The Impact of Participatory Approaches on Reproductive Health for Disadvantaged Youth in Nepal

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Paper prepared for presentation at the Annual Meetings of the Population Association of America, March 31-April 2, 2005, Philadelphia

ABSTRACT

In this paper, we present findings from a community-based study testing the effectiveness of participatory approaches in improving services and outcomes for youth reproductive health in Nepal. The findings are based on micro-level analysis from primary quantitative and qualitative data collected to evaluate an intervention study conducted from 2001-2003. In this study we test whether many of the key principles advocated by development practitioners to make services work for poor people can be effectively operationalized through small-scale, community-based programmatic interventions.

We focus on three dependent variables frequently identified in the literature as critically important for reproductive health, especially for young people: prenatal care, institutional delivery, and knowledge of HIV and AIDS. We examine disadvantage by the respondent's household economic status, and the respondent's own education, rural-urban residence, and gender.

Our results from various vantage points indicate that as compared to the non-participatory intervention design, the participatory approach was more successful in reducing advantage-based differentials in youth reproductive health outcomes. Our analyses also show that particular aspects of disadvantage vary by outcome. For access to prenatal care services and institutional delivery, the key aspect of disadvantage is urban-rural residence, with household wealth being significant for prenatal care only. For knowledge of HIV transmission, it is gender and educational differences that are important.

Our work shows that in addition to macro level efforts, smaller scale community level efforts can be targeted to achieve empowerment and accountability, and thus, to improve services for the poor. This evaluation adds significantly to the literature on the role of participation in diminishing the disadvantages faced by the worst-off: poor, rural, un-educated, female clients.

Introduction

This paper presents findings from a community-based study testing the effectiveness of participatory approaches in improving services and outcomes for youth reproductive health in Nepal. The findings are based on micro-level analysis from primary quantitative and qualitative data collected to evaluate an intervention study conducted from 2001-2003. In this study we test whether many of the key principles advocated by development practitioners regarding how to make services work for poor people can be effectively operationalized through small-scale, community-based programmatic interventions. In particular, our study seeks to establish whether participatory intervention programs can be successful in increasing empowerment of and accountability to poor and disadvantaged populations; by increasing client voice and choice, do such programs serve as critical mechanisms for improving service accessibility and health outcomes for the disadvantaged?

This study targeted youth reproductive health as the outcome of interest for a number of important reasons. For reproductive health policy and programming, a focus on youth is critical as adolescence is when most young men and women experience key transitions in terms of initiating sexuality, entering marriage, and starting childbearing. Yet, most young people embark on this life stage with insufficient information about sexual and reproductive health, inadequate support and guidance from adults, and limited access to health care resources. Youth itself serves as a disadvantage in accessing reproductive health information and services. In most countries, young people are denied reproductive health services in critical ways that do not hold true for older age groups, most often due to social and moral assumptions and judgments around youth sexuality and service needs (Mathur et. al 2001). This tends to be the case even in countries where significant proportions of adolescents are married or in unions, and therefore, at high risk of unwanted pregnancies or disease (Senderowitz 1999). Lack of access to reproductive health services among young people is an issue with some urgency given that demographically, the world is facing the largest generation of youth ever, with over one billion young people between the ages of 10 and 19, and most (84%) living in developing countries (UNFPA 2004). More than at any other time in history, the health, capabilities, and actions of adolescents will define not only their life outcomes, but the future of their societies.

The study was motivated by the desire to test the impact of participatory approaches in improving youth reproductive health. In the field of development programming, community-based and participatory programs have been advocated as more effective than traditional approaches. They are said to involve the beneficiaries in program design, implementation, and evaluation, thus serving as the means of empowering communities and creating ownership over the interventions. Participatory programmatic approaches are also potentially important channels to realize many of the key principles advocated by development practitioners for serving the health needs of the poor and the disadvantaged, in particular, the principles of empowerment and accountability (WDR 2004). Empowerment and accountability can improve service delivery arrangements by increasing the voice and choice of clients. At a macro level, increasing client power can strengthen accountability in the relationship between poor people and providers, between poor people and policy makers, and between policy makers and providers (WDR 2004).

This process should also work at a micro, community level. For example, well-informed, mobilized, and organized community members can exert power by contributing financial resources and co-producing health services. With regard to youth reproductive health, self-care is a particularly important type of service co-production since information and social support are important means for promoting practices such as safe sex, contraceptive use, or prenatal care. Participatory processes increase awareness and information sharing. Better information, in turn, can not only lead to change in self-care behaviors, but also to expanded consumer power to use complaint and redress mechanisms. For youth reproductive health in particular, information sharing is critical for raising community awareness of key demand-side barriers including attitudinal, normative and institutional constraints such as early marriage, son-preference, sexual double standards, etc. (Norman 2001, Mensch et al. 1998).

Participatory programs may also serve to increase client power in relation to clinical service providers. Availability of, access to, and quality of services may improve because, when clients actively participate in decision-making, they are likely to be more motivated, and better able to monitor services and exert leverage on providers for better services. With regard to client power vis-à-vis policy makers, community-based participatory programs may empower disadvantaged citizens by increasing their ability to build coalitions, influence the political process and the allocation of resources, and establish monitoring and accountability mechanisms, due to the better and more readily available information, and access to decision-making bodies provided by a participatory approach (Cornwall and Gaventa 2001). Participatory approaches are seen by many practitioners as especially vital to incorporate in reproductive health programs that focus on young people. In addition to the co-production issues raised above, adolescents, it is argued, are more likely to increase their knowledge base, critical thinking, and decision-making abilities on intimate issues related to sexual and reproductive health if approached in a consultative and inclusive manner (McCauley and Salter 1995; Senderowitz 1998).

For all these reasons, micro-level community-based participatory programs have enormous potential for influencing the relationship between disadvantaged youth and service providers, as well as the relationship between disadvantaged youth and policy makers. However, to date, there have been no comprehensive evaluations conducted on the effectiveness of a participatory process at the community level in implementing programs for adolescent reproductive health in developing countries, and, in particular, in reaching poor and otherwise disadvantaged youth. Our study offers one such evaluation of a program in Nepal.

We chose Nepal for our intervention because it presents a setting where youth reproductive health needs are especially acute. Despite a large youth population and chronically poor outcomes on a number of reproductive health indicators among young people, this issue has received very limited programmatic and policy attention. Early marriage, a strong predictor of reproductive risk, is nearly universal in Nepal: girls currently marry at an average age of 16, and 52 percent have begun childbearing by the age of 20. Among those giving birth, 55 percent of girls under age 20 reported receiving any antenatal care, 14 percent of the births were attended by trained personnel, and only 9 percent of deliveries were in a health facility. Less than 7 percent of married girls in the 15-19 age group reported using any method of contraception, and only 4 percent reported a modern method. Rural girls in Nepal, who are typically poorer than their urban counterparts, are further disadvantaged as compared to girls in urban areas: they

marry and initiate childbearing 2-3 years earlier on average, and are eight times less likely to use antenatal services and a health facility for delivery (Ministry of Health (Nepal) 2002).

Study Design

In the Nepal Adolescent Project (NAP), we employed a quasi-experimental case-control study design to implement and test the effectiveness of a community-based, client-centered participatory approach to improve the sexual and reproductive health of adolescents in rural and urban Nepal. This 5-year project was conducted from 1998 to 2003, as a collaboration between an international service delivery organization (EngenderHealth), an international research organization (International Center for Research on Women), and local Nepali NGOs (New ERA Ltd. and BP Memorial Health Foundation). The project was conducted in two study sites (one urban and one rural) and two control sites (one urban and one rural). Participatory methodologies and techniques were utilized during the research, needs assessment, intervention design, implementation, and monitoring and evaluation phases in the two study sites, whereas more traditional reproductive health research, design, and intervention elements were implemented in the two control sites. The overall intervention period ranged from 12 to 24 months, with the first set of interventions beginning in November 2000, and the last set ending in March 2003.

The rural and urban areas were chosen to enable us to make a clear differentiation in infrastructure, service options, levels of economic development, and standard of living.[1] In other words, the rural-urban difference in site selection itself was aimed at capturing structural disadvantages as well as wealth differentials. At the same time, it is important to note that due to the requirements of intervention design, we needed to select communities that were readily accessible by road, and had certain institutions—such as a secondary school and a health post—already present within ready access. Thus, the communities included in this study are more developed than the typical Nepali rural or urban setting. Once the communities were selected, they were randomly assigned to study or control.

The study and control sites were differentiated both by how the program was implemented and what elements it included. Compared to the control sites, the overall design and implementation efforts in the study sites were more comprehensive, inclusive, and interactive, with a great deal of attention to building community ownership and involvement at every step. This was achieved by setting up a number of mechanisms and structures, such as advisory and coordination teams,

[1] The two rural sites are located in the "Terai," in the districts of Nawalparasi and Kawasoti near the Nepali-Indian border. With approximately 200 households each, the two communities are about 80 km apart, and were selected on the basis of having a secondary school, a range of health service providers, access to a main road, access to electricity, and the presence of at least one working NGO. As such, they represent the relatively more developed Nepali village. Communities in the urban area were defined as extended neighborhoods in a specific geographic area with shared facilities for schooling, commercial and social services, and a governance structure as one ward within the larger municipality. The two urban communities, consisting of approximately 300 households each, were drawn from middle class suburbs on the outskirts of Kathmandu. About 20 km apart from each other, the two suburbs selected met the basic criteria described above, along with the presence of a more developed infrastructure and a wider range of options for transportation, schooling, employment, health services, leisure activities, etc.

and consultative committees that engaged youth and adult community members, especially those who were disadvantaged. At the intervention design stage, an action planning process was conducted, where the needs assessment results were shared and analyzed with the community, and community task forces were created to prioritize and design feasible interventions. Program implementation structures were also more inclusive in the study sites, with community-level committees that allowed both adults and youth to increase their authority and decision-making power in the project. Given the mandate of the participatory approach, the project staff implemented strategies to ensure that disempowered groups—the poor, women, ethnic minorities—were actively engaged in these structures and processes (for example, by setting up rotating representation). There were no such participatory processes or structures in the control site.

Intervention components were very different between study and control sites. Study site interventions aimed at addressing structural, normative, and systemic barriers to youth reproductive health, while the control site addressed only the most immediate risk factors such as STDs or unwanted pregnancies. Thus interventions in the study site tended to link direct youth reproductive health programs with other programs that were deemed to influence the environment youth lived in, such as adult education programs, activities to address social norms, and economic livelihoods interventions. A total of eight such linked interventions, developed and prioritized by the community members themselves, were implemented in the study sites. In comparison, the project staff designed and implemented three standard reproductive health interventions in the control sites that focused on basic risk factors. Of special relevance to the present analysis is the fact that socioeconomic disadvantages—based on gender, rural-urban residence, wealth, ethnicity, schooling status, and marital status—were a specific focus of the intervention design and approach in the study sites, whereas this was not the case in the control sites.

In the context of this intervention research design, this paper examines whether the participatory intervention approach is more successful in reducing the gaps in youth reproductive health service access and outcomes between the disadvantaged and the advantaged than the non-participatory intervention approach.

Data and Methodology

Sample

In the present analysis, we use cross-sectional quantitative household and adolescent survey data collected at baseline and endline for NAP, along with relevant qualitative and participatory data (Appendix A catalogues the full range of data sources, samples and methodologies utilized in the program). For the quantitative surveys, a 100 percent census of households was taken in the rural areas at the baseline and endline. Since the population base in the urban area is larger, a 50 percent random sampling was considered sufficient. This resulted in a sample size of 965 households at baseline and 1003 households at endline.

The age group sampled for the adolescent survey at baseline was 14-21. Since most of the service-related interventions were specifically targeted at this age group, for the endline we

tracked this cohort which was then 18-25 years old. It is important to note that the study design did not allow us to track specific individuals, but rather the cohort within each community. Moreover, since the intervention design was at the community level, interventions aimed at increasing knowledge and information covered a broader population. Therefore, in order to ensure that the impact of such interventions on the younger cohort of adolescents was captured, we also included the 14-17 year olds in the endline sample.[2] The sample sizes for the adolescent survey are shown in Table 1. Although the full sample covering married and unmarried males and females (ages 14-21 at baseline and ages 14-25 at endline) is fairly large, the sub samples for each site are relatively small. These small sub sample sizes present limitations for multivariate analysis, especially where the analysis requires a focus on further subcategories (e.g. married females who have experienced a pregnancy).

Table 1: Adolescent survey samples and sub samples

Sample and Sub sample Base	**Adolescent Survey Sample Sizes (Married and Unmarried, Male and Female)**	
	Baseline (ages 14-21)	Endline (ages (14-25)
Total	**721**[3]	**979**
Urban Study	184	260
Urban Control	164	260
Rural Study	175	205
Rural Control	198	254

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Dependent Variables

The survey data provide a number of outcome variables of interest, including knowledge, behavior, attitudes, and service use for several factors relevant to youth reproductive health. In this paper, we focus on three dependent variables frequently identified in the literature as critically important for reproductive health, especially for young people. These are: prenatal care, institutional delivery, and knowledge of HIV and AIDS. The variables for prenatal care and institutional delivery refer to the first pregnancy of married young women,[4] as there were no pregnancies reported among unmarried young women. The prenatal care variable is a dichotomous measure of whether or not the pregnant woman visited a trained provider (doctor, nurse, or trained clinician) for prenatal care at least once. The institutional delivery variable is a dichotomous measure of whether or not the delivery (or miscarriage or abortion) for the first pregnancy was at a medical facility (hospital, clinic, or nursing home). Since general awareness of HIV and AIDS at baseline was already very high (over 90%), we use a more sophisticated dichotomous measure on whether or not the respondent could correctly list at least two modes of HIV transmission. Response options considered correct were: unsafe sexual contact, sharing needles, mother-to-child transmission, and blood transfusion.

[2] Due to the community-based nature of this project, the baseline and endline are two independent samples, rather than a longitudinal sample of the same cohort. In reality, for the lagged cohort samples (age 14-21 and 18-25 years) there is substantial overlap in the individuals in the sample from baseline to endline.

[3] A total of 724 adolescents were interviewed at the baseline. However for this analysis 3 respondents had to be excluded due to missing household data.

[4] As the respondents are young women with a recent first pregnancy, recall bias is expected to be negligible.

Independent Variables

Defining disadvantage

The 'disadvantaged' refers here to those adolescent girls and boys, and their families, who are worse off than others in the same population on several dimensions.[5] We examine disadvantage by the respondent's household economic status, and the respondent's own education, rural-urban residence, and gender. The inclusion of education, rural-urban residence and gender is based on the qualitative data, which show that in our project areas these criteria are at least as important as wealth in defining disadvantage. Gender and rural-urban residence are defined as dichotomous variables. Education is defined by years of schooling completed. Economic status is defined and measured in terms of household wealth, as elaborated below.

Measuring household wealth

The NAP did not collect data on household income or consumption. Consequently, we measure household wealth in terms of household assets. Other studies have shown that household assets are a reasonable proxy for household income or consumption (Montgomery et al. 2000; Filmer and Pritchett 2001). We obtained the asset information from the NAP household questionnaire, which asks a number of questions concerning each household's ownership of consumer items ranging from a radio to a television and car; land ownership and whether a house is owned or not; type of drinking water source and toilet facilities used; and other characteristics that are related to household wealth status.[6] From these data on household asset ownership, and following the approach used by Gwatkin et al. (2000), we created an "asset index" that provides a single measure of household wealth. Each individual is then assigned the value or score of the asset index for his or her household.

Data analysis

We compare the relationship between various measures of disadvantage and the three dependent variables at baseline and endline for the study and control sites using multivariate analysis. If our intervention design had targeted specific individuals, such analysis would be done on a pooled sample of individuals at baseline and endline, with dichotomous variables for study-control and baseline-endline. However, since the interventions were at the community level, the

[5] There is considerable debate on defining "inequality" in health (Gwatkin, 2000; Gakidou, Murray and Frenk, 2000; Alleyne, Casas and Castillo-Salgado, 2000). While pure inequality – that is, health inequality between any two individuals – is important in its own right, in this paper we focus specifically on inequalities in access to health information or services that are systematically associated with economic status, gender, rural-urban residence, or educational attainment at the time of the study. Other research has examined the extent of unjustness or inequity related to various inequalities (Le Grand, 1987), and the potential ethical dilemmas in a focus on reducing inequalities in health relative to improving health for all (Wagstaff, 2001). We acknowledge the importance of these debates; however, these are outside the scope of this paper.

[6] Specifically, assets included are: whether or not a household has a flush toilet, a pit toilet, a water source in the residence/yard, electricity, radio, black-and-white television, color television, telephone, bicycle, motorcycle, refrigerator, car; whether a household owns its house; whether a household owns any land, owns land in rural areas and how much, owns land in urban areas. (see Appendix B for full details)

NAP data provide us with essentially two cross-sectional samples at baseline and endline. Thus, we present analyses separately by the samples for study-baseline, study-endline, control-baseline, and control-endline, and use significance tests to test the differences in coefficients between baseline and endline, in study versus control sites.[7]

The three dependent variables also apply to different sub samples of adolescents. The two pregnancy-related variables (prenatal care and institutional delivery) are applicable to only married young women. Since the interventions specifically targeted the 14-21 age group for these service-delivery related outcomes, we track this cohort and compare these outcomes for 18-25 year olds at endline. On the other hand, the dependent variable on knowledge regarding modes of HIV transmission applies to the full sample of adolescents, males and females, married and unmarried. Here, we compare the 14-21 year olds at baseline and endline. The 14-17 year olds at endline are included in the comparison because information-related interventions were aimed at the entire community, including younger adolescents. However, the 22-25 year olds are excluded only because knowledge levels among youth in the older age groups are so high that there is no variation to explain. By the endline, in urban areas almost all respondents (92% in the study site and 97% in the control site) correctly identified at least two modes of HIV transmission. With such little variation, multivariate analysis for the urban sample did not yield meaningful results. There was more variation in the rural sites at endline (70% in the study site and 64% in the control site answered correctly), and thus the multivariate analysis presented here focuses on rural areas only.

For the multivariate analyses a continuous wealth variable is used in every case, though the particular continuous variable used depends on the outcome being considered. For the prenatal use and institutional delivery outcomes, we pooled the urban and rural samples and used a continuous wealth variable with the household asset scores for urban and rural areas combined. For the HIV/AIDS knowledge outcome, the rural continuous wealth variable is used, as the analysis is limited to only the rural sample.

In order to visually highlight our findings, we also occasionally use bivariate graphs to show the association between an outcome and household wealth. For the bivariate analysis, households were ranked by their asset score and divided into poor/rich (for institutional delivery) or quartiles (for HIV knowledge), with a different grouping used depending on the sample size for the health outcome being analyzed. All sample individuals were assigned the wealth group of the household in which they resided.

Means and Distributions for Variables in the Analysis

Table 2 presents the descriptive frequencies with means and where relevant, the range of values, for outcome variables and key independent variables. The first set of frequencies is for the sub sample of women who have ever experienced a pregnancy. The sample size here is fairly small, posing limitations for the multivariate analysis. Since the cohort has aged during the intervention period, the mean age at endline is older than at baseline for both study and control

[7] Although we were tracking a cohort of adolescents, the samples are nonetheless likely to have repeat observations from the same individual. However, it is not possible to identify these repeat observations and thus we would not be able to correct for this as needed in a pooled, time-series analysis.

sites. Also, in both sites, the proportional representation of rural women increases from baseline to endline, indicating that urban women were less likely to have experienced a pregnancy by endline. In part due to the greater representation of rural women for this sub sample, the wealth score shows only minimal change from baseline to endline in both sites. However, this group of women is somewhat better educated by the endline in both sites.

The second part of table 2 shows the descriptives for the rural sample of married and unmarried young men and young women and the variable on knowledge regarding modes of transmission for HIV.

For the overall sample of rural young people, the improvements in education from baseline to endline are more substantial than for the selective sample of young women who have experienced pregnancies. The change in the outcome variable of interest is also more substantial from baseline to endline, in both control and study sites. While at baseline, less than 50% of respondents could accurately name at least two modes of transmission, by the endline the proportion is closer to 80%.

Table 2: Sample Means and Distributions for Variables in the Analysis
Subsample for prenatal care and institutional delivery: married young women with pregnancy experience

Variable	**Study Baseline**	**Study Endline**	**Control Baseline**	**Control Endline**
Independent variables				
Mean age in years (range)	19.5 (14-21)	22.1 (18-25)	19.1 (14-21)	21.6 (18-25)
Percent living in rural areas	41.1	57.5	60.7	69.5
Mean wealth score (range)	-0.47 (-2.9, 3.7)	-0.51 (-3.4, 3.8)	-1.33 (-2.9, 2.2)	-1.13 (-3.4, 3.3)
Mean highest education received in years of schooling	4.1	4.8	2.9	3.3
Dependent variables				
Percent receiving prenatal care	71.4	58.8	53.6	56.8
Percent using institutional delivery	48.2	51.9	32.1	47.4
N	56	80	56	95

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Subsample for knowledge of modes for HIV/AIDS transmission: rural male and female youth

Variable	**Study Baseline**	**Study Endline**	**Control Baseline**	**Control Endline**
Independent variables				
Mean age in years (range)	17.2 (14-21)	17.1 (14-21)	17.0 (14-21)	17.2 (14-21)
Mean wealth score (range)	0.56 (-2.3, 4.2)	0.65 (-2.5, 10.1)	0.07 (-2.3, 3.8)	-0.15 (-2.5, 13.2)
Percent female	53.7	49.7	57.6	50.5

Mean years of schooling	4.6	5.6	4.2	5.2
Dependent variable				
Percent who know 2+ modes of HIV Transmission	45.1	82.4	45.6	80.5
N	175	157	198	202

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Findings

Our results from various vantage points indicate that as compared to the non-participatory intervention design, the participatory approach was more successful in reducing advantage-based differentials in youth reproductive health outcomes. This is generally true for the three indicators presented here—prenatal care, institutional delivery, and knowledge of HIV/AIDS transmission.

Overlap in Disadvantages

As a first analysis step, we examine disadvantage in the study and control communities. We find that there is a notable overlap in the incidence of the different types of disadvantage we measure in this population. In particular, the overlap between household wealth status and urban-rural status is striking. Our data show that in fact the difference in wealth across the two settings is so large as to be almost synonymous with rural-urban residence itself. Figure 1, which shows the cut-off points for wealth quintiles for all four sites at baseline and endline, clearly illustrates the wide gap in wealth between the rural and urban areas. In the urban areas, not only is the curve for distribution of wealth at a much higher level than in the rural areas, even the cut-off for the poorest twentieth percentile in the urban areas is at a higher asset index score than the cut-off for richest twentieth percentile in the rural area. This gap in the distributions of wealth across the two areas is apparent at both baseline and endline.

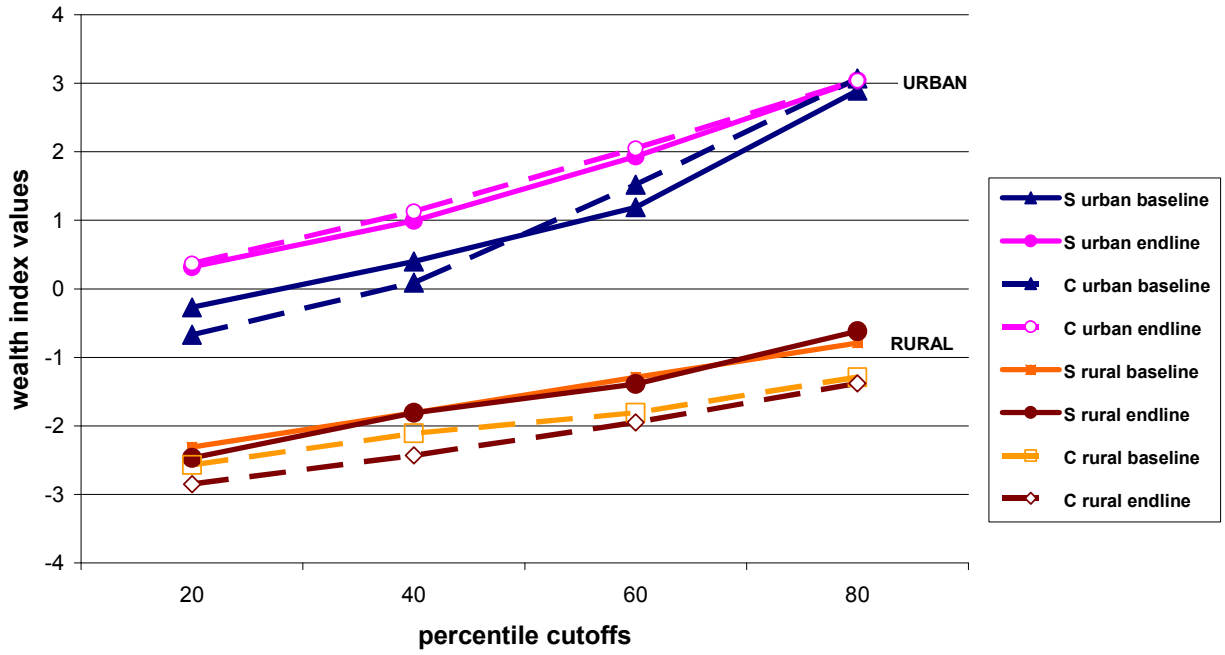

Figure 1: Wealth quintile cut-off points
Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Two other measures of disadvantage—education and ethnicity—also overlap substantially with both wealth and rural-urban residence. Both due to the high collinearity across these measures of disadvantage, and to the small sizes of the sub-samples for some of our dependent variables of interest, it is not always possible to disentangle the effect of each disadvantage-defining variable in a multivariate setting. Therefore, we limit our multivariate analyses to fairly basic models, with minimal controls.[8] Where needed, we also present some bivariate graphs showing the relationship of household wealth to the outcome in question.

Prenatal Care

Table 3 shows the effect of disadvantage, as measured separately by rural-urban residence as well as wealth, on the use of prenatal care by young married women for their first pregnancy. In all cases, the regression coefficients shown are from two models: Model 1a controls for age and shows the impact of residing in an urban as opposed to rural area, and Model 1b controls for age and shows the impact of wealth as a continuous variable.

[8] For all outcomes, models were run with combinations of the following variables: age, education, gender, rural-urban residence, and household wealth. Due to sample size limitations interaction models were not possible. Only final regression models are shown here.

In comparing the coefficients for baseline with those at endline (Model 1a), it is clear than the rural-urban differential is practically eliminated in the study sites, whereas it is essentially unchanged in the control sites. The coefficient for urban residence in the study site is 2.8 at baseline and is significant at the .001 level, whereas at the endline, it reduces to .22, and is no longer significant. The odds ratios indicate what a dramatic turnaround this represents: at baseline, an urban young woman in the study site was sixteen times more likely to get prenatal care than a rural young woman, but by the endline, she is only 1.2 times as likely to get prenatal care. In the control site, the initial contrast was less extreme: urban women were only 3.7 times more likely to get prenatal care than rural women. However, this differential shrinks to only 3.2 times more likely for the urban women, and remains significant at the endline. Tests of significance between baseline and endline coefficients in each of the study and control sites confirm that there is a statistically significant decline in residence-based advantage in the study sites between the baseline and the endline, while there is no significant change in the control sites.

Table 3. Prenatal Care: Regression results, Study and Control Sites

	Study		**Control**	
	Baseline (14-21 years)	Endline (18-25 years)	Baseline (14-21 years)	Endline (18-25 years)
Model 1a: Urban vs. Rural residence (controlling for age)				
Coefficient	2.80	0.22	1.32	1.16
Odds Ratio	16.4	1.2	3.7	3.2
P Value	0.001	0.644	0.028	0.021
(N)	56	80	56	95
One-tailed t test (p)	2.9 (0.00)		0.2 (0.42)	
Model 1b: Wealth (controlling for age)				
Coefficient	1.01	0.20	0.66	0.36
P Value	0.005	0.189	0.017	0.010
(N)	56	80	56	95
One-tailed t test (p)	2.3 (0.01)		1.1 (0.13)	

Note: the t tests are one-tailed to test the hypothesis that differentials by disadvantage **are reduced** from baseline to endline.

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Model 1b shows similar results, using wealth as the key independent variable, and again, controlling for age. The beneficial impact of belonging to a wealthier family is substantial and significant in both study and control sites at baseline (more so in the study than in the control site). In the study site, by the endline the coefficient for wealth is much smaller than at baseline, and no longer significant. In contrast, at the control site, at endline wealth remains an important differentiating factor in young women's access to prenatal care. Again, significance tests confirm that the baseline-endline change in the study sites, but not in the control sites, is significant.[9]

[9] In order to see how wealth interacted with rural-urban residence, we also ran regressions separately by urban and rural areas but these did not yield meaningful results, largely due to small sample sizes. Moreover, the issue of

Institutional Delivery

Table 4 shows the regression results for the relationship between disadvantage and young women's delivery of their first pregnancy in a medical facility. Model 2a shows the extent to which rural-urban differentials shifted from baseline to endline, and again, the results are much more encouraging in the study sites than in the control sites. At baseline, and in both study and control sites, institutional delivery is a rare occurrence in rural compared to urban areas: in the study site, urban young women are over fifteen times more likely to have an institutional delivery as rural women, and in the control site, they are over 13 times more likely to do so. Although differences remain in the study site by the endline, they are substantially reduced: the odds ratio is down to 4.6, and the urban-rural coefficient decreases from 2.75 to 1.52, a statistically significant difference between baseline and endline. In contrast, the differentials actually increase in the control sites, where at endline young women in the urban area are 21 times more likely to have an institutional delivery when compared to their rural counterparts.

Table 4. Institutional Delivery: Regression results, Study and Control Sites

	Study		**Control**	
	Baseline (14-21 years)	Endline (18-25 years)	Baseline (14-21 years)	Endline (18-25 years)
Model 2a: Urban vs. Rural residence (controlling for age)				
Coefficient	2.75	1.52	2.61	3.05
Odds Ratio	15.6	4.6	13.5	21.3
P Value	0.000	0.002	0.000	0.000
(N)	56	79	56	95
One-tailed t test (p)	1.4 (0.08)		-.4 (0.66)	
Model 2b: Wealth (controlling for age)				
Coefficient	0.62	0.68	1.42	0.85
P Value	0.019	0.001	0.000	0.000
(N)	56	79	56	95
One-tailed t test (p)	-0.2 (0.57)		1.5 (0.07)	

Note: the t tests are one-tailed to test the hypothesis that differentials by disadvantage **are reduced** from baseline to endline.

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

At a bivariate level, wealth differentials (poor/rich ratios) show a similar, although less dramatic pattern. Figure 2 shows that at baseline, both study and control sites show substantial differentials between the rich and the poor: the poor to rich ratio in institutional deliveries is .32 in the study sites and .24 in the control sites. [10] However, as a result of the intervention, differentials are reduced more in the study sites than in the control sites, largely because of

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sample selection was also problematic in the urban areas. Between baseline and endline, urban areas showed a large decline in pregnancies, and the pregnancies that did occur were heavily skewed among the poorest.

[10] As noted earlier, due to a small sample size for institutional delivery, we use poor/rich ratios rather than tertiles, quartiles or quintiles.

improved access by the poor in the study sites: by the endline, the improvement in access to institutional delivery is entirely among the poorer 50% of the population in the study site, whereas in the control sites, both the rich and the poor gain from the interventions. As a result, at the endline, the poor to rich ratio in institutional deliveries improves to .54 in the study sites, but only to .35 in the control sites.

The multivariate analysis for the relationship between wealth and institutional delivery, however, is not consistent with this interpretation. As model 2b in table 4 shows, when the measure for wealth is used as a continuous variable, and the age of the respondent is controlled for, there is little change between baseline and endline in the study sites, but a more dramatic reduction in the control sites. Our diagnostics show that the relationship between wealth and institutional delivery for the study and control sites is highly sensitive to how the wealth variable is defined. Defined as a continuous variable and in a linear relationship, the control site shows a stronger improvement. However, defined as a dichotomous variable, or with a squared term, and in a curvilinear relationship, the study site shows a stronger improvement. This is because in the control site much of the increase in institutional deliveries was at the extreme ends of the wealth continuum while in the study site, much of the improvement was among those in the middle.

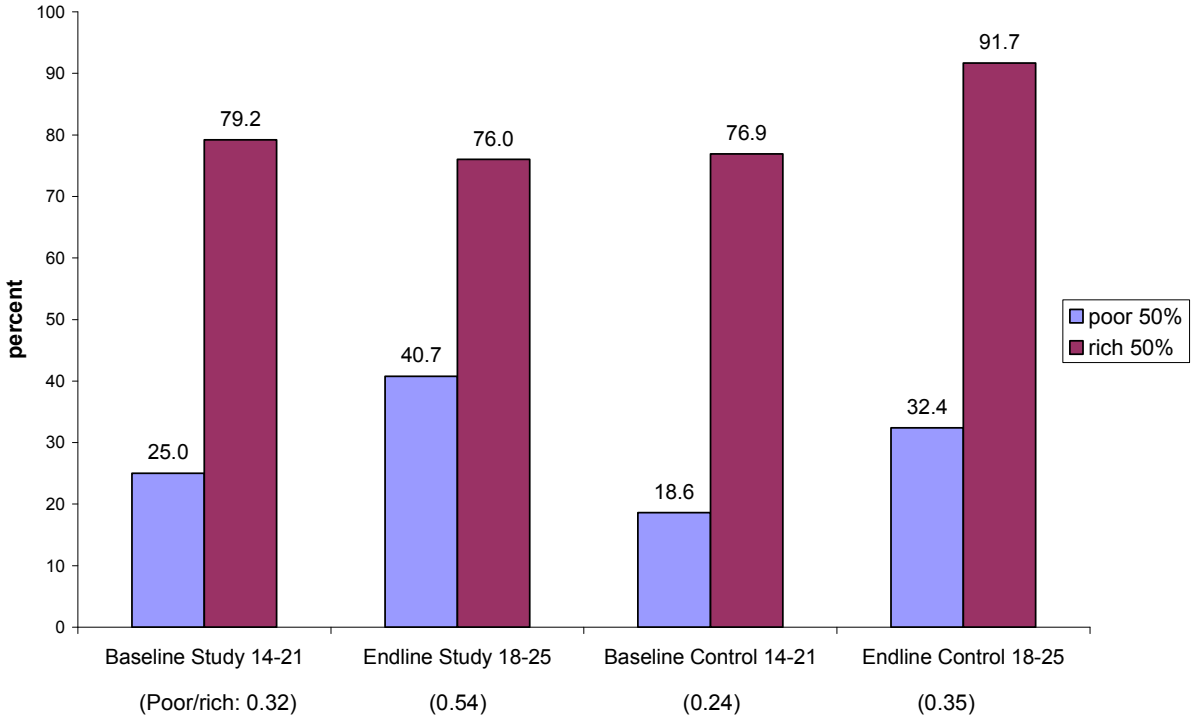

Figure 2: Delivery in a Medical Facility: First Pregnancy, Poor and Rich Young Married Women

Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Knowledge of HIV Transmission

The factors generating disadvantage in knowledge of modes of HIV transmission are somewhat different and broader than those applying to prenatal care and institutional delivery. A major reason for this is the broader sample base to which this indicator applies: married and unmarried young men and women. As many studies on youth and adults have noted, young women tend to be disadvantaged compared to young men with regard to access to information and knowledge on sexual and reproductive issues in general, and with regard to HIV and AIDS in particular (World Bank 2004; Weiss et al. 1996). Thus, gender serves as an important basis for disadvantage, in addition to poverty or rural-urban residence.

Figure 3 presents a bivariate graph of wealth-based inequalities in knowledge of at least two modes of HIV transmission for the study and control sites at baseline and endline. A larger sample size than was available for maternal care allows us to use wealth quartiles in the bivariate analysis rather than just poor/rich ratios, thus capturing a more nuanced picture of the relationship between disadvantage and HIV knowledge. As figure 3 shows, the overall proportion who can correctly identify at least 2 modes of HIV transmission is fairly similar for both the study and control sites, with a substantial improvement from baseline to endline for both sites. However, the degree of improvement varies by the level of wealth score: by the endline, the differentials by wealth in knowledge of HIV transmission are less marked in the study sites than they are in the control sites. In particular, at endline, young people from the poorest quartile are closer in knowledge to the remainder of the population in the study sites than in the control sites.

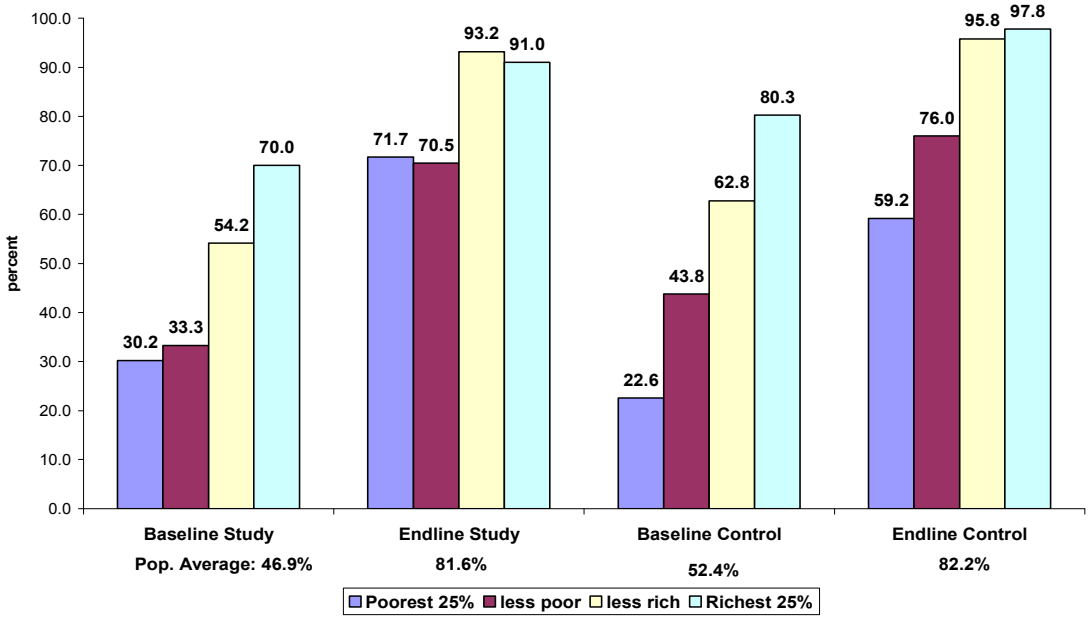

Figure 3: Knowledge of at least two modes of HIV transmission: by Wealth Quartiles, Young Men and Women (aged 14-21)
Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

To further explore these differentials, we present three multivariate models in table 5: model 3a shows the effect of being a male rather than a female, controlling only for age, model 3b shows the effect of gender and schooling, and model 3c further includes a continuous variable for household wealth. The multivariate models present data only for the rural areas, since there was lack of variation in the urban areas, where knowledge levels for everyone were high at endline.

Table 5: Knowledge of HIV/AIDS Transmission: Rural Study and Control Sites

	Study		**Control**	
	Baseline	**Endline**	**Baseline**	**Endline**
Model 3a: Gender(controlling for age)				
Coefficient Male vs female (0=female)	0.41	-0.28	-0.21	1.23
Odds Ratio	1.5	0.8	0.8	3.4
P Value	0.211	0.430	0.531	0.000
One-tailed t test (p)	1.4 (0.07)		-3.1 (0.99)	
Model 3b: Gender and Education (controlling for age)				
Coefficient Male vs. female (0=female)	0.18	-0.71	-1.23	0.74
Odds Ratio	1.2	0.5	0.3	2.1
P Value	0.612	0.086	0.003	0.034
One-tailed t test (p)	1.6 (0.05)		-3.7 (0.99)	
Coefficient Education	0.21	0.46	0.39	0.35
Odds Ratio	1.2	1.6	1.5	1.4
P Value	0.001	0.000	0.000	0.000
One-tailed t test (p)	-2.2 (0.98)		0.5 (0.32)	
Model 3c: Gender, Education and Wealth (controlling for age)				
Coefficient Male vs. Female (0=female)	0.17	-0.73	-1.22	0.74
Odds Ratio	1.2	0.5	0.3	2.1
P value	0.634	0.079	0.003	0.034
One-tailed t test (p)	1.7 (0.05)		-3.6 (0.99)	
Coefficient Education	0.22	0.46	0.40	0.35
Odds Ratio	1.2	1.6	1.5	1.4
P value	0.002	0.000	0.000	0.000
One-tailed t test (p)	-2.1 (0.98)		0.1 (0.48)	
Coefficient Wealth	-0.05	-0.09	-0.08	-0.05
P value	0.619	0.510	0.586	0.625
One-tailed t test (p)	0.2 (0.41)		-0.2 (0.55)	
N	**175**	**157**	**198**	**202**

Note: the t tests are one-tailed to test the hypothesis that differentials by disadvantage **are reduced** from baseline to endline. Source: Nepal Adolescent Project. 1999 Baseline Adolescent and Household Surveys and 2003 Endline Adolescent and Household Surveys

Model 3a shows that in the rural study site at baseline, differentials in knowledge of HIV transmission by gender, although not statistically significant, favored males: compared to young women, young men were 1.5 times as likely to identify at least two modes of transmission. By the endline, however, this small male advantage disappears, and the odds of males knowing more are actually less than 1 (although not statistically significant). However, the disappearance of the male advantage from the baseline to endline in the study site is statistically significant. In contrast, no significant gender differences are apparent at the baseline in the control site. By the endline, however, young men in the control site are more than three times more likely to know about how HIV is transmitted when compared to young women.

Model 3b sheds further light on this pattern. In both sites, and both at baseline and endline, education is positively and significantly associated with knowledge of HIV transmission. In fact, there is little change between baseline and endline in the effect of education. In the study site, by the endline, a baseline advantage for boys seems to have disappeared and girls are significantly more likely to have correct knowledge of HIV transmission than boys: boys are only half as likely as girls to correctly list 2 modes of transmission (odds ratio of 0.5). Significance tests between baseline and endline coefficients show that this shift is significant. This suggests that, since boys are more likely to be educated than girls, and those educated are much more likely to know about HIV transmission, it is only by controlling for the confounding effects of education that we can see the true effect of the intervention in reducing gender disparities in HIV knowledge. In the control site, on the contrary, even after controlling for education, and thus for boys' advantage on the schooling front, young men are still more likely than young women to be aware of modes of HIV transmission. In fact, there is no significant change in the gender differentials between baseline and endline in the control site.

Adding in a variable for household wealth (Model 3c) makes no difference to the gender or education coefficients. The wealth variable itself, in addition, has a very minor coefficient and is non-significant, suggesting that it is education and gender, and not wealth, which are defining aspects of disadvantage for knowledge of HIV transmission.

Summary and Discussion

Our analyses show that for the population in this study, the change in the relationship between disadvantage and health knowledge or behavior depends both on the measure used to define disadvantage and the specific health outcome in question. For access to prenatal care services and institutional delivery, the key aspect of disadvantage is urban-rural residence, with household wealth being significant for prenatal care only. For knowledge of HIV transmission, it is gender and educational differences that are key. On balance, our analysis shows that for most of the measures used to define disadvantage, the participatory approaches in the study sites were more successful in increasing access or knowledge for the disadvantaged than the more standard approaches used in the control sites.

Why Did the Participatory Approach Work?

Our broader results indicate that although generally more positive in its outcomes, the participatory approach is by no means a panacea (Mathur et al. 2004). The broader conclusions are also reflected in the analysis for this paper, where we generally find a more positive impact of the participatory approach in reducing differentials due to disadvantage by rural-urban residence, wealth, and gender, but not universally so.

Our review of the broader set of quantitative variables as well as the qualitative and participatory data indicates that at least three important factors were critical in the relatively greater success of the participatory approach: 1) effectiveness in facilitating co-production of services, 2) empowering youth and adults and increasing the accountability of service providers and policy makers to the community, and 3) increasing community demand for information and services.

The nature of adolescent reproductive health makes it especially amenable to co-production and self-service by clients, and the participatory intervention design substantially facilitated such co-production. Data from the study sites underscore the emergence of well-informed and trained peers and more reliable social networks as critical sources of service provision for young people. Based on findings from the needs assessment, the study site interventions tapped and strengthened social networks for information exchange and counseling while the control site interventions did not. Moreover, young people's understanding of what services actually mean, and how to best use the options available to them, improved more substantially in the study sites.

Second, because of the active effort at imparting information and building decision-making structures and coalitions, the participatory intervention was substantially more successful in empowering youth and adult community members and increasing the accountability of providers and policy-makers to the communities. In part, this resulted from the participatory structures (committees, task forces, youth club, etc.) set up in the study sites which fostered community skills in consensus building, decision-making, planning, organizing, consulting, and demanding resources and accountability from various actors. For example, adults and youth learned to negotiate with the Village Development Committee (VDC) and felt that jointly they are in a position to demand government funds to continue project activities. Empowerment and demand for accountability are also apparent from the data documenting the change in the client-provider relationship in the study sites. Not only were the providers trained by the program to be more youth friendly, courteous, and responsive, young people in the community were aware that they can enforce these expectations.

Finally, in the study sites, the greater focus on altering not just reproductive health outcomes, but changing fundamental social norms and institutions, was a major factor in increasing demand for information and services among the disadvantaged. The evaluation data for the full study (not shown here) demonstrate that the participatory approach had a significant impact on a number of the broader contextual factors that have long term consequences for reproductive health outcomes, including entry into marriage and childbearing, secondary schooling, mobility, and social spaces for girls (Mathur et. al. 2004). The results also indicate that the enabling environment for good reproductive health has improved in the study sites because the

participatory approach has generated a new mindset in the communities, one with a deeper, more sophisticated understanding of youth reproductive health and its implications.

Limitations and Implications for Future Studies

Our study has some limitations that need to be considered in designing such studies and analyses in the future. One such limitation – or choice to be considered – is that associated with a micro, household and community-based study versus a large, macro survey. While the micro household study design provides a unique perspective that is more in-depth than macro studies can be, it has limitations for analyses, mainly arising out of small sample size. Our study is no exception to this. One of our main constraints has been the small sample sizes for some of the outcomes of interest, due to which we were not able to consider certain key reproductive health outcomes such as contraceptive use. For the outcomes we were able to analyze, small sample sizes restricted our ability to use sophisticated regression models. On the other hand, the community-based nature of the data allowed for greater in-depth and qualitative analyses. These were a huge asset in defining disadvantage and poverty in a manner that was contextually-appropriate to our study and control communities in rural and urban Nepal, and in analyzing causes for the patterns of disadvantage and change over time that we observed.

As we highlight in this paper, wealth, residence, education, caste, and gender are all important measures of disadvantage in the Nepali context. However, no one variable captures disadvantage completely, and, using an index based solely on household wealth, or a measure of urban-rural residence, captures most, but not all levels of disadvantage in this population. Other measures such as gender, or education, capture different dimensions of disadvantage than do wealth or urban-rural residence. Thus, none of the measures of disadvantage we used were successful in fully capturing the extent to which groups that have multiple disadvantages suffer. An alternative for future consideration in this and other work is to develop a broader measure of disadvantage by creating an index that includes not only wealth or asset ownership, but also accounts for the other relevant factors in determining disadvantage. Whether a combined index or separate measures of disadvantage should be used will depend on the question to be answered.

Another important point to note is that since the availability of health services in or near the rural and urban communities was a factor in site selection, it could not be used as a factor in the analysis. Finally, as noted earlier, the current study employed a longitudinal study design to the extent that we studied a cohort of young people over time. We could not duplicate a true panel design, in that the same individuals were not followed over time. Unfortunately, most recent studies that have focused on youth reproductive health issues in the developing world have found it difficult and practically impossible to overcome the challenges involved in setting up a true panel design (Magnani et al 2001).

Conclusions

These study results suggest that issues of empowerment and accountability, considered essential to improve health for the poor, can be operationalized at multiple levels. Our work shows that in addition to macro level efforts, smaller scale community level efforts can also be targeted to achieve these outcomes. In fact macro policy efforts have a lot to learn from the participatory

processes that are implemented at the grassroots levels. Such community-based participatory projects are usually not well documented or evaluated, and this study presents a rare, rigorous evaluation of the benefits and pitfalls of using participatory approaches to improve reproductive health outcomes and access to services for disadvantaged clients. As such, this evaluation adds significantly to the literature on the role of participation in diminishing the disadvantages faced by the worst-off: poor, rural, un-educated, female clients.

Our results show that the participatory approach can be successful in providing clients, especially disadvantaged clients, with choices and mechanisms to engage with health and social systems. These approaches and mechanisms have strengthened the power of young people in our study communities in negotiating for appropriate, accessible, and accurate information and services from providers and policy makers, which, in turn, has increased the extent to which such providers are accountable to these clients.

Perhaps most critically, our study reinforces the literature on the need for broader definitions of disadvantage. There is no dispute that poverty is a key and powerful measure of disadvantage. Nonetheless, in many rural communities in the developing world, those who are most disadvantaged owe this disadvantage to complex and interwoven interactions between various contextual factors. To get a full measure of disadvantage in any one community, these context-specific factors need to be fully considered. Beyond this, however, even at a broader, generalizable level, our study and those of others that examine inequalities in health, show that analyses of poverty as a measure of disadvantage need to be accompanied by analyses of rural-urban residence, gender, and educational access as other important markers of social, cultural, and economic differentials.

References

Alleyne, George A.O., Juan Antonio Casas, and Carlos Castillo-Salgado. (2000). Equality, equity: why bother? *Bulletin of the World Health Organization* 78(1): 76-77.

Cornwall, A. and J. Gaventa. (2001).“Bridging the Gap: Citizenship, Participation, and Accountability.” *PLA Notes* 40:32-36.

Filmer, D. and Pritchett, L. (2001). Estimating Wealth Effects Without Expenditure Data – Or Tears: An Application to Educational Enrollments in States of India. *Demography* 38(1): 115-132.

Gakidou, E.E., C.L.J. Murray and J. Frenk. (2000). Defining and measuring health inequality: an approach based on the distribution of health expectancy. *Bulletin of the World Health Organization* 78(1): 42-54.

Gwatkin, D. (2000). Health inequalities and the health of the poor. *Bulletin of the World Health Organization* 78(1): 3-17.

Gwatkin, D., Rutstein, S., Johnson, K., Pande, R., & Wagstaff, A. (2000). Socio-Economic Differences in Health, Nutrition and Population in [44 countries]. The World Bank, Health, Nutrition and Population Department: Washington, D.C.

Le Grand, J. (1987). Equity, health and health care. *Social Justice Research* 1: 257-274.

Magnani, RJ, Lynne, G, Leao de Quino, EM, Seiber, EE, de Conceicao Chagas Almeida M, Lipovsek, V. 2001. Impact of an Integrated Adolescent Reproductive Health Program in Brazil. *Studies in Family Planning.* Vol 32 (3).

Mathur, S, Malhotra, A, and M. Mehta. (2001). “Adolescent Girls' Life Aspirations and Reproductive Health in Nepal.” *Reproductive Health Matters* 9(17): 91-100.

Mathur, S, Mehta, M. and A. Malhotra (2004). Youth Reproductive Health in Nepal: Is participation the answer? Washington, DC and New York: International Center for Research on Women and EngenderHealth.

McCauley, AP and C Salter. (1995). Meeting the Needs of Young Adults. *Population Reports*. Baltimore, MD: Johns Hopkins School of Public Health, Population Information Program. Series J**:** 43.

Mensch, B., Bruce, J, and M. Greene. (1998). “The Uncharted Passage: Girls’ Adolescence in the Developing World.” The Population Council. New York, NY.

Ministry of Health (Nepal), New ERA, et al. (2002). Nepal Demographic and Health Survey 2001. Calverton, Maryland, USA, Family Health Division, Ministry of Health; New ERA; and ORC Macro.

Montgomery, Mark R., Michele Gragnolati, Kathleen A. Burke, and Edmundo Paredes. (May 2000). Measuring Living Standards With Proxy Variables. *Demography*. 37(2): 155-174.

Norman, Jane. (2001). "Building Effective Youth-Adult Partnerships." *Transitions* 14(1):Pages 10-14.

Pande, Rohini P. and Abdo S. Yazbeck. December 2003. "What's in a country average? Income, gender, and regional inequalities in immunization in India." Social Science and Medicine 57 (11): pp 2075-2088.

Senderowitz, J. (1998). Involving Youth in Reproductive Health Projects. Research, Program and Policy Series. Washington, DC: FOCUS on Young Adults/Pathfinder International.

Senderowitz, J. (1999). Making Reproductive Health Services Youth Friendly. Research, Program and Policy Series. Washington, DC: FOCUS on Young Adults/Pathfinder International.

StataCorp 1997. Stata Statistical Software: Release 5. College Station, TX: Stata Corporation.

UNFPA. 2004. Website: http:www.unfpa.org/adolescents/facts.htm

Wagstaff, A. (2001). Economics, Health and Development: Some Ethical Dilemmas Facing the World Bank and the International Community. *Journal of Medical Ethics*. 27(4): 262-267.

Weiss, W, Wehlan, D, and GR Gupta. 1996. Vulnerability and Opportunity: Adolescents and HIV/AIDS in the Developing World. Washington, DC: International Center for Research on women.

World Development Report 2004. Making Services Work for Poor People. Washington, DC and New York: The World Bank and The Oxford University Press.

Appendix A
Data Sources, Samples and Methodologies in the Nepal Adolescent Project

METHODOLOGY	PURPOSE AND RESEARCH TOOLS		
	Baseline & Formative Research (January 1999 – March 2000)	Endline (April to November 2003)	Monitoring & Process Documentation (November 2000 to March 2003)
Quantitative (study and control sites)	Household Survey N=(965) Adolescent Survey ages 14-21, N=(724) Adult Survey ages 30+, N=(752) Service Provider Survey, N= (59)	Household Survey N=(1003) Adolescent Survey ages 14-25, N=(979) Adult Survey ages 30+, N=(654) Service Provider Survey, N= (62)	Facilitator reports on participation in intervention activities (231) Mystery client survey at mid-point and end-point (48)
Qualitative (study and control sites)	Key Informant Interviews (3) In-depth Interviews (14) Focus Group Discussions (10)	Focus Group Discussions (16)	Facilitator reports on intervention activities (same as above)
Participatory (study sites only)	9 participatory activities with 4-5 groups each: Community Mapping Mobility Mapping Free Listing and Ranking Lifelines Body Mapping Reproductive Health Problem Trees RH Service Matrix	5 participatory activities with 20 groups each: Mobility Mapping Lifelines Reproductive Health Problem Trees RH Service Matrix Trend Analysis	67 community group assessments at mid-point and end point

Appendix B: Measurement of Household Wealth

Household wealth in our analysis is measured in terms of household assets. From the data in our study on household asset ownership, and following the approach used by Gwatkin et al. (2000), we created an "asset index" where households were ranked by their asset score. We calculated asset indices separately for baseline and endline. In addition to one overall baseline and one endline index, we also created separate urban and rural indices at baseline and endline, following the approach taken by Pande and Yazbeck (2003). Our creation of separate rural and urban indices is based on the likelihood that the same asset has different possible valuations in different contexts. For instance, owning a bicycle might score high (and thus indicate a wealthy household) in a rural area whereas the same asset may be common enough in an urban area that it does not indicate a particularly wealthy household. More specifically, based on our understanding of the study and controls sites, it was clear to us that the rural sample is much poorer than the urban sample, and thus we expected the entire rural wealth distribution to be very different from that for urban areas. To retain comparability across urban and rural areas, and across baseline and endline samples, assets are defined identically for the most part.[11]

Specifically, assets included in the overall and urban asset indices are: whether or not a household has a flush toilet, a pit toilet, a water source in the residence/yard, electricity, radio, black-and-white television, color television, telephone, bicycle, motorcycle, refrigerator, car; whether a household owns its house; whether a household owns any land, owns land in rural areas and how much, owns land in urban areas. The only asset excluded from the rural index was ownership of urban land since only 2 rural respondents at baseline, and only 3 at endline, owned any urban land.

Each asset was assigned a weight or factor score generated through principal components analysis, using programs generated by STATA (StataCorp, 1997). The resulting "raw" asset scores were standardized in relation to a standard normal distribution with a mean of zero and a standard deviation of one. For each household, the scores reflecting the distribution of assets for that household were summed to generate a household asset score as follows:

$$\text{Household asset score} = \left(\frac{\text{value of asset variable - unweighted mean of asset variable}}{\text{unweighted standard deviation of asset variable}} \right) \times \text{"raw" asset factor score}$$

[11] In some cases, due to small sample sizes for certain categories of assets for either rural or urban areas, definitions may differ between rural and urban areas. Asset definitions, scores and household quintile cut-offs for urban and rural samples are available upon request.