Economic Evaluation of a Comprehensive Teenage Pregnancy Prevention Program

Pilot Program

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Background: Previous research has suggested that comprehensive teenage pregnancy prevention programs that address sexual education and life skills development and provide academic support are effective in reducing births among enrolled teenagers. However, there have been limited data on the costs and cost effectiveness of such programs.

Purpose: The study used a community-based participatory research approach to develop estimates of the cost–benefit of the Pathways/Senderos Center, a comprehensive neighborhood-based program to prevent unintended pregnancies and promote positive development for adolescents.

Methods: Using data from 1997–2003, an in-time intervention analysis was conducted to determine program cost–benefit while teenagers were enrolled; an extrapolation analysis was then used to estimate accrued economic benefits and cost–benefit up to age 30 years.

Results: The program operating costs totaled $3,228,152.59 and reduced the teenage childbearing rate from 94.10 to 40.00 per 1000 teenage girls, averting $52,297.84 in total societal costs, with an economic benefit to society from program participation of $2,673,153.11. Therefore, total costs to society exceeded economic benefits by $559,677.05, or $1599.08 per adolescent per year. In an extrapolation analysis, benefits to society exceed costs by $10,474.77 per adolescent per year by age 30 years on average, with social benefits outweighing total social costs by age 20.1 years.

Conclusions: This comprehensive teenage pregnancy prevention program is estimated to provide societal economic benefits once participants are young adults, suggesting the need to expand beyond pilot demonstrations and evaluate the long-range cost effectiveness of similarly comprehensive programs when they are implemented more widely in high-risk neighborhoods.

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Introduction

Each year in the U.S., more than 400,000 children are born to teenage mothers[1]; are at high risk of preterm birth, low birth weight, child abuse, poverty, and death[2–6]; and are more likely to have educational underachievement and mental health problems.[7] Teenage mothers are at high risk for dropping out of high school and for having low self-esteem and symptoms of depression.[8–10] More than 75% of teenage mothers receive public assistance within 5 years of their child's birth.[11]

A variety of programs[12–16] are effective in reducing births among teenagers who participate. The most effective programs address a comprehensive range of social and behavioral issues in addition to providing sex education,[17] including topics such as access to birth control, life skill development, academic support, and job training. Such comprehensive programs reduce participants' pregnancy rates,[14] substance use/abuse, violent or criminal behavior, and poverty,[16] and they increase both the use of primary health care[14] and rates of graduating from high school.[16]

There is limited evidence of cost effectiveness of such programs.[18] Because these programs require substantial investment, understanding their cost–benefit is

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critical for informing policies to promote larger-scale implementation. In this study, the goal was to estimate the cost–benefit of one comprehensive program, the Greater New Britain Teen Pregnancy Prevention's Pathways/Senderos Center, examining cost effectiveness both during program participation and, using extrapolation, through early adulthood.

Methods

Program

The Pathways/Senderos Center is a comprehensive neighborhood-based program to prevent unintended pregnancies and promote positive youth development for middle school and high school students, operated by Greater New Britain Teen Pregnancy Prevention, Inc. The program, modeled after the Children's Aid Society Carrera program in Harlem NY,[14] uses a case management and "parallel family-systems" approach, meaning that staff are available to the adolescents 24 hours a day and 7 days a week.[19] The program provides six integrated components to boys and girls: (1) education about family life, sex, and health; (2) academic support, including tutoring and weekly monitoring of progress; (3) career and vocational preparation; (4) artistic expression; (5) recreation; (6) physical and mental healthcare referrals. The program serves boys and girls aged 11–18 years from the Arch Street area, an impoverished, largely Latino neighborhood in New Britain CT. Students generally enroll at age 11 years and participate daily until high school graduation, with infrequent contact thereafter.

Due to limited local public transportation, youth are recruited by program outreach workers from as far away from the center as they are willing to walk. All sixth-grade boys and girls are eligible for enrollment. The bilingual outreach workers obtain suggestions for possible participants from youth and families currently in the program and advertise the after-school program and its job club stipends at school bus stops. The program also receives referrals from the schools where program staff make presentations to sixth-graders.

Analytic Framework for Economic Evaluation

Total program costs and benefits were estimated from a societal perspective over the 7-year period for which adolescents are enrolled (Figure 1). Total societal costs were defined as the total operating costs of the program. Total societal benefits included the sum of (1) the total costs averted from prevention of the estimated number of births to teenage girls that would have occurred without the program; and (2) the additional economic benefits from participating, independent from prevention of births.It was assumed that the opportunity cost of participation was $0; because there are otherwise few wage earning and enrichment activities available locally, the young people lost leisure time only.

The data are from the most recent 7 years of the program (1997–2003) for which teenage birth data were available on all participants. A community-based participatory research (CBPR) approach was used (see Appendix A); the academic partners proposed an in-time intervention analysis, calculating the cost–benefit of the period of the program (age 11 years until high school graduation). Community partners proposed an extrapolation analysis to estimate program cost–benefit up to age 30 years. Future benefits were discounted at 3%.[20] Specific analysis steps are described in the following section. Sensitivity analyses were performed on estimated net benefit to determine robustness of conclusions. All economic estimates were adjusted for inflation[21] and stated in December 2006 dollars. The Yale University School of Medicine IRB approved an exemption for the current protocol.

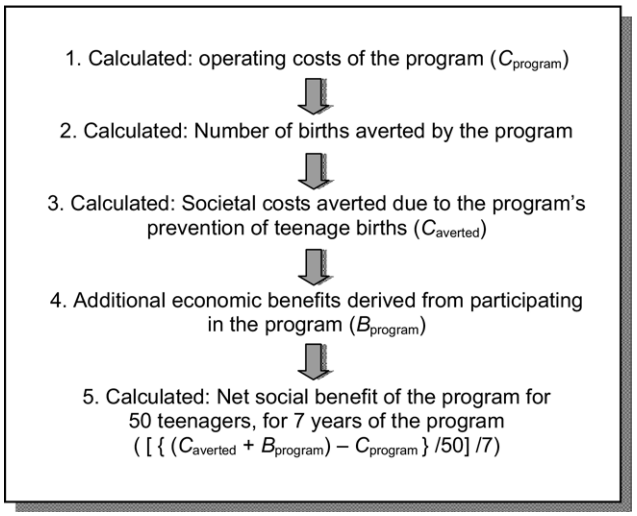

Figure 1. Five steps of analysis

Program Costs: Operating Costs

A calculation was made of average annual operating costs of the program from 1997 to 2003, $C_{program}$. Operating costs included salaries and benefits for administrative and program staff, rent and utilities, maintenance, food, expenses for fundraising activities, the establishment and maintenance of the onsite work experience and training program, and other miscellaneous costs. Revenue generated from fundraisers was treated as an offset to program operating costs.

Program Benefits: Teenage Births Averted

To determine expected numbers of births among teenage girls, an expected birth rate was calculated, q_{ij} (where i=race/ethnicity and j=age group), for each race/ethnicity–age group stratum in New Britain CT (i.e., white girls aged 10–14 years, Latina/Hispanic girls aged 15–19 years). This expected birth rate, q_{ij}, is the average number of births among each race/ethnicity–age group stratum, B_{ij}, divided by the average population of teenage girls of each race/ethnicity–age stratum living in New Britain, P_{ij}. To calculate B_{ij}, 1997–2003 data were used from the Connecticut Department of Public Health,[22] which provided annual birth data categorized by race/ethnicity (white, black, Latina/Hispanic, and other) and by age group (10–14 years, 15–17 years, and 18–19 years). To calcuate the average population of teenage girls of each race/ethnicity–age stratum living in New Britain, P_{ij}, data were used from the 2000 U.S. Census[23] categorized by race/ethnicity (white, black, Latina/Hispanic, and other) and by age group (10–14 years and 15–19 years). Race/ethnicity was determined by the participant at intake.

To estimate the probability of teenage childbearing among girls for each year of age rather than for the overall age

group, q_{iy} (where y=year of age), the expected birth rate for each race/ethnicity–age group stratum (q_{ij}) was divided by the number of years included within the age group. For example, the probability of a white girl aged 14 years giving birth is the expected birth rate for her race/ethnicity–age group stratum (white, aged 10–14 years) divided by 5, as a 5-year age span is included in the age group:

$$q_{\text{white, aged 14 years}} = (B_{\text{white, aged 10–14 years}}\, P_{\text{white, aged 10–14 years}})/5 \text{ years.}$$

To calculate the race/ethnicity-specific probability of teenage childbearing between age 11 years and high school graduation, Q_i, the probabilities of teenage childbearing for each specific year of age, y, were summed, so that $Q_i=\Sigma q_{iy}$ (where y=age 11, 12, . . . , 18 years).

These race/ethnicity-specific probabilities of teenage childbearing were applied to the population of girls enrolled in the Pathways/Senderos Center to calculate the estimated number of births that the enrollees would have had without the program. The estimated number of births was compared to the actual number for program participants in 1997–2003. The documentation of model paramaters, sources, and assumptions is provided in Tables 1 and 2.

Program Benefits: Costs Averted by Reducing Teenage Births

A calculation was made of the total societal costs averted by reducing the number of teenage births through the program, C_{averted}, by multiplying the number of births averted, using previously published estimates of the societal costs of teenage childbearing that are averted by delaying childbearing from age 18 years until age 20 or 21 years.[6] Previous research has estimated costs averted for two distinct kinds of teenage pregnancy prevention programs (Table 3): (1) programs that are narrowly focused on reducing teenage childbearing as the sole goal; and (2) programs that are focused not only on reducing teenage childbearing but also address educational, professional, and health issues.

The societal costs averted by a more narrowly focused program include earnings-related outcomes for teenage mothers (slightly increased productivity as a consequence of greater work effort); earnings-related outcomes for fathers of children born to teenage mothers (decreased productivity from lower educational and labor-skill attainment and subsequent decreased provision of resources to mothers and children); earnings-related outcomes for children born to teenage mothers (decreased productivity from lower educational attainment); public assistance (cash assistance, food stamp benefits, rent subsidies, medical assistance for parents and children, and the administrative costs of public assistance programs); administrative costs of foster care programs; and incarceration costs of male children born to teenage mothers.[6] The societal costs averted by a more broadly focused program include the benefits of the narrowly focused program plus improvements in educational and employment opportunities, decreased social and economic support needs, improved personal motivation, and improved peer group influence.[6] As the Pathways/Senderos Center is broadly focused, the latter estimates were used to calculate averted costs.

Program Benefits: Economic Value of Program Participation

An estimate was made of the societal benefit of program participation, B_{progam}, derived from teenagers' exposure to educational, professional, and health-related curriculum, for teenage boys and for teenage girls who did not bear children before high school graduation. Using previously published estimates,[6] a calculation was made of the difference per pro-

Table 1. Data used to calculate teenage births averted

Data used (variable)	Reference	Value[a]	
Average annual population of girls aged 10–14 years ($P_{10–14}$)	2000 U.S. Census[23]	Overall	2418
		White	881
		Black	307
		Latina/Hispanic	1103
Average annual population of girls aged 15–19 years ($P_{15–19}$)	2000 U.S. Census[23]	Overall[b]	2648
		White	1243
		Black	307
		Latina/Hispanic	973
Average annual number of teenage births among girls aged <15 years ($B_{10–14}$)	Connecticut Department of Public Health[22]	Overall[b]	3.43
		White	0.43
		Black	0.14
		Latina/Hispanic	2.86
Average annual number of teenage births among girls aged 15–17 years ($B_{15–17}$)	Connecticut Department of Public Health[22]	Overall[b]	70.00
		White	6.86
		Black	4.71
		Latina/Hispanic	54.57
Average annual number of teenage births among girls aged 18–19 years in community ($B_{18–19}$)	Connecticut Department of Public Health[22]	Overall[b]	108.29
		White	19.29
		Black	10.43
		Latina/Hispanic	72.00
Race/ethnicity of enrolled students (%)	Pathways/Senderos Center[c]	White	0 (0–10)
		Black	5 (0–10)
		Latina/Hispanic	95 (80–100)
Number of girls enrolled	Pathways/Senderos Center[c]	Total	25 (10–40)
Average number of years prior to age 18 years of teenage childbearing, among teenage mothers	Connecticut Department of Public Health[22]	Total	2.42 (0.50–6.00)

[a]Values in parentheses were used for sensitivity analyses.
[b]The sum of the rows for white, black, and Latina/Hispanic does not equal the overall row because other races and ethnicities were also counted by both the 2000 U.S. Census and the Connecticut Department of Public Health.
[c]Average number/proportion enrolled in the Pathways/Senderos Center, 1997–2003

Table 2. Variables calculated to estimate expected number of teenage births[a]

Data used (variable) with formula	Ethnicity	Average annual number of teenage births among girls	Average annual female population	Calculation	Result
Teenage birth rate per 1000 girls, aged 10–14 years	Overall	3.43	2418	[(3.43/2418)×1000]/5	0.28
	White	0.43	881	[(0.43/881)×1000]/5	0.10
	Black	0.14	307	[(0.14/307)×1000]/5	0.09
	Latina/Hispanic	2.86	1103	[(2.86/1103)×1000]/5	0.52
Teenage birth rate per 1000 girls, aged 15–18 years	Overall	70.00+108.29	2648	[[(70.00+108.29)/2648]×1000]/4	13.47
	White	6.86+19.29	1243	[[(6.86+19.29)/1243]×1000]/4	4.21
	Black	4.71+10.43	307	[[(4.71+10.43)/307]×1000]/4	9.86
	Latina/Hispanic	54.57+72.00	973	[[(54.57+72.00/)/973]×1000]/4	26.02
Teenage birth rate per 1000 girls until high school graduation in community ($Q=\Sigma q_y$)[b]	Overall			((3.33)×(0.28))+((3.67)×(13.47))	50.33
	White			((3.33)×(0.10)+(3.67)×(4.21))	15.75
	Black			((3.33)×(0.09)+(3.67)×(9.86))	36.46
	Latina/Hispanic			((3.33)×(0.52)+(3.67)×(26.02))	97.14
Teenage birth rate per 1000 girls until high school graduation in community reflecting Pathways/Senderos Center enrollment [(0.95)($Q_{Latina/Hispanic}$)+(0.05)(Q_{Black})]	Reflecting Pathways/ Senderos Center enrollment			((0.95)×(97.14))+((0.05)×(36.46))	94.10

[a]Calculations may not result in calculated values because of rounding.
[b]Formula for high school graduation: $[(0.33)\times(q_{11})]+q_{12}+q_{13}+q_{14}+q_{15}+q_{16}+q_{17}+([(0.67)\times(q_{18})]$; to account for most teenagers reaching age 12 years during their first year of middle school as well as reaching age 18 years during the final year of high school.

gram participant between societal costs of teenage childbearing averted for comprehensive versus narrowly focused programs.

Program Net Benefit

A calculation was made of the net benefit of the program as the total societal benefit minus the total societal costs of the program. To calculate the total social benefit of the program, a summation was made of the societal costs of teenage childbearing averted among girls enrolled in the program, C_{averted}, and the economic value of program participation among boys and girls, B_{progam}. From this sum was subtracted the total program operating costs, C_{program}:

$$Net\ Benifit_{\text{program}} = (C_{\text{averted}} + B_{\text{program}}) - C_{\text{program}}.$$

Sensitivity Analysis

To determine the robustness of findings, sensitivity analyses were performed to examine the time horizon for which the total social costs and benefits of the program are equivalent. For the current in-time intervention analysis, key variables were varied (number of students, proportion female, expected pregnancy rates for nonparticipants and participants, average age of childbearing, annual program costs, and discount rate for future benefits) over a reasonable range to determine at which point the program's economic benefit exceeded program costs. Data analysis was performed using Microsoft Office Excel 2003.

Results

For the period 1997–2003, the Pathways/Senderos Center enrolled 50 students per year in a year-round curriculum with expected daily participation for 7 years. Each year, three to seven students graduate from high school and leave the program, opening new spots. During the past decade, approximately half of enrollees were female, nearly 95% were Latino/Hispanic, and the remainder were black/African-American. From 1997 to 2003, all enrollees graduated from high school on time, 57% matriculated at a 4-year college, and to date, 14% have graduated from a 4-year college.

Program Costs: Operating Costs

From 1997 to 2003, the total inflation-adjusted program operating costs averaged $469,304.01 per year, or $3,285,128.08 for 7 years (C_{program}), for a cost per student per year of $9,386.08 and a 7-year total cost per student of $65,702.56.

Program Benefits: Teenage Births Averted

A calculation was made of an expected pre–high school graduation birth rate in New Britain of 50.33 per 1000

Table 3. Estimated annual societal costs averted by delaying teenage childbearing until age 20 years per teenage mother (December 2006 dollars)

Outcome measure	Societal costs averted[a]	
	Addressing only teenage childbearing (costs)	Addressing maximum set of related factors (costs)
Earnings-related outcomes (billion $)	**8.30**	**24.76**
Mother's earnings	(1.30)	12.70
Father's earnings	9.59	12.05
Public assistance (billion $)	**2.33**	**2.20**
Medical assistance for children	2.20	1.68
Administrative costs	0.13	0.52
Other consequences (billion $)	**9.07**	**11.54**
Out-of-pocket costs of children's health care	(0.65)	(0.65)
Foster care	1.81	2.07
Incarceration of male children	1.30	3.11
Productivity of adult children	6.61	7.00
Total per year (billion $)	**19.70**	**38.36**
Average per teen parent per year ($C_{averted}$)	**8184.87**	**15,978.32**

[a]Values may not sum to column total because of rounding.
Source: Maynard RA. Kids having kids: economic costs and social consequences of teen pregnancy. Washington DC: Urban Institute Press, 1997.[6]

girls (Table 2). Adjusting for the ethnic distribution of program participants who are predominantly Latino/Hispanic, an expected pre–high school graduation birth rate was calculated of 94.10 per 1000 girls or 2.35 for the 25 girls in a cohort of 50 students between enrollment at age 11 years and high school graduation. In comparison, from 1997 to 2003, one participant aged 25 years bore a child, for a teenage childbearing rate of 40.00 per 1000, an estimated reduction of 54.10 teenage births per 1000 girls, or 1.35 teenage births averted among the 25 girls.

Program Benefits: Costs Averted by Reducing Teenage Births

The societal costs of teenage childbearing averted by a broadly focused teenage pregnancy prevention program are estimated to be $15,978.32 per teenage mother per year (Table 3). Using Connecticut Department of Public Health data,[22] it was determined that the average age of teenage childbearing among teenage mothers was 16.24 years, 2.42 years before high school graduation and 3.76 years before age 20 years. By averting 1.35 teenage births for 2.42 years, the Pathways/Senderos Center is estimated to have averted $52,297.84 in societal costs ($C_{averted}$) during program years; and using the extrapolation analysis, $81,256.15 in societal costs was averted by averting 1.35 teenage births for 3.76 years.

Program Benefits: Economic Value of Program Participation

The added benefit of participating during program years, B_{progam}, is estimated at $7,793.45 per teenager per year, or $54,554.15 per teenager for a total benefit of $2,673,153.11 among a cohort of 50 students. In the extrapolation analysis, this cohort benefit was $3,165,815.23 by age 20 years, $5,017,928.45 by age 25 years, and $6,870,041.68 by age 30 years.

Program Net Benefit

Considering total program operating costs, societal costs averted by reducing teenage births, and economic benefits of participation, the total operating costs exceeded economic benefits by $559,677.05 during the program years, or $1,599.08 per teenager (Table 4). In the extrapolation analysis program, net benefits were estimated to be $10,474.77 per program participant by the time they reach age 30 years. In sensitivity analysis, total social benefits would outweigh total social costs by reaching age 20.1 years (Table 4).

Sensitivity Analysis

Sensitivity analyses suggested the net societal cost of the program during program years would be less than $0.00 (cost saving) per teenager per year if the number of students exceeded 60 or annual program operating costs were reduced by at least 17%. The net societal costs of the program never exceeded $50,000 per teenager per year when varying any given variable value.

Discussion

Our analysis suggests that from a societal perspective, the total benefits from participation in the Pathways/

Table 4. Net societal benefit of the Pathways/Senderos Center

Assumption: 50 teenagers (25 girls, 25 boys) enrolled in Pathways/Senderos Center for 7 years from age 11 years to high school graduation (Cost or Benefit [$])	
Total operating costs ($C_{program}$)	3,285,128.08
Societal costs averted by reducing teenage births ($C_{averted}$)	52,297.84
Economic benefits of participation ($B_{program}$)	2,673,153.11
Net societal benefit, per teenager per year of participation (([($C_{averted}$+B_{progam})−$C_{program}$]/50)/7) (Cost or Benefit [$])	
Through program completion (high school graduation)	(1,599.08)
Through age 20 years	(108.73)
Through age 20.1 years	0.00
Through age 25 years	5,183.02
Through age 30 years	10,474.77

Senderos Center would exceed the total costs of the program once enrollees reach age 20.1 years, while costs modestly exceed benefits by about $1600 per teen per year during participation. This analysis suggests that investments in such programs may yield longer-term net societal gains. Estimated program costs were somewhat higher than would be the case for ongoing programs because they included the start-up costs for the work-experience program. In particular, program costs per person per year decreased from 2003 to 2007 from $9,386 to $8,025. Calculated expected birth rates for nonprogram participants are conservative, as they are based on citywide estimates rather than being limited to this impoverished neighborhood. The estimate of long-range benefits is conservative because they account for the economic gain from high school graduation only, not higher educational attainment.[24] More than half of participants have entered 4-year colleges, compared to an expected matriculation rate among poor teenagers of 31%.[25] Further, current estimates of costs averted do not include future savings in costs of special education for children born to teenage mothers.[7] No estimate was made in the current study of the economic impact of teenage childbearing on the parental household.

The current findings suggest that the long-run net economic benefit from the Pathways/Senderos program is largely due to the program's success in addressing decision making and overall life skills, and promotion of an adolescent's sense of responsibility, fulfilling important unmet needs of teenagers in a high-risk neighborhood beyond the value of a pregnancy prevention program. Children from impoverished families are less likely to start school ready to learn[26] are more likely to attend poorly functioning schools,[27] and are less likely to graduate from high school.[28] Programs such as the Pathways/Senderos Center that are broadly focused on improving the lives of impoverished youth, and not just on pregnancy prevention, can be an important resource for teens in the most at-risk neighborhoods, supplementing their education and creating greater occupational opportunities.

Despite the potential economic benefits of a comprehensive model of teenage pregnancy prevention, such programs are limited in number across the country. Previous literature[14–16] has shown that teenage pregnancy prevention programs featuring comprehensive curricula are most successful in reducing pregnancy rates. The current study extends the literature by evaluating the costs and benefits to society of such a comprehensive program. Such programs require greater up-front investment than do narrower pregnancy prevention programs, and their net economic benefits occur in the future and do not address immediate fiscal concerns of policymakers. Supporting these programs requires policy and funding leadership that understands the value of investing in the future for underserved youth and families, and of budget neutrality or even a net gain in the long run.

Community–Academic Partnership

Community partners suggested the need for this analysis and provided key additions to its scope, potential program impact, and meaning of findings. A common issue in CBPR, apparent throughout this project, was the tension between the academic and community partners regarding the framing and dissemination of the findings.[29] The academic partners focused on how the research would be viewed by peer-reviewed journals and research experts, and the community partners focused on how the research would be viewed by potential funders and board members. A sustained period of engagement facilitated sharing of perspectives and the development of an integrated set of objectives and analysis. Our experience suggests that an engaged partnership can initiate and conduct a rigorous cost-effectiveness analysis that is useful to both local program planning and to the academia. Limitations of the current community–academic approach and of the economic analysis used here are presented in Appendix A.

Implications

This is a pilot and a first effort to apply cost–benefit analysis; even given these caveats, the outcomes appear promising and support investment, through larger demonstrations that can address remaining technical and partnership challenges. Comprehensive teenage pregnancy prevention programs reflect the philosophy that altering the factors that lead to teenage pregnancy and adolescent childbearing requires tremendous effort. An adolescent makes a myriad of decisions over many years that ultimately determine whether or not she/he avoids adolescent parenting. If an intervention is to succeed, it must be sustained year-round, throughout adolescence, and as with Carrera's "parallel family-system,"[19] staff members must be available to program participants even during nonprogram hours; such commitment and its attendant costs may make more-comprehensive programs less appealing for policymakers who focus on demonstration of immediate cost neutrality or savings. This partnered study offers a perspective to policymakers, program planners, and communities to consider longer-term goals when investing in programs that address challenging problems such as teenage pregnancy in underserved youth.

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Appendix A

Community-Based Participatory Research

There are three ways in which the current study used a community-based participatory research (CBPR) approach, as defined by the Agency for Healthcare Research and Quality (AHRQ).[30] First, the approach included "participation by representatives of organizations and researchers in all aspects of the research process." This study was initiated by the Board of Directors of the Pathways/Senderos Center because they believed in the cost effectiveness of the center. The Executive Director (RB) next contacted a Yale researcher (EB) who had been identified by one of the board members of Pathways/Senderos as having expertise in program evaluation, who in turn recruited other researchers with necessary expertise for the project (MR, JR). In addition, the executive director invited two family planning collaborators to join the research project team (RR, JP). Three of the authors represent the community agency. Although two of the authors (RR, JP) had academic appointments, they were in outreach positions of the state university, outside a traditional academic role, and were working in conjunction with the Connecticut Department of Social Services. One of the authors (RB) was a full-time employee of the community agency. Second, the project involved "sharing of decision-making power and mutual ownership of the processes and products of the research enterprise." The community partners (RB, RR, JP) proposed the concept and the academic faculty designed and carried out the initial analysis consisting of total costs and benefits over the 7 years adolescents were enrolled. When the authors met to discuss and interpret the findings, the community partners argued that the analysis was too limited; they argued that although costs ended when the adolescent graduated from high school, the economic benefits to society continued to accrue for years after that. The community partners convinced the academic partners to do a second analysis that incorporated economic benefits to society after the adolescent graduated from high school. All authors actively participated in interpretation of results and manuscript writing through conference calls and iterative writing. Finally, the "reciprocal transfer of expertise" occurred through the multiple open and honest conversations about the analysis and interpretation.

Limitations of Community–Academic Approach

A limitation of the current CBPR approach is that there were no representatives on the research team from the community of teenagers receiving the services or eligible to receive the services. Teenagers might have very different opinions as to what type of an evaluation of the program was necessary; for example, they may not have cared about costs but been more interested in the impact on happiness, grades, or future success. Rather, the community representatives in the project included the staff and board members of the community-based organization. As evidenced by the tensions and resolutions in conducting the analysis, as well as by the staff's role as "parallel family," the community representatives brought important and distinctive expertise to the research team.

Limitations of Economic Analysis

Our work is consistent with a previous economic evaluation[18] of a 2-year school-based program[31] that reduced unprotected sexual intercourse and, theoretically, teenage pregnancy rates; however, the current study is the first to use local, rather than extrapolated, birth rates, in a comprehensive teenage pregnancy prevention program to estimate benefits and costs. Nevertheless, there are several limitations to consider when interpreting the current findings. First, a determination was made of the economic value of a single program that may not be generalizable where there are differences in leadership or population. Second, although published economic estimates[6] were used, these estimates were specifically tailored to teenage girls, and neither account for costs averted by delaying teenage fathering, nor for the non–birth related economic benefits among boys participating in the program. Moreover, these estimates were determined before the 1997 enactment of the Temporary Assistance to Needy Families legislation and the State Children's Health Insurance Program. Additionally, these published estimates do not account for contributions made to society by children born to teenage parents. Although all children have potential to contribute to society, the estimates presume that the contributions of children born to teenage parents would not be greater than those children born to parents aged >19 years. On the other hand, when the community and academic partners discussed what calculations went into the published estimates, it was decided that, overall, they were good approximations for evaluating the program. Third, cost and benefit calculations were based on the assumption that 50 teenagers enrolled in the program immediately when eligible in 1997, and remained in the program until high school graduation in 2003. In 1997, there were 50 teenagers enrolled in the program of various ages, some of whom graduated from high school in 1998 (to be replaced by a new enrollee in 1999) and some of whom would not graduate from high school until 2003. However, attrition from the program was limited; hence results are unlikely to have been affected by the staggered entry and completion of the program. Fourth, enrollment in the program is not random, and therefore if participants in the program differ in ways that would make them less inclined to have teenage pregnancies, then comparisons to aggregate state data could lead to overestimating the benefits of the program in ways that are not likely to be fully accounted for by the age–ethnicity stratification of the state data. The nature of program evaluation, however, is such that the results are conditional on participation in the program; for those who chose it, it appears to have improved outcomes relative to the outcomes of those who did not participate. Youth are not preselected for any criteria except age and residence in the catchment area. Finally, the analysis is limited to the experiences of only 50 adolescents over 7 years, including 25 girls, 25 boys, and one pregnancy; results may have been different with small changes in the number of pregnancies. While the small sample prohibits firm conclusions, it does provide important pilot information about the potential for community-based comprehensive teenage pregnancy prevention programs. Given the relative paucity of similar programs, community-partnered evaluations such as this one are critical to identifying whether such programs are effective and cost effective. Wider implementation of similar programs, with careful follow-up and evaluation, are necessary to determine if these pilot findings are reproducible. Although pregnancy prevention programs are generally small and personal, limiting generalizations from analyses, these programs are all that exist to inform current policy proposals. Moreover, the majority of the economic benefits of programs like this are a consequence not of pregnancy prevention, the current estimate of which is unlikely to be precise, but of greater educational and occupational opportunities afforded by these programs.