sup>During the colonial period in Brazil, White men far outnumbered White women, and many White men had children with indigenous women and African-origin slave women. Intermarriage between people of different colors is still common in Brazil today, though marriages between Blacks and Browns or Browns and Whites are more common than marriages between Whites and Blacks (Degler, [1971]1986; Silva, 1985).

<sup>3</sup>However, many Blacks live in the Rio de Janeiro metropolitan area in the Southeast, considered to be among the most developed areas in the country. Nonetheless, there is great inequality even in Rio de Janeiro, with favelas, or shantytowns, standing next to wealthy neighborhoods (Silva, 1999). This means that region alone is not an adequate indicator of level of living.

### South Africa

South Africa has long been characterized by extreme racial inequality in socioeconomic status and opportunities for socioeconomic achievement (Treiman, McKeever, & Fodor, 1996), as well as accompanying disparities in health and the resources that are associated with healthy outcomes. Apartheid institutionalized four official population groups that persist to the current day: Whites, Asians, Coloreds, and Blacks. Whites are the descendants of Dutch and English settlers, and have dominated South African society since colonization. Asians in South Africa are mainly descended from indentured laborers from the Indian sub-continent, while the Colored population is descended from mixed couples, mostly Afrikaaners and the indigenous population of the Cape Town region. Blacks, also known as Africans, are descendants of the indigenous Bantu-speaking peoples, and make up the large majority of the population. As a result of apartheid and the preceding history of colonialism, the four race groups continue to be strongly differentiated by educational and occupational attainment and average incomes, a situation that has not changed radically even with the official end of apartheid in 1994.

Under apartheid, Afrikaaner Whites legislated to improve their own social and economic position at the expense of the non-White population; while Whites, Asians, Coloreds and a small number of properly documented Blacks were allowed to reside in the more developed areas of the Republic of South Africa, the majority of Blacks were forcibly resettled to ten rural “homelands” with few socioeconomic opportunities and underdeveloped medical care infrastructures. During the apartheid period, the public health sector was organized into a large number of administrative systems, with a separate National Department of Health for each racial group, homeland, and provincial administration, and health departments for 400 local authorities (Bloom & McIntyre, 1998). This highly fragmented and redundant system allocated resources unequally by race, with White districts favored over all others and particularly at the expense of Black districts. Public hospitals employed 4.6 times more general doctors, 31 times more specialist doctors, and 2.4 times more nurses in the richest compared with the poorest districts in 1992 (Bloom & McIntyre, 1998).

Though the health system has begun to be reformed in the aftermath of apartheid, these longstanding socioeconomic inequities in access and geographic inequalities in distribution persist. In May 1994, within the first 100 days of the country’s first democratic elections, health care for children under the age of 6 years and pregnant women was declared free of charge (Benetar et al., 1997), and in 1997, all user fees at primary health clinics were abolished. However, changes since the end of apartheid have required severe budget cuts in

historically better-served provinces to create parity with the less well-served, reducing the effectiveness of already established health care institutions (Benetar et al., 1997). Despite the changes implemented since 1994, there remain dramatic differences in the accessibility of services and facilities across South Africa, with central cities in former White areas featuring sophisticated curative services rivaling those available in developed countries, while women living in remote rural areas are often forced to travel great distances to visit a clinic providing only basic services (Abrahams, Jewkes, & Mvo, 2001; Bloom & McIntyre, 1998). Many services most convenient for Blacks are located in the former homeland areas where they were forcibly resettled, far from urban centers (de Montigny, Ferrinho, Barron, Lozat, & Gear, 1991), and a 1994 survey found that more than 35% of Black residents of rural areas traveled more than one hour to reach health service providers, and 73% had to wait between 1 and 5 hours to see health care personnel after they arrived (Hirschowitz, Orkin, et al., & Community Agency for Social Inquiry (CASE), 1995).

#### *Determinants of pregnancy care utilization*

Race does not cause women to use, or not to use, pregnancy-related medical care, but racial group differences in the resources women need to obtain care or in their beliefs about medical care create racial disparities in service use. In this study, I work within the framework introduced by the Behavioral Model of Health Services Use (Andersen, 1995), with adjustments to accommodate the outcomes and contexts studied here. The initial behavioral model emphasized three categories of population characteristics that influence the use of health services: predisposing characteristics, enabling resources, and measures of need (Glei, Goldman, & Rodriguez, 2003). Predisposing characteristics include the demographic and social structural characteristics and health beliefs of a family or individual within a population; in this study, I include a variety of predisposing characteristics relevant to the Brazilian and South African cases, including demographic characteristics surrounding individual pregnancies and characteristics that determine placement within a social structure, such as educational attainment and racial group membership, as it has historically shaped life chances.<sup>4</sup> Enabling resources

include the availability of health personnel and medical facilities, and the means for a family or individual to obtain those services. Accessibility of care, both financial and geographic, has been shown to influence its use in South Africa, for example (Abrahams et al., 2001; Hamilton, Perlmann, & de Souza, 1987; Pattinson & Roussouw, 1987). I include some measures of the type of place of residence for the households in the study, as well as indicators of household economic resources necessary to pay for medical services, health insurance coverage, and travel to health facilities. Finally, measures of need include perceived needs and needs as evaluated by health professionals. A woman's need for pregnancy-related care may be influenced by her experiences with past pregnancies or births, or by other, generally unobserved, characteristics or preferences. I include some exploratory analysis of the impact of negative experiences with previous pregnancies in the final section of this study that provides suggestive evidence for the importance of factors relating to need, but due to data limitations, I focus on the more upstream social and historical factors that condition access to and use of care in these societies.

#### **Data and methods**

##### *Data*

Household data for both countries were collected as part of the Demographic and Health Surveys series, with Brazilian data from the Pesquisa Nacional Sobre Demografia e Saúde 1996, or Brazilian Demographic and Health Survey (DHS-3), and South African data from the 1998 South Africa Demographic and Health Survey (SADHS). Both DHS samples are nationally representative surveys of women 15–49 years old, and collected detailed information on prenatal care and delivery assistance for all births in the previous 5 years. The DHS surveys administered to reproductive-aged women are conducted by female interviewers at household visits. Questionnaires and interviewers are available in all the major languages of a country, and questions about the use of pregnancy-related care are standardized across countries. The Brazil DHS-3 was drawn from a total of 842 primary sampling units that represented all but the rural areas of the North region, and used a multistage, clustered sampling frame based on the one used for the 1991 Brazilian census (BEMFAM/DHS, 1996). The Brazil DHS interviewed 3,761 women with one or more pregnancies in the 5 years preceding the survey, for a total of 5038 pregnancies/children in the sample. After cases missing information on outcome variables and explanatory characteristics are omitted, the analytic sample is comprised of 4958 children. The SADHS sample was stratified by province and urban or

<sup>4</sup> Unfortunately, explicit measures of health beliefs are not available in the data used here, and will not be included in the analysis, but other studies in these countries have shown that the use and timing of prenatal care is influenced by women's knowledge of the role of prenatal care and perceptions of the quality of care available (Timyan, Brechin, Measham, & Ogunleye, 1993). By controlling for socioeconomic resources, however, I can control for the differences in health beliefs and knowledge associated with women's education, for example.

non-urban area,<sup>5</sup> with the sampling frame based on the one used for the 1996 South African census (Department of Health of South Africa, 2002). In the full SADHS sample, there are 4148 women with one or more births in the 5 years preceding the survey, and the total number of births is 5066. The final sample used in this analysis consists of 4800 births, after cases missing information on outcome or explanatory variables are omitted.

These data have at least two shortcomings for the purposes of the present analysis. First, the DHS surveys do not include a direct measure of household income, wealth, or expenditures. To address this omission, a linear index is constructed from asset ownership indicators (discussed below). Second, the DHS-3 survey asked only about births in the 5 years preceding the survey, and women may have behaved differently during their pregnancies that occurred prior to this period. However, limiting the recall period to 5 years has advantages, since mothers may not remember details of care more than 5 years after the event, and conditions in the household and community may have been significantly different more than 5 years before these surveys. In particular, the state apartheid system was still in place until the beginning of collection of the South African data.

#### Outcome measures

Previous studies have shown that the majority of women in both Brazil and South Africa attend at least one prenatal visit (de Castro & Hirschowitz, 1995; Tanaka, Siqueira, & Bafile, 1989), but not all women initiate care early in their pregnancies (da Silva et al., 2001; Pattinson, 2000; Rip, Keen, Woods, & VanCoe-verden de Groot, 1988). A 1995 South African study showed that while the vast majority of women had obtained some prenatal care, White (89%) and Asian (89%) women were much more likely to initiate care in the first 3 months of pregnancy than Colored (60%) or Black (30%) women (de Castro & Hirschowitz, 1995). To denote *early prenatal care* in this study, I use an indicator variable coded 1 if a woman initiated prenatal care in the first trimester of pregnancy and 0 otherwise.<sup>6</sup> Table 1 shows that in Brazil overall, two-thirds of all births received prenatal care in the first trimester. Early prenatal care was more common among the children of White mothers (76%) as compared to the children of

Table 1  
Distribution of pregnancy-related care utilization, overall and by mother's race and key covariates, Brazil 1996 and South Africa 1998

	Early prenatal care	Test ( <i>p</i> -value)	Doctor at delivery	Test ( <i>p</i> -value)
<i>Brazil</i>				
Overall	67.1		78.6	
Mother's race <sup>a</sup>				
White	76.3	<0.001	87.7	<0.001
Brown	61.6		72.9	
Black	61.4		73.8	
Place of residence				
Urban	73.7	<0.001	85.1	<0.001
Rural	46.7		58.4	
Region				
North/northeast	53.0	<0.001	57.6	<0.001
Rest of Brazil	76.5		92.5	
<i>South Africa</i> <sup>a</sup>				
Overall	27.7		31.0	
Mother's race				
White	77.5	<0.001	89.7	<0.001
Asian	65.5		52.3	
Colored	40.4		41.1	
Urban black	26.0		37.0	
Rural black	19.2		17.0	
Place of residence				
Urban	34.6	<0.001	43.4	<0.001
Rural	20.9		18.7	
Region				
Western Cape	42.5	<0.001	45.5	<0.001
Eastern Cape	17.6		18.3	
Northern Cape	39.2		39.2	
Free State	37.9		30.6	
KwaZulu Natal	26.8		35.3	
North West	28.7		32.6	
Gauteng	32.2		44.5	
Mpumalanga	29.8		21.2	
Northern	18.0		14.3	
Province				

Source: From author's calculations of DHS-3 data. Note: Data are weighted.

<sup>a</sup> Pair-wise comparisons across racial groups show statistically significant ( $p < 0.05$ ) differences in both outcomes between Whites and Browns and Whites and Blacks in Brazil; for South Africa, all pair-wise comparisons between racial groups for both outcomes show significant differences.

<sup>5</sup> In addition, the Eastern Cape Province was stratified into five health regions, with each health region stratified into urban and non-urban areas.

<sup>6</sup> This outcome variable is based on the question: "How many months pregnant were you when you first received antenatal care?" Women who reported receiving care within the first 3 months of the pregnancy were coded as receiving care in the first trimester.

Brown (62%) or Black (61%) mothers (henceforth referred to as White, Brown, and Black children, respectively). Prenatal care was more commonly used by urban mothers compared to those in rural areas, and was more frequently used by those in the rest of Brazil as compared to those in the North/Northeast regions. In South Africa, by contrast, less than one-third (28%) of the births in this sample received prenatal care within

the first trimester of the pregnancy. White (78%), Asian (66%), and Colored (40%) children were more likely to have received early prenatal care than urban Black (26%) or rural Black children (19%). Urban children were more likely to have received care than rural children and there was also considerable variation in the utilization of medical pregnancy care across the provinces of South Africa.

Though much prenatal and delivery care in Brazil is officially free of charge, the proportion of newborns examined by a doctor in the delivery room is low relative to the number of women delivering in hospitals (da Silva et al., 2001). In this analysis, I explore a dichotomous variable indicating whether a woman reported having a doctor at delivery or not.<sup>7</sup> Table 1 shows that in Brazil overall, almost 80% of births were attended by a doctor. White births (88%) were more likely than Brown (73%) or Black births (74%) to be attended by a doctor, and urban births and those in the Rest of the Brazil were relatively more likely to have a doctor present. In South Africa, only 31% of births took place in the presence of a doctor, though 90% of White births received this level of care, compared to 52% of Asian births, 41% of Colored births, 37% of urban Black births, and only 17% of rural Black births. In South Africa, urban births were more likely to be attended, and there was significant variation across provinces. Interestingly, in both Brazil and South Africa there is important variation in medical service use linked to both levels of urbanization and to specific geographical regions of the country; in South Africa these differences were the result of targeting resources toward the White population group, which was concentrated in particular urban areas of the country, while in Brazil, there was no overt targeting of resources on the basis of race. The variation in care across racial groups in South Africa is greater than in Brazil because of explicit targeting of resources to Whites at the expense of others, but is compounded by the concentration of non-White groups in areas (rural, geographically underserved) that have lower utilization of care in many countries, such as Brazil.

### Independent variables

The determinants of pregnancy care utilization are measured at the level of the pregnancy or birth and the household. Distributions of these characteristics are shown in Table 2 for Brazil and Table 3 for South Africa, which present figures overall and separately by racial groups. I include descriptive characteristics for the whole sample in the final column, as well as for the

<sup>7</sup>This outcome variable is based on the question: "Who assisted with the delivery of (NAME)?" Women who reported that a doctor assisted with the delivery were coded as having a doctor present at the delivery.

analytic sample used in the analysis, but as there are no notable differences, only the analytic sample will be discussed here.

The key independent variable in this analysis is mother's race.<sup>8</sup> Mother's race is used, rather than the race of the child or some combination of mother's and child's race, both because of data limitations, and because the mother is the individual presenting at a medical facility at the time of pregnancy. It is her appearance or identity that determines the response she will receive from potential caregivers. I use race as a socially-defined and imposed categorization that captures major socioeconomic divisions that influence health behaviors and health outcomes. For Brazil, I utilize the racial categories used in recent Brazilian censuses and in the DHS survey, distinguishing the children of White, Brown, and Black mothers.<sup>9</sup> For South Africa, I use the four census categories used in the DHS sample: White, Asian, Colored, and Black, but I separate the Black sample into children living in rural and urban areas. The rural sample of Black children reflects the large segment of the population who were forcibly relocated under the apartheid regime or were prevented from migrating to urban areas. These children are at a particularly sharp disadvantage when compared to children living in urban areas with respect to general levels of living and the availability of medical health services, including pregnancy-related care. The great majority of White, Asian, and Colored children in South Africa live in urban areas, so I do not make the distinction for non-Black groups. In Brazil, about 38% of the analytic sample are White, 57% are Brown and 5% are Black, while in South Africa, 5% of the analytic sample are White, 2% are Asian, 9% are Colored, 36% are Black children living in urban areas, and 47% are Black children living in rural areas.<sup>10</sup>

<sup>8</sup>In both countries, mother's race is measured by an observer; for the Brazilian survey, the interviewer recorded his or her perception of the woman's race, while for the South African survey, the mother reported her racial identity as it had been determined by the state. In both cases, this is the information that we need to observe the woman's reception by medical care providers. It would be preferable to have information about the interviewer's racial group, but this information is not readily available in these data sources.

<sup>9</sup>Asian children ( $n = 8$ ) are added to the White group, as they have very similar characteristics and living conditions; for the same reasons, Indigenous children ( $n = 2$ ) are added to the Brown group.

<sup>10</sup>I compared these distributions to appropriate census data from each country to assess the representativeness of these samples. Due to the more fluid nature of racial identity in Brazil, it is not surprising that the distribution by racial group in the DHS data (based on the interviewer's perception) is not as similar to the census distribution (based on self-reported racial group) as the two are in South Africa. The 1991 Census of Brazil shows that among women aged 15 to 49 years (the age

The unit of analysis in this study is the pregnancy or child, represented by the children who were born in the 5 years preceding the surveys. *Child's age in years* captures any change in women's utilization of prenatal or delivery care over the 5-year period covered by the surveys. Tables 2 and 3 show that on average, children in the samples are about 2 years old, with little difference in average age by race for the sample from Brazil, while White and Asian children are slightly older than other children in South Africa. *Birth order* can affect a mother's use of pregnancy-related services both because it reflects her level of experience with childbearing, and because it may influence the amount of resources available for each child already living in the household. First pregnancies are more uncertain events, and women may be more likely to seek modern health care services (Navaneetham & Dharmalingam, 2002). Later births may be less likely to receive early prenatal care and expensive delivery services unless women have experi-

(footnote continued)

group interviewed for the DHS studies), 56% reported being White, 39% Brown, and 5% Black, compared to interviewer reports about the mothers of the pregnancies and children reported on in this sample, which were 38% White, 57% Brown, and 5% Black. The greater proportion White in the census probably reflects a woman's choice to "Whiten" herself, as Whites have the highest average standing in Brazilian society. However, women in the Brazilian DHS sample were given the chance to report their own racial group, using the census categories, and the distribution was very similar to that based on the interviewer's report of the woman's race. Comparison of the data sources suggests that the 1996 DHS sample for Brazil over represents Brown women and under represents White women. This means that the racial group comparisons performed here may be conservative estimates of difference, if higher-status White women are relatively less likely to be included in the sample. By contrast to these apparent differences in racial group distribution, comparison of the 1996 DHS and the 1991 Brazilian census show very similar figures for women's education (DHS: 5.7 years, Census: 5.8 years) and the proportion living in rural areas (DHS: 24%, Census: 22%), and some overrepresentation of North/Northeastern residents, where the concentration of Brown women is greater (DHS: 40%, Census: 30%). For South Africa, the DHS figures for racial group are 5% White, 2% Asian, 9% Colored, and 83% Black, while the census figures are 11% White, 3% Asian, 9% Colored, and 76% Black, suggesting some over representation of Blacks and under representation of Whites. As for Brazil, this is likely to make the findings of this study a conservative estimate of the differences between these groups, as Whites have much higher average status than Blacks, and the highest status individuals are often less likely to agree to be interviewed. The comparison of average education (DHS: 8.3 years, Census: 8.8 years) and the distribution of women across the provinces of South Africa reveal that the DHS 1998 survey of South Africa approximates the South African population of the time, which is made likely by the relatively short two years between the Census and the DHS survey.

enced problems with previous pregnancies or births. Higher parity women may also have fewer resources to provide for pregnancy-related health care.<sup>11</sup> Birth order is separated into three categories: first births, second through fourth births, and fifth or higher order births. The modal category was second through fourth births across all racial groups in both countries, but fifth or higher births were more common among non-Whites, and represented about one-quarter of births among rural Black children in South Africa. Another factor that could influence a mother's use of pregnancy-related care is the *wantedness of the pregnancy* at the time it occurred; unwanted pregnancies may be less likely to receive timely and adequate care (Oropesa, Landale, Inkley, & Gorman, 2000). In the DHS surveys, women's attitudes about their past pregnancies are assessed with a retrospective question, and I use their responses to indicate whether they wanted the pregnancy at that time, or they didn't want the pregnancy at that time or at all. There were significant differences in wantedness across racial groups in both countries, with 53% of White children, 45% of Brown children, and only 36% of Black reportedly wanted at the time in Brazil, while in the South African sample, the proportion of children wanted at the time ranged from 77% of Whites to only 42% of rural Black children.

The second level of analysis is the mother or household, which includes measures of mother's age, mother's and father's education, and household economic resources. *Mother's age* is often considered to be one of the most important factors influencing health care utilization (Celik & Hotchkiss, 2000), but the direction of the effect of age is not clear. Relatively older women are more likely to be referred to hospitals for delivery than women of average child-bearing age, especially those giving birth for the first time (Ferrinho, Gear, & Reinach, 1991). In addition, older women may have greater experience using health services and more influence in household decision-making, leading to greater utilization of prenatal and delivery care. However, it is also possible that older women have had more experience with pregnancy and childbearing, and may be less likely to use these services because they have fewer concerns about the pregnancy and birthing process and

<sup>11</sup> Ideally, I would like to control for the problem of adverse selection, which is likely to affect these results. Adverse selection occurs when women who have had difficult pregnancies or births in the past are more likely to use prenatal care or delivery services with later births. I do not have information about all previous births for the women in this sample, and many women have experienced only one pregnancy, but I have explored potential effects of problem pregnancies below. The indicators of birth order provide some control for the "learning" that women undergo during their first or early pregnancies that informs their behavior during subsequent pregnancies.

Table 2  
Distribution of characteristics for analysis of pregnancy-related care, Brazil 1996

	Analytic sample				Full sample
	White	Brown	Black	Total	
Mother's race					
White	100.0	—	—	37.8	37.5
Brown	—	100.0	—	57.2	57.6
Black	—	—	100.0	4.98	4.92
Child Age (years)	1.97 (1.40)	2.01 (1.40)	1.93 (1.35)	1.99 (1.40)	2.00 (1.40)
Birth Order					
First birth	39.8	32.5	31.4	35.2	34.9
2nd to 4th birth	52.8	51.0	51.6	51.7	51.8
5th or higher birth	7.41	16.5	17.0	13.1	13.3
Child wanted at the time of birth	52.5	45.1	35.7	47.4	47.3
Mother's age at child's birth					
< 20 years	17.0	21.9	19.2	19.9	19.9
20–29 years	57.6	54.0	50.2	55.2	55.0
30+ years	25.4	24.1	30.6	24.9	25.0
Mother's education: years	7.02 (3.90)	4.97 (3.47)	4.61 (3.09)	5.73 (3.76)	5.70 (3.75)
Father's education: years (among present fathers)	6.80 (4.18)	4.60 (3.58)	3.66 (3.02)	5.41 (3.97)	5.37 (3.96)
Father's education missing	8.83	11.7	17.8	10.9	10.8
Household economic resources	0.620 (0.207)	0.504 (0.210)	0.478 (0.206)	0.546 (0.216)	0.545 (0.217)
Region North/northeast	23.5	50.7	40.8	39.9	39.8
Rural residence	20.8	26.5	27.1	24.4	24.6
<i>N</i>	1659	3052	247	4958	5038

*Source:* From author's calculations of DHS-3 data. Proportions and means based on weighted data, percentage bases unweighted. *Note:* Chi-square tests for categorical variables show statistically significant ( $p < 0.05$ ) differences across racial groups for measures of birth order, whether the child was wanted at the time of birth, mother's age at child's birth, father's education missing, region, and rural place of residence. Two sample *t*-tests for continuous variables show statistically significant ( $p < 0.05$ ) differences across racial groups in mother's education for Whites compared to Browns, and Whites compared to Blacks; for father's years of education across all three pair-wise comparisons; and for household economic resources across all three pair-wise comparisons.

have had uncomplicated previous pregnancies (Elo, 1992; Raghupathy, 1996). Turning to the other end of the age distribution, some studies have shown that teenaged women are less likely to obtain prenatal care (Bhatia & Cleland, 1995), but younger adult women may be more accepting of modern medical care and more educated than their older counterparts, leading them to obtain more care (Elo, 1992). For this analysis, I trichotomized mother's age at the time of the child's birth as less than 20 years old, 20–29 years old, and 30 years or older. In both countries, the majority of

children in both groups were born to women in their twenties, but non-White children were more likely to have either teenaged mothers or mothers who were at least 30 years old.

*Mother's education*, measured here as years of school completed, is well-established as a positive predictor of health care use (Filho, da Costa, & Ieno, 1994; Osis, Hardy, Faundes, & Alves, 1993). More educated women may make more efficient use of financial and other resources, have more control of these resources within the household, and may communicate more effectively

Table 3  
Distribution of characteristics for analysis of pregnancy-related care, South Africa 1998

	Analytic sample						Full sample
	White	Asian	Colored	Urban black	Rural black	Total	
Mother's race							
White	100.0	—	—	—	—	5.18	5.04
Asian	—	100.0	—	—	—	2.38	2.29
Colored	—	—	100.0	—	—	9.05	8.98
Urban black	—	—	—	100.0	—	35.9	36.0
Rural black	—	—	—	—	100.0	47.4	47.7
Child Age (years)	2.18 (1.41)	2.22 (1.38)	1.91 (1.40)	1.96 (1.46)	1.90 (1.40)	1.95 (1.42)	1.95 (1.42)
Birth Order							
First birth	40.6	36.1	35.2	36.3	29.6	33.2	33.1
2nd to 4th birth	59.1	53.5	57.9	54.3	45.9	50.9	50.6
5th or higher birth	0.38	10.3	6.92	9.47	24.5	15.9	16.3
Child wanted at the time of birth	77.2	69.3	47.9	46.1	41.7	46.4	46.5
Mother's age at child's birth							
< 20 years	4.92	8.41	16.2	15.8	19.4	16.8	16.7
20–29 years	68.1	62.4	55.3	50.5	46.5	50.2	50.1
30+ years	27.0	29.2	28.6	33.7	34.2	33.0	33.2
Mother's education: years	12.6 (2.36)	11.0 (2.34)	8.54 (3.13)	9.19 (3.38)	6.91 (4.06)	8.27 (3.95)	8.21 (3.98)
Father's education: years (among present fathers)	12.8 (2.34)	11.4 (2.27)	8.53 (3.66)	8.57 (3.76)	5.82 (4.26)	7.71 (4.42)	7.62 (4.46)
Father's education missing	4.14	1.70	43.4	45.6	38.6	38.9	38.9
Household economic resources	0.850 (0.114)	0.724 (0.155)	0.563 (0.234)	0.441 (0.232)	0.221 (0.193)	0.375 (0.272)	0.374 (0.271)
Region							
Western Cape	15.1	1.17	62.7	4.05	0.25	8.06	8.02
Eastern Cape	9.95	0.62	10.4	9.83	21.3	15.1	14.9
Northern Cape	3.22	0.00	13.8	1.50	0.16	2.03	2.04
Free State	7.88	2.12	1.93	8.16	3.74	5.34	5.15
KwaZulu Natal	11.6	77.3	2.01	15.9	28.2	21.7	21.9
North West	5.35	0.00	2.84	5.80	8.84	6.81	6.81
Gauteng	44.4	12.8	5.60	45.0	0.00	19.3	19.1
Mpumalanga	2.45	3.05	0.71	6.67	10.5	7.64	7.58
Northern Province	0.00	2.97	0.00	3.15	27.0	14.0	14.5
<i>N</i>	208	109	564	1450	2469	4800	5066

*Source:* From author's calculations of DHS-3 data. Proportions and means based on weighted data, percentage bases unweighted.  
*Note:* Chi-square tests for categorical variables show statistically significant ( $p < 0.05$ ) differences across racial groups for measures of birth order, whether the child was wanted at the time of birth, mother's age at child's birth, father's education missing, and region of residence. Two sample *t*-tests for continuous variables show statistically significant ( $p < 0.05$ ) differences across racial groups in child's age in years for Whites compared to Coloreds, Urban and Rural Blacks, and for Asians and Rural Blacks; for mother's and father's years of education across all pair-wise comparisons; and for household economic resources across all pair-wise comparisons.

with medical care personnel (Cleland & Van Ginneken, 1988). In addition, well-educated women may be employed in jobs with health care benefits that encourage the use of maternal and child health services.

There is significant racial inequality in educational attainment in both countries: in Brazil, mothers of White children have about 7 years of schooling, compared to close to 5 years for the mothers of Brown

and Black children. In South Africa, average completed schooling ranges from nearly 13 years for White mothers to only about 7 years for rural Black mothers. *Father's education* in years is also included, because better-educated men are likely to have more prestigious jobs and higher incomes than others, net of all else. I also include an indicator variable for children without information on their father's education. This indicator is a proxy for mother's marital status, since most of the children for whom father's education information is unavailable are living without a father present in the household. There is an even larger and significant difference by race in father's education than in mother's; among children with information on their fathers in Brazil, fathers of White children have 6.8 years of schooling, whereas fathers of Brown children have 4.6 years and fathers of Black children have only 3.7 years, on average. In South Africa, average years of schooling for fathers ranges from about 13 for White children to six for rural Black children. Non-White children are more likely to be missing information about their fathers, particularly Colored and Black children in South Africa, for whom the fraction approaches half.

*Household economic resources* are a very important determinant of prenatal and delivery care use. There is existing evidence, for example, that access to health care in Brazil (Da Costa et al., 1996; Medici & Campos, 1992), and its effective use (Travassos, 1995), varies according to family income. Economic resources could affect the demand for pregnancy-related health services because they can be used to purchase high-quality health care, and also to finance travel to health care facilities and child care for a mother's other young children. A household's level of economic resources is also likely to be positively associated with having some form of health insurance. The DHS surveys do not include information on household income, so I use a linear index of asset ownership indicators to represent wealth or long-term income, as has been done in recent child health studies (Filmer & Pritchett, 2001).<sup>12</sup> To create the index, a set of dichotomous variables indicating ownership of various items that represent household economic standing and resources, such as an automobile or a television, are subjected to a principle components analysis, and the scores that result after rotation of the principle factor

that emerges are used as weights to indicate the relative importance of each item. The weighted yes or no response for ownership of each item is tallied to create a total score across all items, and then the values are rescaled to range from 0 to 1. In the Brazil sample, the mean household economic resources score is 0.62 for Whites, 0.50 for Browns, and 0.48 for Blacks, while for South Africa, the mean household wealth score is 0.85 for White children, 0.72 for Asian children, 0.56 for Colored children, 0.44 for urban Black children, and only 0.22 for rural Black children. Households are situated within communities that also have varying level of economic and other resources. I include indicators of the geographical region of residence in both countries, and of rural residence in Brazil. Brazil can be divided into two major regions, the North/Northeast and the rest of the country, reflecting the considerable differences in available health infrastructure and sociodemographic characteristics for the people who reside in each region. While about one-quarter of White children in Brazil live in the North or Northeast, half of the Brown children and 41% of the Black children in this sample live in these less-developed regions. There are nine provinces in post-apartheid South Africa, characterized by wide variation in level of development, population composition, and health care infrastructure. Provinces that are largely comprised of former Black homeland areas are particularly disadvantaged, and are populated almost entirely by Blacks. For example, while 44% of White children live in the relatively highly developed province of Gauteng, none of the rural Black children live there. Asian children are concentrated in KwaZulu Natal, while the majority of Colored children live in the Cape provinces. Rural areas have underdeveloped infrastructure, and individuals living there may have to travel long distances to obtain care. In Brazil, about 21% of White children and 27% of non-White children live in rural areas. I have used rural residence to further define the racial groups in South Africa, so do not include a separate rural residence measure.

### Methods

This analysis is based on a two-level model that takes into account the clustering of children within communities, here represented by survey clusters.<sup>13</sup> Communities tend to be governed by similar socio-cultural norms and residents have similar access to health care infrastructure, making pregnancy experiences more similar within survey clusters than in those chosen at random. The determinants of women's use of

<sup>12</sup> Assets included in the index for Brazil are (ownership of): automobile, television, radio, refrigerator, washing machine, videocassette recorder, the number of maids, number of rooms in the dwelling, having electricity in the dwelling, and use of high quality building materials for the dwelling. Assets included in the index for South Africa are (ownership of): bicycle, motorcycle, automobile, television, radio, refrigerator, washing machine, and computer, having electricity in the home, and the use of high quality building materials in the construction of the home.

<sup>13</sup> Children are also clustered within households, but there are many households represented in the study by only one child so it was not useful to employ three-level multilevel modeling techniques in this analysis.

pregnancy-related medical services are explored using the generalized estimating equations (GEE) approach (Liang & Zeger, 1986), implemented as population-averaged logistic regression models using STATA 8.0 software (StataCorp, 2003). The Huber-White or “sandwich” estimator is used to correct standard errors for the effects of clustering. The multistage, clustered sample design of the DHS-3 survey also necessitates the use of sampling weights.

The general form of the two-level logistic regression model used in the analysis of early prenatal care and doctor at delivery and can be written as:  $\log [p_{ij}/(1-p_{ij})] = X'_{ij}\beta_1$ , where the dependent variable is the binary response,  $y_{ij}$ , that indicates whether child  $i$  living in community  $j$  received pregnancy-related services ( $y_{ij} = 1$ ), or that the child did not receive these services ( $y_{ij} = 0$ ). The probability that the child received these services is defined as  $p_{ij} = \Pr(y_{ij} = 1)$ , and the logit transformation of  $p_{ij}$  is a linear function of the covariates in the model, where  $X'_{ij}$  is a vector of fixed child and household characteristics and  $\beta_1$  is an associated vector of fixed parameter estimates.

In the multivariate analysis I estimate a series of two-level logistic regressions to assess the influence of each determinant on the pregnancy-related outcomes when all other predictors are controlled. In results not shown here, I estimated models with all possible interactions of mother’s race and other predictors, to determine whether determinants such as mother’s education or household wealth functioned differently for the members of different racial groups. There were few significant interactions between mother’s race and other explanatory factors, and none relevant to the main emphases of this analysis, so no interactions are included in the models discussed here.

## Results

Estimated odds ratios for the indicator of mother’s race are presented across models and outcomes in Table 4, with results for Brazil in the top panel, and for South Africa in the bottom panel. For both outcomes in Brazil and South Africa, Wald test

Table 4

Estimated odds ratios (and  $p$ -values) for mother’s race indicator: GEE logistic regression models of pregnancy-related care, Brazil 1996 and South Africa 1998

	Early prenatal care		Doctor at delivery	
	(1) Race Only Model	(2) Full Model	(1) Race Only Model	(2) Full Model
<i>Brazil</i> [White omitted]				
Brown	0.655 ( $<0.001$ )	0.935 (0.475)	0.670 ( $<0.001$ )	0.832 (0.127)
Black	0.637 (0.006)	1.04 (0.819)	0.632 (0.018)	0.849 (0.474)
Wald chi-square	23.5 ( $<0.001$ )	494.7 ( $<0.001$ )	14.7 (0.001)	531.7 ( $<0.001$ )
Wald test contrast	Chi-square (d.f.)	$p$ -value	Chi-square (d.f.)	$p$ -value
Model 2 – Model 1	478.3 (12)	$<0.001$	486.3 (12)	$<0.001$
<i>South Africa</i> [White omitted]				
Asian	0.614 (0.143)	0.744 (0.388)	0.153 ( $<0.001$ )	0.121 ( $<0.001$ )
Colored	0.227 ( $<0.001$ )	0.363 ( $<0.001$ )	0.091 ( $<0.001$ )	0.204 ( $<0.001$ )
Urban Black	0.118 ( $<0.001$ )	0.222 ( $<0.001$ )	0.076 ( $<0.001$ )	0.172 ( $<0.001$ )
Rural Black	0.079 ( $<0.001$ )	0.220 ( $<0.001$ )	0.027 ( $<0.001$ )	0.106 ( $<0.001$ )
Wald chi-square	170.0 ( $<0.001$ )	317.3 ( $<0.001$ )	196.2 ( $<0.001$ )	436.0 ( $<0.001$ )
Wald test contrast	Chi-square (d.f.)	$p$ -value	Chi-square (d.f.)	$p$ -value
Model 2 – Model 1	127.6 (18)	$<0.001$	185.7 (18)	$<0.001$

Source: From author’s calculations of 1996 DHS-3 data (Brazil);  $N = 4958$ ; and 1998 DHS-3 data (South Africa);  $N = 4800$ .

contrasts show that the full model represents a significant improvement over the race-only model. The odds ratios represent the relative likelihood of obtaining prenatal care in the first trimester or having a doctor present at delivery for children of Brown or Black mothers in Brazil, and children of Asian, Colored, Urban or Rural Black mothers in South Africa, relative to children whose mothers are White. The first column shows that in the race-only Model 1 for Brazil, Brown and Black children's odds of obtaining early prenatal care are only two-thirds as great as the odds for White children. Considering the *p*-value located just below the odds ratio in parentheses, we see that the odds ratio is statistically significantly different from 1, with a *p*-value of less than 0.001. In this analysis, estimates are considered statistically significant if they fall at or below a *p*-value of 0.05. In Model 2 for Brazil, which adds the other independent predictors, the odds are now 94% as great for Brown children and 104% as great for Black children relative to White children, but the racial group differences are no longer statistically significant.<sup>14</sup> Models of the presence of a doctor at delivery in Brazil show that Brown (OR: 0.83) and Black children's odds (OR: 0.85) are not statistically significantly different from those of White children after controlling for all the independent variables considered here, though there are significant differences in the race-only model. In other words, in Brazil there are racial group differences in women's utilization of pregnancy-related care, but these racial differences can be largely explained by accounting for differences in the demographic and socioeconomic conditions surrounding individual pregnancies.

The results for South Africa are notably different, with Colored (OR: 0.36) and urban and rural Black children (OR: 0.22) statistically significantly less likely than Whites to obtain early prenatal care, even after controlling for all the other predictors. The likelihood of having a doctor present at delivery is significantly lower for Asian (OR: 0.12), Colored (OR: 0.20), urban Black (OR: 0.17) and rural Black children (OR: 0.11), even after accounting for major differences in sociodemographic characteristics. For both outcomes, a substantial proportion of the racial disparity is explained by the predictors considered here, but the racial group differ-

<sup>14</sup>The full model for Brazil includes measures of child age in years, birth order, wantedness of the pregnancy, mother's age at child's birth, mother's and father's education, household economic resources, region and rural residence. The full model for South Africa includes measures of child age in years, birth order, wantedness of the pregnancy, mother's age at child's birth, mother's and father's education, household economic resources, and region of residence.

Table 5

Two level population-averaged logistic regression models of pregnancy-related care, Brazil 1996

	Early prenatal care	Doctor at delivery
Mother's race [White omitted]		
Brown	0.935 (0.475)	0.832 (0.127)
Black	1.04 (0.819)	0.849 (0.474)
Child age (years)	1.11 (<0.001)	0.931 (0.005)
Birth order [2nd to 4th birth omitted]		
First Birth	1.24 (0.025)	1.46 (<0.001)
5th or higher birth	0.426 (<0.001)	0.736 (0.029)
Child wanted at the time of birth	1.49 (<0.001)	1.06 (0.535)
Mother's age at child's birth [20–29 years omitted]		
< 20 years	0.646 (<0.001)	0.774 (0.020)
30+ years	1.45 (0.001)	0.856 (0.209)
Mother's education: years	1.09 (<0.001)	1.05 (0.008)
Father's education: years (among present fathers)	1.07 (<0.001)	1.08 (<0.001)
Father's education missing	0.737 (0.026)	1.37 (0.042)
Household economic resources	3.51 (<0.001)	4.17 (<0.001)
North/Northeast region	0.677 (<0.001)	0.202 (<0.001)
Rural residence	0.732 (0.005)	0.620 (0.001)
<i>N</i>	4958	4958

Source: From author's calculations of DHS-3 data. Note: Estimates are represented as odds ratios in the first row of each cell with *p*-values in parentheses below.

ences still remain statistically significant in the full model. Results for Models 2 for each outcome are presented in Table 5 for Brazil and Table 6 for South Africa, which display odds ratios and *p*-values for each predictor variable.

Table 6  
Two level population-averaged and multilevel GEE logistic regression models

	Early prenatal care	Doctor at delivery
<i>Two level population-averaged logistic regression models of pregnancy-related care, South Africa 1998</i>		
Mother's race [White omitted]		
Asian	0.744 (0.388)	0.121 (<0.001)
Colored	0.363 (<0.001)	0.204 (<0.001)
Urban Black	0.222 (<0.001)	0.172 (<0.001)
Rural Black	0.220 (<0.001)	0.106 (<0.001)
Child age in months	1.06 (0.056)	1.02 (0.392)
Birth Order [2nd to 4th birth omitted]		
First birth	1.05 (0.648)	1.0005 (0.996)
5th or higher birth	0.741 (0.062)	0.775 (0.086)
Child wanted at the time of birth	1.22 (0.019)	1.26 (0.020)
Mother's age at child's birth [20–29 years omitted]		
< 20 years	0.675 (0.006)	0.971 (0.846)
30+ years	1.27 (0.023)	1.66 (<0.001)
Mother's education: years	0.999 (0.935)	1.07 (<0.001)
Father's education: years (among present fathers)	1.03 (0.072)	1.04 (0.015)
Father's education missing	1.06 (0.734)	1.40 (0.079)
Household economic resources	2.88 (<0.001)	3.96 (<0.001)
Region [Western Cape omitted]		
Eastern Cape	0.649 (0.025)	0.720 (0.131)
Northern Cape	1.02 (0.897)	1.05 (0.820)
<i>Multilevel GEE logistic regression models of prenatal and delivery care, South Africa 1998</i>		
Free State	1.30 (0.230)	0.808 (0.411)
KwaZulu Natal	0.857 (0.474)	1.97 (0.003)

Table 6 (Continued)

	Early prenatal care	Doctor at delivery
North West	0.933 (0.750)	1.35 (0.214)
Gauteng	0.815 (0.346)	1.08 (0.746)
Mpumalanga	1.20 (0.396)	0.714 (0.187)
Northern Province	0.696 (0.121)	0.675 (0.135)
<i>N</i>	4800	4800

Source: From author's calculations of DHS-3 data. Note: Estimates are represented as odds ratios in the first row of each cell with *p*-values in parentheses below.

### Brazil

I discuss models for Brazil first, then consider models for South Africa and highlight the differences between countries. As shown in Table 4, after controlling for the predictors used here, there is no significant difference by mother's racial group in the utilization of pregnancy-related services in Brazil. Child's age in years, a marker of temporal changes in health services, is significantly positively related to the use of early prenatal care (OR: 1.11), indicating that children born relatively earlier were more likely to have been seen in the first trimester of the pregnancy. By contrast, the presence of a doctor at delivery appears to be more common among children born more recently (OR: 0.931). First births were more likely to have had early prenatal care (OR: 1.2) and a doctor at delivery (OR: 1.5), while fifth or higher births, as expected, were less likely to have early prenatal care (OR: 0.43) or to be delivered by a doctor (OR: 0.74). Pregnancies that were wanted were more likely to have early prenatal care, but there was no significant effect of wantedness on whether a doctor was present at delivery.

Mother's and household characteristics are strong predictors of the utilization of pregnancy-related medical care. Young mothers are significantly less likely to be seen in the first trimester (OR: 0.65) or to have a doctor present at delivery (OR: 0.77), while women over 30 are more likely to obtain early prenatal care than women in their twenties (OR: 1.5). Mother's educational attainment increases the odds of obtaining early prenatal care and being delivered by a doctor by between 5% and 9% per year of schooling, and father's educational attainment increases the odds of obtaining each service by between 7% and 8% per year of

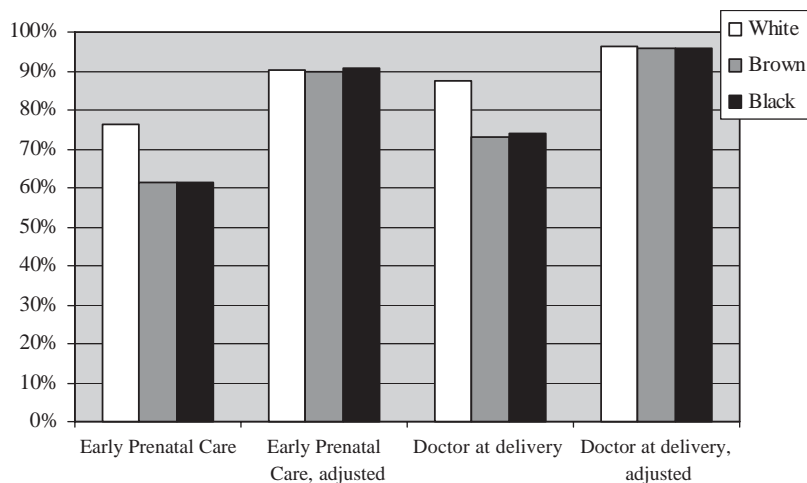


Fig. 1. Unadjusted and adjusted proportions of births receiving each type of pregnancy-related medical care, Brazil, 1996. *Note:* predicted figures are based on a child that was 2 years old, first-born, had a mother with 12 years of schooling who was 20–29 years old at the time of birth, who was born in an urban area of the rest of Brazil, was wanted at the time of birth, lived in a household at the 75th percentile of household economic resources, and was at the mean for father's years of schooling.

schooling. Children who are missing information on their fathers are less likely to receive early prenatal care (OR: 0.74), but unexpectedly, are more likely to have a doctor present at delivery (OR: 1.4), net of all else. This finding could reflect the move away from marriage by younger, higher status women in Brazil and more urban women, but deserves further investigation. Household economic resources are strongly and significantly positively associated with the use of pregnancy-related services in Brazil; the odds of obtaining early prenatal care are 3.5 times as great for children in the wealthiest household compared to children in the poorest household, and the odds of delivery by a doctor are 4.2 times greater in the richest as compared to the poorest households. The location of a household is an important predictor of the use of medical care during pregnancy: children born in the North/Northeast are less likely to receive early prenatal care (OR: 0.68), or to be delivered by a doctor (OR: 0.20), compared to those in the rest of Brazil. Rural residence also reduces the odds of obtaining early prenatal care (OR: 0.73) or delivery by a doctor (OR: 0.62), net of all else.

To better illustrate the degree to which racial group differences can be explained by the predictors examined in this analysis, Fig. 1 shows the percentage of births that received early prenatal care and had a doctor present at delivery for each racial group, comparing the unadjusted percentages with those adjusting for the characteristics included in the full multivariate models. For both outcomes, adjustment eliminates almost all of the racial group difference. The adjusted results, predicted on the basis of Model 2, show that about 90% of all children would have received early

prenatal care and more than 95% would have been delivered with the assistance of a doctor, if all children in the sample were 2 years old, were first births, had a mother with 12 years of schooling who was 20–29 years old at the time of birth, were born in an urban area of the rest of Brazil, lived in a household at the 75th percentile of household economic resources, were wanted at the time of birth, and were at the mean for father's years of schooling.

#### South Africa

For the purposes of this analysis, the major finding of Table 6 is that after controlling for all other factors, children of non-White mothers are still much less likely to obtain pregnancy-related services than children of White mothers. Other independent variables also had important effects: early prenatal care appears to have been more common among children born earlier in the period covered by this sample (OR: 1.1), as is the case for Brazil, but there do not appear to have been significant changes in the presence of doctors at delivery over the 5-year period covered here.<sup>15</sup> In contrast to the results for Brazil, birth order is not associated with the use of pregnancy-related services

<sup>15</sup>The lack of a secular increase in medical pregnancy care use over the post-apartheid period is surprising in light of the tremendous political changes occurring in South Africa over the period of births covered by the survey, but probably reflects the scope of the changes required and the continuing lack of resources necessary to address disparities in access to care and quality of care available.

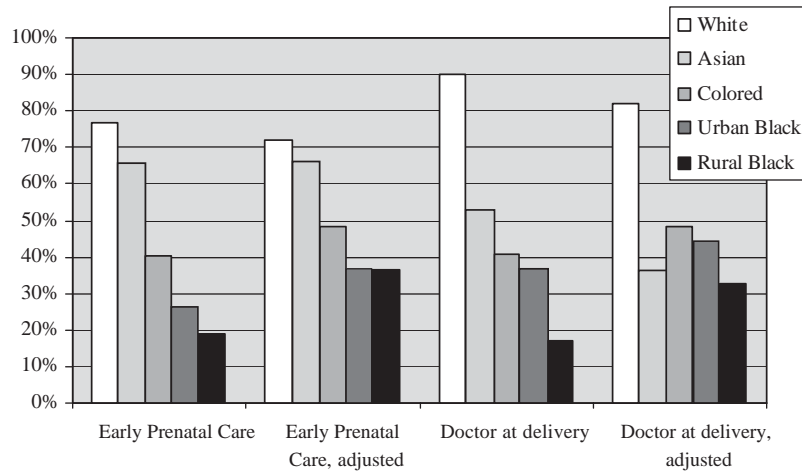


Fig. 2. Unadjusted and adjusted proportions of births receiving each type of pregnancy-related medical care, South Africa, 1998. *Note:* Predicted figures are based on a child that was 2 years old, first-born, had a mother with 12 years of schooling who was 20–29 years old at the time of birth, who was born in Western Cape province, was wanted at the time of birth, lived in a household at the 75th percentile of household economic resources, and was at the mean for father's years of schooling.

in South Africa at conventional levels of statistical significance, but pregnancy wantedness is positively associated with utilization of early prenatal care (OR: 1.2) and having a doctor at delivery (OR: 1.3).

Young mothers are significantly less likely to obtain early prenatal care (OR: 0.68) and older mothers are significantly more likely to receive care in the first trimester (OR: 1.3) and to have a doctor present at delivery (OR: 1.7) than mothers in their twenties. For each additional year of mother's schooling, the odds of having a doctor present at delivery increase by 7%, but mother's education is not related to the use of early prenatal care. In South Africa each additional year of father's schooling increases the odds of having a doctor present at delivery by 4%. In contrast to the case of Brazil, missing father's information does not have a significant effect on the odds of receiving either type of care.<sup>16</sup> Household economic resources play a large role, as they do in the models for Brazil: the odds of receiving early prenatal care are 2.9 times as great and those of having a doctor at delivery are 4.0 times as great for children in the wealthiest household as compared to those in the poorest household. There are some statistically significant differences in service use by

province: children from Eastern Cape (OR: 0.6) are less likely to receive early prenatal care, and those in KwaZulu-Natal are more likely to have a doctor present at delivery (OR: 2.0) compared to those in Western Cape, when all else is controlled. These province-specific effects are difficult to interpret because I include no specific information about women's access to care within each province, and province indicators included mostly as controls for unmeasured factors at the regional level.

Fig. 2 shows the proportion of South African births from each racial group that received each form of pregnancy-related service, comparing unadjusted with adjusted proportions as for Brazil in Fig. 1. In sharp contrast to the results for Brazil, adjustment reduces, but does not eliminate, racial disparity. The adjusted results, based on Model 2, show that just above 35% of urban and rural Black children, almost 50% of Colored children, about 65% of Asian children and more than 70% of White children would have received early prenatal care if all children in the sample were 2 years old, were first births, had a mother with 12 years of schooling who was 20–29 years old at the time of birth, were born in Western Cape province, lived in a household at the 75th percentile of household economic resources, were wanted at the time of birth, and were at the mean for father's years of schooling. Under these conditions, about one-third of Asian and rural Black children, about 45% of urban Black children and nearly 50% of Colored children, and more than 80% of White children would have been delivered with the assistance of a doctor.

<sup>16</sup>It is possible that though the child's father is no longer present in the home in South Africa, mothers receive resources from him. Alternately, mothers have other means of obtaining resources that may include employment, fostering children out, or other arrangements. In South Africa, it is much more common for women not to have information about their child's father, so the impact may be lower than in Brazil, where female-headed families are less common.

## Discussion

This analysis has shown that racial group differences in socioeconomic characteristics and the demographic characteristics prevailing at the time of a given pregnancy account for a considerable amount of the observed racial disparity in the use of pregnancy-related medical care in Brazil and South Africa. However, even after controlling for these compositional differences, I find that non-White children in South Africa were much less likely than their White counterparts to have had early prenatal care or to have been delivered in the presence of a doctor. Remaining unexplained racial variation in the use of pregnancy care could have several sources, including poor measurement of included predictors, preferences not taken into account in this study, and the effects of persisting discrimination against non-White women in South Africa, despite the official end of the apartheid system.

Poor measurement of several key predictors is a possibility, particularly for household economic resources and conditions prevailing in the geographic area or type of place of residence, and there are also several potential omitted predictors. First, as noted above, household economic resources are measured in this analysis using a linear index of asset ownership, not a direct measure of income or expenditure. Also, while I have included indicators of province and of rural residence, these are rather limited controls for the considerable variety in levels of health-related infrastructure across each country. Further work should attempt to include measures of availability of prenatal and delivery care services, including the presence of doctors and other health personnel. Alternatively, future surveys could directly ask women about their access to these services. In addition, there are several indicators that were not measured in the ideal time frame; information about pregnancy wantedness was obtained after the child's birth, and some household characteristics were measured at the time of the survey, not during the pregnancy period or at the time of birth.<sup>17</sup>

An potential omitted variable in this analysis is a measure of medical aid or health insurance coverage during the pregnancy and at the time of birth. While I can measure characteristics known to be associated with

insurance coverage, such as parental education, an explicit indicator would probably account for some of the remaining non-White disadvantage in South Africa. Medical aid schemes in South Africa, which cover about 17% of the population, are available to employed persons who pay into funds that are supplemented by their employer (Torkington, 2000). The cost is based on the number of dependents of the primary members, and is prohibitive to those who have many dependents and receive low wages. In a recent survey of health care in South Africa, only about one in ten Blacks had access to medical aid coverage, compared with about three in four Whites (Smith, Solanki, & Kimmie, 1999). Among those with high socioeconomic status, 53% had medical aid coverage, compared with only 2% of those with low status. Furthermore, even within categories of socioeconomic status, Whites were more likely to have coverage. Future work would benefit from explicit controls for health insurance coverage, which is strongly linked with the quality of care available and ease of access.

This analysis does not control for the selection effect induced by women's experiences with previous pregnancies, particularly negative experiences that could increase the use of medical pregnancy care. Other studies have shown that women experiencing difficulties, a fetal loss or a neonatal death in earlier pregnancies are more likely to obtain pregnancy care for their later pregnancies (Bhatia & Cleland, 1995; Clarke, Miller, Albrecht, Frentzen, & Cruz, 1999; Echevarria & Frisbie, 2001). To address the possibility of negative selection, I conducted additional analyses for each country, using relevant indicators as they were available in these data. In results for Brazil (not shown here), I controlled for mothers' reports of prolonged labor, excessive bleeding, high fever/discharge, and/or convulsions during any birth prior to the birth in question. In models for South Africa (not shown here), I included the number of previous pregnancy losses as a predictor of pregnancy-related medical service use. The results from these additional analyses, available from the author on request, show that complications experienced during a previous birth did not increase women's use of early prenatal care or increase the likelihood that a doctor would be present at delivery in Brazil. The number of previous pregnancy losses did not increase women's use of early prenatal care in South Africa, but it was positively associated with having a doctor present at the time of delivery. The results suggest that a history of serious obstetrical complications could increase the likelihood of receiving some forms of pregnancy-related care, particularly at the time of birth. However, this conclusion is based on incomplete birth histories, and more conclusive results will depend on data that take account of all of a woman's pregnancies, as well as the timing of onset for complications and the use of medical care.

<sup>17</sup> Women's perceptions of the wantedness of their pregnancy may have changed after the child was born; however, this seems to be somewhat unlikely given the relatively large fraction of women who reported that the pregnancy had been mistimed or unwanted. Ideally, women would be asked prior to, or at the time of, becoming pregnant about their desires for more children, then followed prospectively to measure their use of pregnancy-related services. The same is true for measures of father's presence in the household, parent's educational attainment, household wealth, and place of residence.

Unmeasured preferences of users and of medical care providers in South Africa may also make a contribution to lower use among non-White women. Due to data limitations, this analysis has not considered the possibility that demand for prenatal and delivery care is lower among non-White women because they have had poor experiences with health care in the past. Qualitative research has shown that Black and Colored women may begin to attend for prenatal care relatively late in their pregnancies because they do not see the value of prenatal care, aside from it being necessary for facilitating access to care during delivery (Abrahams et al., 2001). Poorer women with relatively low access to information may not know the optimal time to “book,” or to initiate prenatal visits and register for assistance at the time of birth, and may receive inaccurate information from health service personnel, whom patients view as unhelpful or even abusive (Joyce & Grossman, 1990). Certainly, this could help to explain the lower likelihood of initiating prenatal care early, but probably has less effect on the likelihood that a doctor will attend the delivery.

The preferences of care providers may also influence women’s use of pregnancy-related services. One South African study showed that by adapting the health system to make use of existing patient behavior patterns, it was possible to shift the commencement of prenatal care to an earlier gestational age (Jeffery et al., 2000). Investigators in the province of Gauteng offered women a one-stop pregnancy confirmation and first prenatal visit clinic, and were able to identify that about one in five women had conditions that may have compromised their pregnancies if they had delayed care. However, the staff at one site was reluctant to offer the one-stop services because they felt that their workload would be excessively increased. This finding highlights the importance of the perceptions of primary care providers in the implementation of changes in the provision of pregnancy-related services. Since non-White women are most likely to use primary care services that are free, while Whites are more likely to use private services that are more adequately staffed, provider attitudes about changes in free services could affect non-Whites disproportionately. In addition, the concentration of doctors and other health professionals in urban centers with high quality medical facilities reflects their preferences for working under these conditions. The distribution of doctors under apartheid along color-area lines has probably made the racial disparity in access to a doctor for delivery greater than in Brazil, where resources were not targeted explicitly on the basis of racial groups.

Aside from potential measurement problems and the structural discrimination that lingers into the post-apartheid period, it is also possible that persisting historical patterns of interpersonal discrimination may

explain some of the remaining racial disparity in the use of pregnancy-related care. Direct discrimination by a doctor could affect which women are attended at delivery, but the role of interpersonal racial discrimination in affecting women’s access to early prenatal care is less obvious. Future studies could explore potential mechanisms by which face-to-face discrimination against non-Whites within the health care system or through other avenues might be creating racial disparity in pregnancy service use.

While racial group disparity in pregnancy-related care utilization is a compelling focal point, this study has also revealed several determinants of medical care use that are present across the social contexts studied here and elsewhere, such as the United States (Echevarria & Frisbie, 2001). This study and others underscore the importance of inequality in the distribution of sociodemographic characteristics that influence the use of care among all women, regardless of the racial makeup of a given society. Individuals are placed at risk of multiple poor health outcomes, such as poor pregnancy or birth outcomes, by fundamental social causes like socioeconomic status (Link & Phelan, 1995). Racial and socioeconomic inequality in the use of preventive reproductive health services provide evidence of the importance of these fundamental causes. Mother’s and father’s education strongly and positively influence the likelihood that a doctor will be present at delivery in both Brazil and South Africa, and parent’s education increases the likelihood that a woman will obtain early prenatal care in Brazil, though it does not have an independent effect in South Africa. Household economic resources have a strong positive impact on the use of pregnancy-related care in both countries, and there are regional differences in the use of services and lower use in rural areas, suggesting that the inequitable geographic provision of medical pregnancy-related services also has an effect on utilization.

Understanding continuity and variation in the impact of these social determinants of medical pregnancy care use will require a deeper look than is possible with the data used here. In South Africa, for example, a woman’s educational attainment may not be as important as having the household economic resources necessary to afford the travel and time away from work or childcare responsibilities that an early prenatal visit represents. The placement of medical prenatal care services may not be as adequate across the South African population as it is in Brazil, or information about the importance of using prenatal care early in the pregnancy may not have been as successfully disseminated. Alternatively, women in different societies and subpopulations of these societies may have health-related beliefs that compel them to delay medical prenatal care (Chapman, 2003). The findings of the present analysis and others suggest

that while fundamental social and economic factors underlie many health-related outcomes, it is important to be sensitive to possible variation in the impact of sociodemographic resources on the utilization of medical care across different socio-historical contexts and different outcomes.

In addition, equalizing the distribution of pregnancy-related medical services may not necessarily reduce disparities in service use if more fundamental social determinants are not addressed. For example, previous research in Brazil has shown that secular improvements in pregnancy-related medical services have not benefited the poor and underserved, nor reduced socioeconomic or racial group disparities in maternal and child health. Despite maternal and child health interventions targeted to the relatively poor state of Ceara in Northeast Brazil in the late 1980s and early 1990s, inequity between the rich and poor in disease frequency and infant mortality remained largely unchanged over the period (Victora, Vaughan, Barros, Silva, & Tomasi, 2000), and inequality in the distribution of income also failed to decrease. Together, the evidence seems to indicate that improvements in health services may disproportionately benefit those who least need them, the families with relatively high levels of socioeconomic resources (Da Costa et al., 1996). Such findings do not point toward rapid increases in equality across racial and socioeconomic groups in the use of pregnancy-related medical care in South Africa, even though the state-sponsored apartheid mechanisms promoting racial inequality in life chances and medical care access have been dismantled, and general improvements in primary health care services are being emphasized. The case of Brazil suggests that eradication of racial inequalities in basic household resources and the availability of medical care could greatly reduce or eliminate racial disparity in care use, but that racial and socioeconomic disparity in levels of living has persisted in the long post-abolition period, even without structures designed to uphold it. Targeting medical care resources directly to those groups of the population who are particularly underserved, or addressing the unequal distribution of social and economic resources that strongly influence the use of care, may be necessary before inequality in women's use of pregnancy-related care can be reduced (Victora et al., 2003).

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