School-Based Health Centers and the Decline in Black Teen Fertility During the 1990s in Denver, Colorado

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Objectives. We examined the changes in Black adolescent fertility rates in high-school areas with school-based health centers and compared them over time with changes in rates in high-school areas without school-based health centers.

Methods. Fertility rates were estimated for high-school areas with and without school-based health centers with geocoded birth certificate and school enrollment data.

Results. A high adolescent fertility rate (165 births/1000) in 1992 among Black students in Denver high-school areas with school-based health centers declined to a low rate (38/1000) in 1997 that matched the rate of school areas that did not have school-based health centers. Rates declined for both types of areas over the study period, but the rate of decline in the areas with school-based health centers was significantly greater (77% vs 56%).

Conclusions. The rapid and significant decline in Black adolescent fertility in school areas with school-based health centers strongly suggests that attending to the health needs of students at risk of pregnancy resulted in a radically lowered risk of fertility. The decline is likely the result of strategies to identify, intervene, and follow-up on students engaging in behaviors that place them at risk for unintended pregnancy. (*Am J Public Health.* 2006;96:1588–1592. doi:10.2105/AJPH.2004.059816)

After peaking in the early 1990s, adolescent fertility rates have declined markedly in the United States in recent years. In particular, the Black adolescent fertility rate in the United States at the end of the 1990s was dramatically lower than at the start of the decade. The National Center for Health Statistics reported a 26% decline in the fertility rate for Black adolescents between 1991 and 1997, from a high of 84.1 births per 1000 adolescents aged 15–17 years to a low of 60.8 just 6 years later (Figure 1).[1] In Colorado, the decline in fertility rates among Black adolescents was even greater. From a high of 83.7/1000 in 1991, virtually the same as the US rate, Colorado's Black adolescent fertility rate dropped to 45.3/1000 in 1997 (Figure 1). This rate was more than 15 points lower than the US rate, representing a decline over the same period of 46%. Colorado's decline was the steepest of any state in the nation for this period (S. Ventura, National Center for Health Statistics, oral communication, December 2001).

In Denver, the decline surpassed the Colorado decline. Between 1991 and 1997, the Denver Black adolescent fertility rate dropped by 50%, from 109 to 55/1000, whereas the rest of the state dropped by only 36% (from 64 to 41 [Figure 1]). At the beginning of the decade, Denver's Black adolescent population contributed nearly 60% of the Black adolescent births in the state; by 1997, its contribution dropped to 45%. Since 1997, the Denver Black adolescent fertility rate has continued to fall, reaching an estimated 48/1000 in 2003. Colorado's rate also has fallen, reaching 32.9/1000 in the same year.

We examined the decline in Black adolescent fertility that occurred in Denver between the early 1990s and 1997 and explored the decline's association with the hosting by Denver schools of school-based health centers (SBHCs), an innovation that had appeared in the city's high schools by 1989. School attendance boundaries changed in 1997 with the resolution of a federal court case that had required busing for racial integration, which necessitated ending the analysis with that year.

Because of the prevalence of health risk behaviors among teens and an emerging understanding of the many health issues affecting adolescents, interventions have focused on the school setting as a logical delivery point. Provision of comprehensive physical and mental health care can be accomplished effectively by locating services in schools. Barriers to access are reduced, and confidentiality, compliance, early identification of risk factors, and follow-up are increased when services are made available at school.[2,3] When SBHCs are well implemented, large numbers of students will use their services.[4] Because they use population-based health promotion strategies, SBHCs alter the school's social climate by supporting healthy behavior even for those students who do not use the direct health care services.

The adoption of SBHCs has grown on a national scale, and Colorado has led in establishing SBHCs. By 1999, there were 33 SBHC sites in Colorado, and during the 2001–2002 school year, 1 out of every 13 Colorado public-school students was estimated to have access to an SBHC.[5]

SBHCs have been controversial in some communities, with the potential for provision of reproductive health services being the top concern of opponents.[6,7] At the same time, health care providers, concerned about the consequences of adolescents forgoing reproductive health care,[8] have been intrigued by the potential for delivering these services in an accessible environment. Within the current political climate and policy context, SBHCs face institutional and logistical barriers to providing recommended reproductive health care. Although over 90% of centers report providing a broad array of reproductive health services, most offer contraception only off-site by referral, which is the case with the Denver SBHCs.[9]

During the 2001–2002 school year, the 7 SBHCs located in Denver high schools provided services to 3833 high-school

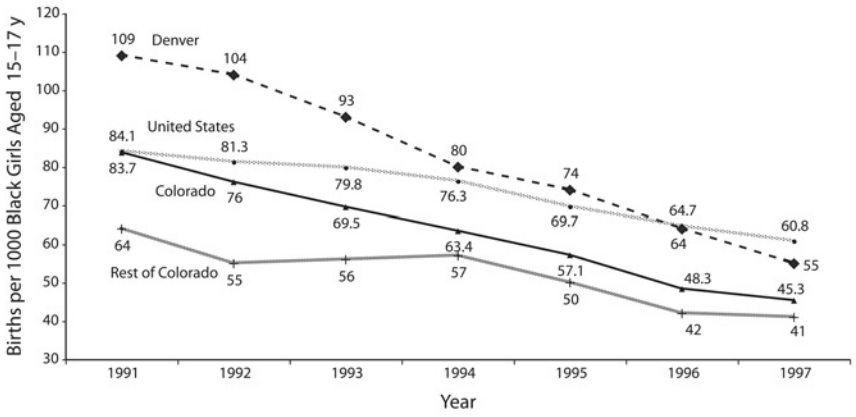


FIGURE 1—Fertility rates of Black female adolescents aged 15–17 years in Denver, Colorado, in the rest of Colorado, in Colorado as a whole, and in the United States: 1991–1997.

student users who made 15 628 visits to the centers for services, averaging 4.1 visits each. No fees were charged for care delivered through the centers.

METHODS

School-Based Health Centers in Denver

Of Denver's 10 high schools, 3 hosted SBHCs continuously during the 1990s. East, Lincoln, and Manual high schools established centers in 1989. Four Denver high schools did not have centers during the 1990s: Thomas Jefferson, South, George Washington, and West (although West established a center in the fall of 1999). Denver therefore presents a setting where adolescent fertility can be examined in relation to the presence or absence of an SBHC (Denver's 3 other high schools established SBHCs later in the decade; 1 in 1993 and 2 in 1995. These were not operating long enough to have relevant data, and were not included in the analysis).

SBHC services included: health maintenance exams, with health screening, psychosocial histories, and counseling for behavioral risk reduction; immunizations; diagnosis and treatment of acute illnesses and injuries; acute management of chronic conditions; pregnancy testing; abstinence and birth control counseling; gynecologic exams; diagnosis and treatment of sexually transmitted disease (STD); and mental health and substance abuse services. None of the high schools in Denver provided contraceptives or prescriptions for them on-site, in compliance with an agreement with the Denver School Board. However, center providers offered full gynecologic exams and birth control counseling and referred students needing contraceptive supplies to the city's neighborhood health centers, where students were not required to undergo further examinations, visits were confidential, and an ability-to-pay scale used the adolescent's income to determine fees.

Measures

We used birth certificate data for all 932 births that occurred between 1991 and 1997 among young Black women aged 15–17 years who were residents of Denver. The data were geocoded to the 10 high-school areas for the city, so that the number of births in each high school's attendance area in each year could be determined. The geographic area for each high school included the neighborhood around the school and the areas from which students were bused to that school. Each birth that occurred among 15- to 17-year-old Black female residents in the study's 7 high-school areas was assigned to its corresponding high school.

Black adolescent births were selected for analysis because of the unprecedented drop in the Colorado and Denver rates in the 1990s, a phenomenon that demanded explanation. Hispanic adolescent fertility was not selected because rates were dependent on accurate population figures as well as numbers of births, and explosive growth in the immigrant Hispanic population during the 1990s made determining the numbers of adolescent girls difficult. School enrollment was not a useful proxy, because Hispanic students were sometimes not enrolled in school and had high dropout rates.[10]

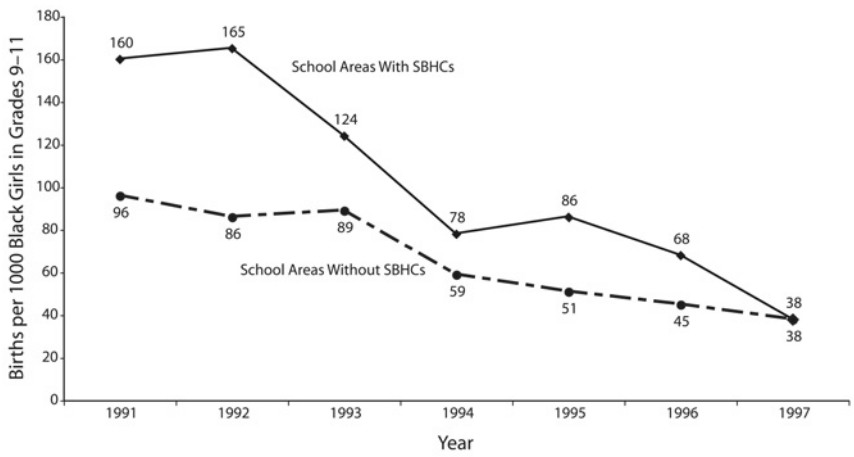
Fertility rates (births per 1000 female adolescents) were calculated for each year for each high-school area. Birth certificate data provided the numerators (births). The denominators (female adolescents) were taken from Denver Public School enrollment data required by law to be collected by each school annually in October. The number of Black female students in grades 9–11 was totaled for each year for each of the high schools as an estimate of the number of female adolescents. Fertility rates were calculated by dividing the number of births each year by the number of students enrolled in school the previous October, representing the "pool" among which births could occur, and then multiplying the result by 1000. Overall Black female adolescent enrollment in the 7 schools during the time span of the study (1990–1997) varied from 964 to 1056.

The denominators understate the number of Black female adolescents, as they exclude adolescents in schools outside the Denver school system or not in school at all. The numerators include all births to all Black adolescents. Therefore, the estimated fertility rates overstate actual fertility rates. Because we used the previous fall enrollment figures, students who may have dropped out of school because of pregnancy could be counted in the denominators. The number of other unenrolled adolescents is unknown.

For school years 1990–1991 through 1996–1997, fertility rates among Black female students who attended high schools with SBHCs (East, Manual, and Lincoln) were aggregated and compared with fertility rates among Black female students who attended high schools without SBHCs (George Washington, West, South, and Thomas Jefferson).

RESULTS

Black adolescent fertility rates were first calculated for the 3 high schools (East, Lincoln,



Note. SBHC = school-based health center.

FIGURE 2—Black adolescent fertility rates in school areas with and without school-based health centers during the entire period of 1991–1997.

and Manual) that had comprehensive SBHCs. In the following discussion of differences in fertility rates, the phrase "schools with SBHCs" is a shortened label for "high-school attendance areas that contain schools with SBHCs." These schools had been selected to have SBHCs on the basis of community task force recommendations that considered ethnic composition, financial need, and health and social conditions as criteria.[11] These schools were generally determined to have the highest enrollment of "at-risk" adolescents.

The Black adolescent fertility rate for the 3 high-school areas together was 160 births per 1000 female students in 1991 and 165 in 1992 (Figure 2). In 1993, the rate dropped to 124, and in 1994 it dropped again to 78, a decline of 37% in a single year. In 1995, the rate was 86; in 1996 it declined to 68; and in 1997, it dropped to 38. In 1992, 56 births were attributed to 340 Black female students in the 3 schools; in 1997, the number of births fell to 19, attributed to 504 students. Between 1992 and 1997, the Black adolescent fertility rates at these 3 schools fell by 77%.

Black adolescent fertility rates were also calculated for the 4 high schools (Thomas Jefferson, George Washington, South, and West) that were not chosen to host SBHCs because their student populations were determined to be at lower risk. In 1991, the rate was 96 for the 4 schools (Figure 2). In 1992, the rate was 86, and in 1993 the rate was 89. Then, in 1994, the rate dropped to 59, and continued a downward trend to 38 in 1997. In 1992, 44 births were attributed to 514 students; in 1997, the number of births fell to 21, attributed to 552 students. Between 1992 and 1997, the rate fell 56%.

In 1992, the adolescent fertility rate for schools with SBHCs was 165, compared with 86 for schools without centers. These rates are significantly different by Fisher exact test ($P=.0007$). In 1997, the rate for both settings was 38 (and the rates are not significantly different [Figure 2]).

Regression lines were fit to the fertility rates for each type of school. The slopes of the two regression lines were significantly different at the 0.05 α level, using an F test to test the assumption that the regression functions for the 2 lines were not identical, and an additional F test to determine whether the slopes of the regression lines were equal.[12]

It should be noted that, during the time period of this study, there was an increase in the dropout rate of Black female students enrolled in the 3 schools with SBHCs. The dropout rate of Black female students in the 4 high schools without SBHCs decreased. Therefore, the rates that were calculated for 1997 may overestimate the actual fertility rate for school areas with SBHCs, and underestimate the actual fertility rate for the school areas without SBHCs, relative to the 1992 rates.

DISCUSSION

Between 1992 and 1997, the Black adolescent fertility rate fell among students attending Denver high schools with and without school-based health centers. The fertility rate of students who attended schools with SBHCs fell by 77%, a 5-year decline from a high of 165 to a low of 38 births per 1000 adolescents. The adolescent fertility rate also fell over the same period among adolescents attending schools without SBHCs, from a high of 96 in 1991 to a low of 38 in 1997. What is remarkable about these changes is that the rates at the end of the period are the same for adolescents in the "at-risk" schools, which fell to the same rate as that for schools whose student bodies were considered at lower risk.

Among the 3 "at-risk" schools, 20%–25% of students were identified as Black, with the largest number attending East and Manual. Between 1989–1990 and 1996–1997, enrollment in the SBHCs by Black female students averaged 56%, and was as high as 78% at East High, 70% at Manual, and 93% at Lincoln in some years. A study in Denver inclusive of the same time period as this study found that students averaged 5.3 visits per year to the SBHCs (unpublished data). Black students averaged twice as many visits—10.6 per year. Furthermore, Black students on average made far more visits per year to the SBHCs than they did to Denver's neighborhood health centers (3.4 visits). Black adolescents were more likely to visit the neighborhood health centers for reproductive health care, whereas they were more likely to visit the SBHCs for health maintenance and mental health services.[13]

Individual clinical services were key in identifying and intervening with students at risk for too-early sexual activity and pregnancy. About 20% of student visits each year were for preventive health exams, which included a personal health survey identifying health risk behaviors, including unprotected sexual intercourse.[14] Providers reviewed identified risk behaviors with the student, prioritized health problems, counseled on changing behavior, and planned for follow-up. When risk for pregnancy was identified, the practitioner offered a pelvic examination, screened for STDs, and counseled on birth control.

When appropriate, the practitioner referred the student to a community provider for contraceptive methods.

Denver's SBHC clinical program was effective in focusing on early identification of and aggressive intervention for key health risks, including sexual behavior. A 1990–1993 study, comparing care provided in Denver's SBHCs with that provided in a health plan, found higher rates of documented screening and anticipatory guidance for pregnancy risk (3.5 times the frequency), sexual activity (twice the frequency), and STD risk (almost five times the frequency) than in the health plan.[15]

A measure of the SBHCs' clinical quality was established to track the proportion of students referred to community sources of care for contraceptive methods who actually "make and keep" an appointment. Research shows that SBHCs can be effective in increasing referral completion[16]; during the study period, the SBHCs achieved a referral completion level of 72%.

The SBHCs at East, Manual, and Lincoln high schools were uniquely designed and staffed to address the needs of adolescents. Services included health promotion programming—a population-based strategy that addressed common health risks among students that used and did not use the direct health care services. The SBHC staff worked with school staff to implement classroom-based curricula, as well as school-wide and targeted activities to raise awareness about student health needs and risks, promoting use of SBHC services to address the common health risks among students, and strengthening the school climate in support of student health. These activities included many student-led activities, such as campaigns to prevent drinking and smoking that used hallway posters, writing and art contests, newsletters for parents and students, health fairs, morning public address announcements, and improvisational theater.

Although studies have demonstrated that providing contraceptive services in schools does not increase sexual activity, the impact on contraceptive use and pregnancy rates has been mixed.[17–20] Likewise, evidence of the relative effectiveness of providing these services on-site versus by referral has been mixed.[21,22] The present study provides evidence that adolescent births may be impacted by intensive educational and counseling services in the school, and by using established formal referral links to community sources of care.

The decline in the fertility rate for the 3 schools with SBHCs was not achieved until about 4 years after the centers opened. Historically, SBHCs reach full utilization by students after 2–3 years. After those first years had passed in Denver, declines in the adolescent fertility rate occurred in 4 of the next 5 years.

The 56% decline in adolescent fertility that occurred in the 4 schools without SBHCs can be considered a secular trend. The trend in Colorado and the United States was downward over the same period. The trend might well have occurred in the 3 schools with SBHCs over the period, whether or not SBHCs had been established. If this had been the case, the rate of 165 might have been expected to fall by 56%, to a rate of 73/1000. The rate actually was reduced to 38—effectively one half of the expected rate.

Study Limitations

This study contains some data limitations. Not all births to young Black residents of the city of Denver occurred among Denver public school students. Some may have occurred among students attending private high schools, and some among adolescents that no longer attended high school, even in the year before the year of birth. Some may have occurred among students whose address was associated with a Denver high school, but who actually attended a different Denver high school (the district allowed open enrollment after 1989, but few students took advantage of this little-known policy [E.G. Berman, Denver School Board member, Denver Public Schools, oral communication, April 15, 2005]). Some may have occurred to adolescents whose residence was shown as Denver County, but whose address could not be geocoded, or was geocoded to a different county.

Enrollment in private schools is limited to a small percentage of Black female 15- to 17-year-old students in Denver. Census data for 1990 show 5.3% of this population enrolled in private schools (C. DeGroen, Colorado Department of Local Affairs, State Demography Office, written communication, May 2, 2005)—little different from the 4.9 percent of Black females in grades 9–12 enrolled in private school in the 2000 Census.[23] Moreover, alternative public schools in Denver lost Black female enrollment between the fall of 1991 (146) and the fall of 1996 (37), sending these students back to their local high schools.

An improving economy that benefited Black residents may have contributed to the dramatically declining birth rates among Black adolescents. Between 1991 and 1997, Denver's overall unemployment rate fell by one third, to 4.0%.[24] At the same time, the state Black unemployment rate fell by one quarter, to 6.9%[25] (Denver data are unavailable), whereas the labor force grew by 20%.[25] Other data available only at the national level show that unemployment among Black adolescents, aged 16–19 years, declined by 18% over the 1992–1997 period.[25]

An alternative reason for decreasing fertility rates might be increasing abortion rates. However, the SBHCs, by policy, did not provide abortion services, and data on the number of abortions reported for Black Denver adolescents show a decline from 32 in 1991 to 16 in 1996. This drop mirrors national data showing steadily declining numbers and rates during the 1990s.[26]

We were not able to determine a direct causal link between the precipitous drop in Black adolescent birth rates and the specific use of the community- and school-based health care services available to Denver's Black adolescents. However, high rates of SBHC utilization among Black adolescents have been documented elsewhere.[13] Although the authors of that study were unable to track other sources of care outside the SBHC, no new neighborhood health centers opened in the area during the study period.

These data limitations are not considered to have significantly affected the results of the study, and there is no other obvious explanation for the disproportionate drop between the 3 high schools with SBHCs and the 4 schools without them.

Conclusions

The Black adolescent fertility rate declined by 26% in the United States between 1991

and 1997, during which time Colorado's Black adolescent fertility rate declined by 46%, the largest of any state for that period. Colorado's decline was driven by Denver, where the rate fell by 50%, substantially greater than the 36% drop in the rest of the state. The changes in the Colorado and Denver rates were large and unprecedented.

Beginning in 1989, Denver schools began establishing SBHCs. By 1997, the adolescent fertility rate had declined by 77% in the first 3 high schools selected for centers, a decline significantly greater than the decline that occurred in schools without centers, strongly suggesting that attending to the health needs of students resulted in a radically lowered risk of pregnancy and birth for those students. We postulate that the decline in the fertility rate in schools with SBHCs is the result of program strategies to increase access to health care: population-based health promotion and education; aggressive identification, intervention, and follow-up with students with high-risk behaviors; and proactive use of formal referral links.

Certain clinical and policy implications arise out of these findings. Although there may be advantages to providing a full range of reproductive health services within SBHCs, an impact on adolescent births may be experienced by centers with more limited reproductive health care services. Clinicians and policymakers interested in reducing adolescent birth rates should consider expanding the numbers of SBHCs. ■

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Contributors

S.A. Ricketts conceptualized the study and designed and carried out the analysis. B.P. Guernsey assisted in interpreting the data and conducted the literature review. As director of the Denver SBHCs from 1987–1994, B.P. Guernsey provided information about the context of the school setting and the services provided.

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Human Participant Protection

No approval was needed for this study.

References

1. Ventura SJ, Mathews TJ, Hamilton BE. Births to teenagers in the United States, 1940–2000. *Natl Vital Stat Rep.* 2001;49:1–23. Table 2.

2. Bearss N, Santelli JS, Papa P. A pilot program of contraceptive continuation in 6 school-based clinics. *J Adolesc Health.* 1995; 17:178–183.

3. Santelli J, Kouzis A, Newcomer S. Student attitudes toward school-based health centers. *J Adolesc Health.* 1996;18:349–356.

4. Anglin, TM, Naylor KE, Kaplan DW. Comprehensive school-based health care: high school students' use of medical, mental health, and substance abuse services. *Pediatrics.* 1996; 97:318–330.

5. *Maternal and Child Health Block Grant Program Application for FY 2004.* Denver, Colo: Division of Prevention and Intervention Services for Children and Youth, Colorado Department of Public Health and Environment; July 15, 2003:74.

6. Rienzo BA, Button JW. The politics of school-based clinics: a community-level analysis. *J Sch Health.* 1993;63:266–272.

7. Emihovich C, Herrington CD. *Sex, Kids, and Politics: Health Services in Schools.* New York, NY: Teachers College Press; 1997.

8. Ford CA, Bearman PS, Moody J. Foregone health care among adolescents. *JAMA.* 1999;282:2227–2234.

9. Santelli JS, Nystrom RJ, Brindis C, Juszczak L, Klein JD, Bearss N, et al. Reproductive health in school-based health centers: findings from the 1998–99 census of school-based health centers. *J Adolesc Health.* 2003; 32:443–451.

10. *Five-Year Comparison of Dropout Rates by Ethnic/Racial Group by Grade* [1994–1995 through 1998–1999]. Denver: Colorado Department of Education; 2000. Available at: http://www.cde.state.co.us/cdereval/rv99DropByEthnic&Grade.htm. Accessed June 1, 2006.

11. Kaplan DW. Robert Wood Johnson Foundation Grant Application, October 24, 1986. Princeton, NJ: Robert Wood Johnson Foundation.

12. Neter J, Wasserman W, Kutner M. *Applied Linear Statistical Models.* 3rd ed. Homewood, IL: Richard D. Irwin, Inc.; 1990.

13. Juszczak L, Melinkovich P, Kaplan D. Use of health services by adolescents across multiple delivery sites. *J Adolesc Health.* 2003;325:108–118.

14. Armstead M, Fleming M, eds. *Guidelines for Adolescent Preventive Services (GAPS): Implementation Guide for School-Based Health Centers.* Chicago, Ill: American Medical Association; 1999.

15. Kaplan DW, Calonge BN, Guernsey BP, Hanrahan MB. Managed care and school-based health centers. *Arch Pediatr Adolesc Med.* 1998; 152:25–33.

16. Hacker KA, Weintraub TA, Fried LE, Ashba J. Role of school-based health centers in referral completion. *J Adolesc Health.* 1997;21:328–334.

17. Zabin LS, Hirsch MB, Smith EA, Streett R, Hardy JB. Evaluation of a pregnancy prevention program for urban teenagers. *Fam Plann Perspect.* 1986;18:119–126.

18. Kirby D, Resnick MD, Downes B, et al. The effects of school-based clinics in St. Paul on school-wide births. *Fam Plann Perspect.* 1993;25:12–16.

19. Schuster MA, Bell RM, Berry SH, Kanouse DE. Impact of a high school condom availability program on sexual attitudes and behaviors. *Fam Plann Perspect.* 1998;30;67–72.

20. Kirby D. *Emerging Answers: Research Findings on Programs to Reduce Teen Pregnancy.* Washington, DC: National Campaign to Reduce Teen Pregnancy; 2001.

21. Brindis C, Starbuck-Morales S, Wolfe AL, McCarter V. Characteristics associated with contraceptive use among adolescent females in school-based family planning programs. *Fam Plann Perspect.* 1994;26:160–164.

22. Frost JJ, Darroch FJ. Understanding the impact of effective teenage pregnancy prevention programs. *Fam Plann Perspect.* 1995;27:188–195.

23. *US Census 2000, Summary File 4, Sample Data for Black Females in Denver County.* Washington, DC: US Census Bureau; 2002.

24. Historical Employment Statistics. Denver, Colo: Colorado Department of Labor and Employment. Available at: http://www.coworkforce.com/lmi/CES/ceshome.asp. Accessed on June 1, 2005.

25. *Queryable Data Sets.* Washington, DC: US Department of Labor, Bureau of Labor Statistics. Available at: http://www.bls.gov/data/. Accessed June 1, 2005.

26. Darroch JE, Singh S. Occasional report: why is teenage pregnancy declining? The roles of abstinence, sexual activity and contraceptive use. New York, NY: The Alan Guttmacher Institute; 1999. Available at http://www.alanguttmacherinstitute.org/pubs/or_teen_preg_decline.html. Accessed May 27, 2005.