School Characteristics and the Transition to Marriage in Chitwan, Nepal

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Abstract

Although the research literature has reported strong links between exposure to schools and family patterns in rapidly changing societies, less research has examined the detailed characteristics of schools. In this paper I examine how multiple dimensions of schools are linked to young people's transition to marriage in the Chitwan Valley of Nepal. I divide school characteristics into three domains (volume, quality, and ideational content) and hypothesize how each of these domains is related to marriage rates. I test the hypotheses with data from the Chitwan Valley Family Study and discrete-time event history models. The results show that multiple measures of school quality are associated with marriage rates for men and women. When nearby schools have more volume of students and teachers, are of better quality, and have more egalitarian ideational content, individuals tend to delay marriage. These associations, however, are not explained by individuals' own experiences with schooling.

Introduction

Researchers have long hypothesized how participation in education in developing societies is related to the timing of individual family behaviors, such as marriage (Thornton 2001; Goode 1970; Caldwell, Reddy, and Caldwell 1983; Taeuber 1966). More recently, there have been efforts to supplement individual measures of educational participation with macro-level measures of educational opportunities, such as whether or not an individual has a school in his or her neighborhood, or how far away the nearest school is (Yabiku 2004; Alderman, Berhman, et al. 2001; Tansel 1997; Entwisle et al. 1996; Pong 1996; Knodel and Wongsith 1991). While these additional macro-level measures of educational opportunity often have associations with individuals' behaviors, these measures lack sufficient detail to test specific mechanisms by which schooling systems might affect behavior. A single measure, such as the presence of a school in a community, collapses wide variation in schooling

characteristics into a crude indicator. With a single measure, it is difficult to test the mechanisms that link school characteristics to individual behavior because the single measure may not capture the multiple dimensions of the school. The research in this proposal addresses these prior shortcomings by using rich, multidimensional measurement of school characteristics combined with detailed measurement of potential individual-level mechanisms.

Schooling systems and their influence on young people is a concern of broad importance and has been studied across the world. In more industrialized settings, the relationship between schools and various measures of student achievement has received the most attention (Card and Krueger 1998; Finn and Voelkl 1993; Namboodiri, Corwin, and Dorsten 1993; Schwartz, Stiefel, and Kim 2004; Oakes 1989; Hanushek 1986). Schooling systems in rapidly developing societies, however, often have a reach that is much broader than achievement outcomes. In developed societies, schools are frequently just one of many organizations and services that individuals and families interact with on a daily basis. Other organizations and services include employers, marketplaces, transportation infrastructure, healthcare institutions, and media outlets. In developing settings, however, schools are often the very first nonfamily organizations to exist in individuals' communities, with other nonfamily organizations and services coming much later (Axinn and Yabiku 2001). Thus schools in developing societies hold special importance and great promise for affecting individuals' lives not just with regards to educational outcomes, but for a diffuse array of social and family behaviors.

Despite their broad importance, school characteristics in the developing world have been less studied than in industrialized countries (Fuller 1987; Riddell 1997; Heyneman 1993; Heyneman and Loxley 1983). Research that has examined school characteristics in the developing world has tended to focus on education-related student outputs, such as school achievement (Glewwe and Jacoby 1994; Halpern 1986). Some notable exceptions include the work by Mensch et al. (2001), who examined how teacher attitudes, student attitudes, and school curriculum were related to premarital sex in Kenya.

Lloyd et al. (2000) used these same Kenyan data to examine the relationships between school quality and dropout. In both cases, however, these data were cross-sectional and did not capture broad variation in school characteristics over historical time. Bommier and Lambert (2000) studied the relationship between school enrollment, distance to schools, and three measures of school characteristics (educational supplies, language of instruction, and quality of mathematics instruction), but the data were cross-sectional and had limited measures of school characteristics.

The research in this paper takes a broad view of the role of school characteristics and examines how multiple dimensions are linked to young people's transition to marriage across a period of rapid social change in the Chitwan Valley of Nepal. Although there are many ways to classify different school characteristics, in a transitional setting such as Chitwan a relevant classification of school characteristics can be divided into three areas: volume, quality, and content. This classification captures many of the important features found in prior work on school characteristics in developing settings (Verwimp 1999; Palafox, Prawda, and Velez 1994; Gorman, Holloway, and Fuller 1988; Fuller 1987).

Volume. The volume of the schooling opportunities describes how much schooling or educational opportunity is available. Factors related to the volume of schooling opportunity include the number of teachers, the number of students, and the physical number of classrooms in the school. Volume also includes the sheer number of schools available to students. It is hypothesized that greater schooling volume with be associated with lower rates of marriage for young people. Separate, multiple mechanisms link schooling volume to decreased marriage rates.

First, a larger volume of teachers and classrooms provides more opportunities for school enrollment. Parents may not be able to enroll their children in school when there are not enough available schooling opportunities (Bommier and Lambert 2000). School enrollment has been shown to be an important dimension of the schooling experience because it is strongly linked to processes of role incompatibility and role conflict (Blossfeld and Huinink 1991; Thornton et al. 1995; Raymo 2003; Yabiku

2005). As educational systems become more widespread, the student role is the central focus of life from childhood through adolescence, and for many people on into early adulthood (Caldwell et al. 1998; Mensch et al. 1999). Because of this, role conflict and role incompatibility prevents many young people from combining their roles as "student" with other roles such as worker or spouse. Many roles, including those of student, spouse, worker, and parent, are contingent on other roles held previously or contiguously. Marriage is frequently viewed as an adult status that is incompatible with the role of student. This leads to expectations that students complete their schooling before taking on the responsibilities of marriage and family (Thornton, Axinn and Teachman 1995). As schooling has become more common in Chitwan, parents increasingly view adolescence for schooling and adulthood as the time for marriage (Yabiku 2005). Consistent with these premises, being enrolled in school has been found to be negatively associated with marriage rates in Chitwan, Nepal (Yabiku 2004; Yabiku 2005).

Second, even if individuals themselves do not attend school, a large volume of schooling activity near them may affect their marriage behaviors. This process has been previously described as the proximity mechanism (Yabiku 2004; Barber 2004). Even if a young person does not go to school, he sees other young people going to and coming from school. Social theorists as early as Mead (1934) proposed that individual behavior can be influenced by taking the role of the other (Heimer and Matsueda 1994). Simply observing an object or situation stimulates individuals to infer a potential relationship between them and the situation (Woelfel and Haller 1971). Even an individual who has been excluded from these organizations is likely to imagine how he or she would go to school, learn to read, and socialize with classmates. While this mechanism might not be plausible in a developed setting where schooling is widespread, in many transitional societies schooling was an exclusive privilege until the recent past, and schooling beyond primary school is still not universal (Fuller 1986). By seeing and learning from others, proximity to schools may raise aspirations and change behavior so that excluded individuals modify their

behavior to match the individuals who are able to participate in the activity (Bongaarts and Watkins 1996).

Quality. The quality of schooling refers to how effective the school's instructional and learning processes are. Quality of schools includes both human and physical resources available to the educational process. One important dimension in both developed and developing settings is the quality of teachers (Elliott 1998; Heyneman and Loxley 1983; Gorman, Holloway, and Fuller 1988). In Chitwan, Nepal, there is great variation, both historically and in cross-section, in the quality of teachers. At the dawn of Chitwan's schooling system in the 1950s and 1960s, only 10% of teachers had college degrees. By the 1990s, this increased greatly, but was still only slightly more than 50%. Thus the basic qualification of teachers is an important source of variation in this context. The physical properties of a school also can be indicative of its quality. Although the number of classrooms was conceptualized earlier as part of the volume of schooling, in the Chitwan context the physical number of classrooms can also indicate quality. Some schools in Chitwan began operating with no classrooms—the classes regularly met in a clearing or under a tree, rather than in a building. Clearly, not having a classroom or not having enough classrooms decreases the effectiveness of instruction. Another aspect of quality is the highest level of education offered. If students want to acquire more education but the school does not offer advanced study, then these students' educational experiences are truncated. It is hypothesized that the quality of schools with be associated with young people's marriage timing. The direction of these associations, however, depends on the specific mechanisms linking school quality to marriage; distinct dimensions of school quality are likely to impact marriage timing differently.

First, if parents perceive that a school is a high quality institution, they may be more likely to encourage their children to attend that school and pay for the schooling costs, if there are any. Bommier and Lambert (2000) found that higher quality schools in Tanzania were associated with higher levels of enrollment of children, and Alderman, Orazem, et al. (2001) observed a similar association

among children in Pakistan. Thus school quality may decrease marriage rates because it stimulates higher enrollment of young people in school, creates role conflict with other young adult roles and activities, and temporarily removes young people from the marriage market.

Second, an alternative mechanism is that high quality schools are more effective in increasing human capital accumulation in young people. Schools endow students with better skills, credentials, and abilities for employment. Even in an economy that contains large segments of the population operating through subsistence agriculture, education can be valuable for its prestige and status. In developed country settings, marriage market theories predict a positive relationship between years of education and marriage rates (Oppenheimer 1988, 1994). Individuals with more education are viewed as more attractive spouses because of their prestige and earning power. In Chitwan, this relationship is likely to hold for men: it is more common for men than women to work outside the home, and thus men's education is likely to increase their desirability. For women, however, more education may delay marriage. First, higher quality education can lead to increased women's participation in the nonfarm labor market, which can lead to economic independence, nonfamily living, and lowered incentives for marriage. Second, higher quality education can impact the mate selection process. In East and South Asian settings, men often prefer their wives to have less education than they have (Leete 1987; Rao 1993; Jejeebhoy and Sathar 2001). A highly educated woman could have difficulty finding a man who rivals her educational attainment, and she may have an extended search time to locate a spouse (Becker, Landes, and Michael 1977). In sum, the association between the quality of education and marriage timing is likely contingent on the gender of the student.

Content. The content of schooling refers to the substance as well as the ideational messages students receive from the school. Although a school's quality represents its effectiveness in teaching general skills and abilities, the ideational content students absorb during instruction can have equally important implications for their subsequent marriage behavior. Ideational content is often transmitted

through formal curriculum. For example, some schools in Chitwan offer English language instruction, while others only offer instruction in Nepali. Some schools have family planning as part of their curriculum, but others do not. Ideational messages, however, can also be generated through informal or unintended means. For example, the gender composition of school staff and student body can affect young people's ideas about the proper roles for men and women. Some schools have female teachers, but others have none. Similarly, the number of female students also varies across schools and across historical time. Multiple, distinct mechanisms link these different dimensions of content to marriage timing. The hypothesized relationship between school content and marriage timing depends on the specific dimension of context.

First, the curriculum may have strong reference to family formation behaviors. When family planning is taught at school, it may endorse the message that family-building decisions fall within the realm of individual control, as opposed to the exclusive control of elders or being "up to God." Thus the instruction of curriculum such as family planning is hypothesized to raise young people's aspirations for independence in family behaviors, such as marriage, and delay their transition from single to married. Young people will more frequently abandon the marriage behaviors of their parents' generation, which was universal and early marriage, resulting in delayed marriage for themselves.

Second, the curriculum can give students skills to consume and access ideational content outside of school. Mass media, such as movies, radio, and television, alter the distribution of information within the family (Caldwell 1982; Westoff and Rodriguez 1995; Bongaarts and Watkins 1996; Thornton 2001) and may weaken the family's influence on its members. In the case of Chitwan, much of what is seen and heard comes from countries outside Nepal, such as India, China, and Western countries (Liechty 1998). Individuals who consume foreign-produced media are likely to be influenced by its content, which repeatedly displays a form of family life typical of its country of origin (Thornton 2001). In popular American films, the form will feature the individual choosing to marry on the basis of

love rather than having a marriage arranged, marrying as an adult rather than as an adolescent, and having a small family. Thus television and movies are likely to have a negative effect on marriage rates for both sexes. When schools offer instruction in English, students' English-language skills may heighten ideational effects by increasing the consumption of media that portray forms of family behavior that differ from historical Nepalese patterns, resulting in delayed marriage.

Third, students are exposed to egalitarian ideas when the teachers and student body have female representation. Here, the egalitarian content arises not out of a formal curriculum, but from the organizational structure of the school—the presence of women and girls in settings and roles where they may have been previously prohibited or discouraged. Schools are legitimizing institutions (Meyer 1977), and as more females go to school and become teachers, women's roles are viewed beyond simply the roles of spouse and mother. If students are taught by female as well as male teachers, young people may gain a more egalitarian perspective. This exposure to female teachers may be especially important for young girls, because female teachers may serve as role models. Schooling has long been theorized to be an important mechanism in increasing women's autonomy (Niraula and Morgan 1996). While prior research has focused on the impact of education on raising women's decision-making authority in relation to men, exposure of both young men and women to coeducational environments may also be an important mechanism by which schooling raises egalitarianism in both sexes. This increasing exposure to egalitarianism is hypothesized to delay marriage.

Fourth, it is important to note that egalitarianism in schools can be exposed to individuals even if they themselves do not go to school. The proximity mechanism (Barber 2004; Yabiku 2005) discussed earlier predicts that even individuals who do not go to school will likely be aware of female teachers and students going to school nearby. Although it is likely to be dampened in comparison to the experience of actually attending a coeducational school, this indirect exposure to egalitarianism is likely to broaden an individual's notion of acceptable roles for women, again delaying marriage.

Data and Methods

Data. This analysis relies on rich individual and contextual level data available in the Chitwan Valley Family Study (CVFS), which beginning in 1996 has extensively measured social change and family behaviors in the Chitwan Valley of Nepal. The Chitwan Valley is 450 feet above sea level, about 100 miles south-west of Kathmandu, the capital city of Nepal. Chitwan is located in the Terai, a region of low-lying plains along the southern borders of the country. Up to the end of the 1950s the area was largely uncultivated jungle. Then the Nepalese government, with assistance from the United States Agency for International Development, introduced the Rapti Valley Land Development Project to eradicate malaria and deforest the land (Ghimire 1992; Shivakoti et al. 1999; Axinn and Yabiku 2001). By the end of the 1960s, what had been jungle became prime farmland, and migration to the area increased dramatically (KC and Suwal 1993; Guneratne 1996; Axinn and Yabiku 2001). The Chitwan Valley soon became a major farming region, and services and infrastructure expanded across the area (Axinn and Yabiku 2001). Despite large social changes over the last 50 years, marriage in Chitwan remains nearly universal. Data from the CVFS indicate that in 1996, 98.3 per cent of men and 99.6 per cent of women between the ages of 30 and 34 had married. The mean age at marriage, however, has risen. CVFS data suggest that for women, the mean age at marriage rose from 15.0 years for Chitwan marriages in the period 1950-59 to 17.6 years for marriages that took place between 1990 and 1996. For men, the mean age at marriage for the same time periods increased from 16.8 years to 21.9 years. While age at marriage was increasing, so was educational attainment at the time of marriage. For women, it rose from a mean of less than 1 year to 7.3 years, and for men it increased from .9 years to 9.3 years.

Several distinct CVFS data sources document the large changes in individuals and organizations since the 1950s. A questionnaire-based, structured individual interview was completed in Chitwan in 1996, and it measured individuals' personal characteristics (e.g., gender, age, ethnicity), family

background (parental education, work, and media experiences), and attitudes, beliefs, and values. This questionnaire surveyed 5271 individuals aged 15-59 who were selected through a random probability sample (Barber et al. 1997). Spouses of sampled individuals, regardless of their ages, were also interviewed. Along with the individual interview, a semi-structured life history calendar (Axinn, Pearce, and Ghimire 1999; Freedman et al. 1988) was administered. This calendar collected retrospective information on the timing of key life events from the respondent's birth until the survey interview in 1996: marriages, children, living arrangements, migration, schooling, and work. In the entire CVFS sample, 3881 past marriage events were recorded. A neighborhood history calendar documented the social context of respondents' neighborhoods from 1953 to 1995 (Axinn, Barber, Ghimire 1997). These calendars were semi-structured interviews with groups of respondents that arrived at consensual measures of how far the neighborhoods were in minutes walking from nonfamily organizations and services, such as the nearest school, employer, market, or health clinic. The time resolution of neighborhood change was also measured to the nearest year. Finally, school history calendars collected detailed information on schools in the study area. Because schooling in Chitwan started less than sixty years ago, a complete historical enumeration was possible. For each school, its date of founding and, if applicable, its date of closure was collected, as well as numerous school characteristics. These data were collected from a combination of methods, such as interviews with current and former school officials, community members, and administrative school records. Even if a school opened and closed before the school history data collection in 1996, data for the school was collected: former administrators and teachers were located and interviewed in their homes. Every school's geographic position was also recorded. Since 1954 when Chitwan's first school opened, 142 schools were founded in Chitwan. All school characteristics are measured to the nearest year, when applicable. This temporal measurement resolution matches the individual and neighborhood history calendars. The measured characteristics include: Number of classrooms, Number of teachers, Number of teachers w/college

degree, Number of female teachers, Number of students, Number of female students , English language instruction offered (Y/N), Family planning curriculum (Y/N), and if a standard academic curriculum exists.

Analytic Approach. An important consideration in this analysis is the conceptualization and measurement of school characteristics. Prior studies have often measured the impact of neighborhood organizations such as schools or health clinics simply as the presence of the organization within a boundary area (neighborhood, census tract, or region) or the distance to the nearest organization (Frankenberg and Thomas 2001; Entwisle et al. 1997; Brewster, Billy and Grady 1993; Entwisle and Mason 1985; Yabiku 2004). While these are valid measures, the rich data of school characteristics in this proposed project allows more flexibility. In addition to having multiple dimensions of school characteristics, the spatial information of schools permits three theoretically relevant ways of constructing school measures in relation to a focal individual: closest school, schools within a fixed radius, and all schools in the study area (Brauner, Axinn, and Ghimire 2004). Each of these approaches follows different theoretical models of organizational influence. Using only the closest school follows prior work in viewing only the geographically nearest organization as being relevant to individuals' lives. In Chitwan, few people have cars, and walking by foot is the main method of transportation for most residents. Thus there is good reason to believe the nearest school will be highly influential. For mechanisms such as proximity, it is the nearest school that individuals will have the most indirect exposure to even if they themselves do not go to school. Schools within a fixed radius, however, may be a more accurate measurement model. This method would take the average value for all schools in the area, while using only the nearest school ignores additional schools slightly farther away. The final way to construct school measures is to use characteristics from all schools. This approach averages all schools in the study area, weighting each school inversely proportional to its distance to the respondent (Land, Deane, and Blau 1991; Tolnay 1995). An example of such a weighting function is the following:

$$S^{*}_{cjt} = \sum_{k=1}^{142} \frac{S_{ckt}}{W_{jk}} \qquad (1)$$

Where S^{*}_{cjt} is the transformed, geographically-weighted school characteristic c for a respondent in neighborhood j at time t. For example, c indexes different characteristics such as number of teachers, number of students, or whether or not a family planning curriculum is offered. S_{ckt} is school characteristic c for school k at time t. W_{jk} is the weight for school k in reference to respondent's neighborhood j. The value of W_{jk} can be expressed in several ways, such as the distance in meters from the school to the respondent's neighborhood, or the log of this distance. Because schools and neighborhoods do not change geographic locations, W_{jk} is treated as time-fixed. The summation is over 142 schools because that is how many schools ever existed in Chitwan (if a school did not exist at any given time t, then its characteristics are 0 and thus do not affect the summation). The above coding of school characteristics, therefore, takes into consideration all the schools in Chitwan at any given time. Note that the school history calendar data are time-varying. The measures are sensitive to temporal ordering, and do not allow school characteristic at a later point in time to be incorrectly combined with measures from an earlier historical point in time.

The purpose of the analyses is to test hypotheses about the relationships between school characteristics and marriage timing. Because not all respondents will have experienced marriage by the time of the survey, the outcome is right censored. Thus an appropriate estimation technique suited for handling these transitions is discrete-time event history analysis. Because retrospective marriage histories are used, the analysis sample includes all respondents from the 1996 survey. Individuals start the hazard at different points in historical time, but for all individuals the hazard of marriage begins at birth and continues until the respondent marries or is censored (i.e., is still unmarried at the time of the 1996 survey). The hazard begins at birth because in the Chitwan context some child marriages occurred

in the oldest cohorts. About 4% of all marriages in the Chitwan data happened before age 12. An example of an event history model from Aim 1—examining total relationships between school characteristics and marriage timing—takes the following form:

$$\text{logit}\,(p_{ijt}) = \beta_0 + \boldsymbol{\beta}_1\mathbf{S}_{jt} + \boldsymbol{\beta}_2\mathbf{C}_{ijt} + \boldsymbol{\beta}_3\mathbf{T}_{ijt} \qquad (2)$$

for individual i in neighborhood j in year t, where $p_{ijt} = P[Y_{ijt} = 1 | \mathbf{S}_{jt}, \mathbf{C}_{ijt}, \mathbf{T}_{ijt}]$; Y_{ijt} is 1 if individual i in neighborhood j experiences a marriage event in year t, and 0 otherwise; β_0 is the intercept, $\boldsymbol{\beta}_1$ and $\boldsymbol{\beta}_2$ and $\boldsymbol{\beta}_3$ are vectors of coefficients. Note that we follow the convention of writing vectors of variables or coefficients in bold type; single variables and coefficients are in regular type. $\mathbf{S}_{jt}$ is a vector of school characteristics. Several models will be estimated in which different school characteristics will be examined separately and then jointly to test the interdependence of school characteristics.

$\mathbf{C}_{ijt}$ is a vector of control variables at both the individual and neighborhood level. Individual controls include the respondent's gender, ethnicity, and parental background factors (mother's and father's education, employment, and media consumption experiences). Note that the parental background factors were measured so that they pertain to the respondent's childhood (before age 12), so that proper temporal ordering is preserved (i.e., only parental experiences in childhood are used to predict young adult and adult marriage behavior). Ethnicity is controlled through a series of dummy variables that represent the five ethnic-religious subdivisions in the Valley. These five groups have different experiences and histories in the Valley that could lead to different marriage rates and levels of participation in schooling. The groups include upper caste Hindus (such as Brahmins and Chhetris), lower caste Hindus (known as the occupational castes), Newars, Hill Tibetoburmese and Terai Tibetoburmese (Axinn and Yabiku 2001; Pearce 2000; Bista 1972). Another control is the respondent's birth cohort. The CFVS data span cohorts born as early as 1937 and as late as 1981, and these time periods represent very different experiences. Several neighborhood controls are also included because the quality, volume, and content of schooling may be related to the development of other nonfamily

organizations in the area. Thus the models will include controls for the distance to nearest nonfamily organizations, including employers, health clinics, markets, movie theaters, and bus stops. $\mathbf{T}_{ijt}$ is a specification for the baseline hazard of marriage and is parameterized by a series of dummy variables.

Additional Methodological Issues. There are issues that complicate inferences from the data: multilevel data, migration of respondents, and missing data. The analytic approach will employ techniques to address these issues and mitigate their threats to validity as much as possible.

*Multilevel data***.** This research involves clustered individuals who are sampled through neighborhoods. This requires estimation of multilevel models of family formation processes. Techniques for multilevel modeling are well developed and have been widely applied in family formation research, and they are now commonly used to estimate event history models. Because of the similarity between individuals in the same neighborhood, single-level event history analyses will have elevated Type 1 error rates, biased estimators of the regression coefficients, and duration bias (Barber et al. 2000). Equation (2) can be modified to include a neighborhood random intercept as follows:

$$\text{logit}\,(p_{ijt}) = \beta_{0j} + \boldsymbol{\beta}_1\mathbf{S}_{jt} + \boldsymbol{\beta}_2\mathbf{C}_{ijt} + \boldsymbol{\beta}_3\mathbf{T}_{ijt} \qquad (3)$$

where β_{0j} is the intercept or base rate of marriage for individuals in neighborhood j. These kinds of models are typically called variance components or random intercept models (Raudenbush and Bryk 2002).

*Migration of respondents***.** Because the retrospective life history calendars recorded the migration history of respondents, it is possible to further address problematic issues of migration that may influence the results. Accurate contextual information is known for respondents' locations in 1996. If an individual lived outside the Chitwan Valley prior to the 1996 interview, contextual data is not available because only schools in the Chitwan Valley were measured as part of the school history calendars.

In previous analyses, these migration issues have been addressed in four different ways (Axinn and Yabiku 2001). The first approach is to ignore migration. The second approach is to include only person-periods that are spent in the sample neighborhood. The third approach is to include in the analyses only persons who never migrated. The fourth approach is to include a time-varying indicator of whether or not the respondent is outside his sample neighborhood at each person-period of risk. Building on the model in (2), incorporating migration in this way would take the form:

$$\text{logit}\,(p_{ijt}) = \beta_0 + \boldsymbol{\beta}_1\mathbf{S}_{jt} + \boldsymbol{\beta}_2\mathbf{C}_{ijt} + \boldsymbol{\beta}_3\mathbf{T}_{ijt} + \beta_5 M_{ijt} \qquad (4)$$

which is identical to equation (2) except for the addition of β_5, which is a coefficient, and M_{ijt}, which is a dichotomous migration indicator that is coded 0 if individual i in neighborhood j is living in his or her sample 1996 neighborhood at time t, and coded 1 if that individual is living outside his or her sample neighborhood. In previous analyses, it was found that the four different approaches generally give the same pattern of results (Axinn and Yabiku 2001), which strengthens the confidence that migration of respondents is not a process that substantially biases the inferences.

Missing Data. Missing data has the potential to bias results if the mechanism creating the missing data is correlated with variables of interest. Data tends to be missing the most on parental background characteristics. Fortunately, prior analyses of the CVFS data have had relatively low rates of missing data. In Yabiku (2004), the highest rate of missing data was 1.4%, and this was a measure that pertained to parents' media consumption experiences. Listwise deletion is often a simple way to handle missing data, and when the rates of missing data are low, this approach can be acceptable (Allison 2001). For the final version of the manuscript for PAA, multiple imputation techniques will be explored. The author has prior experience using multiple imputation (Yabiku et al. 2007; Holley, Yabiku, and Benin 2006).

Results

Table 1 presents descriptive statistics for the sample, separated by sex. For both men and women, marriage was common. In the period of observation, 78% of women and 72% of men married. Many of these unmarried people will eventually marry, but because observation was censored at the date of the survey in 1996, they are not observed to have married.

(Table 1)

The remaining variables' means and standard deviations are also presented in Table 1. Note that the descriptive statistics for the time-varying variables are taken from the last observed year person-year, which is either the year of marriage or the year of censoring. If all person-years were averaged together, then individuals with longer exposures to risk would unequally weight the averages. Note that some variables that do not appear to have any variation in Table 1, such as the standardized curriculum school characteristics, have more variation than shown. This is because while there is little variation in the last observed year (which is the basis for Table 1), there is more variation in the years of exposure to risk leading up to the last year.

In these initial models, I examine the association between characteristics of the nearest school and the individual's rate of first marriage. For the final manuscript at PAA, weighted distance measures, as described in the previous section, will be tested. There are nine measures of school characteristics in each of the three broad domains of volume, quality, and content. For the sake of concise presentation, I do not focus on the results that show the association between each separate schooling measure and the rate of first marriage for men and women. These full results can, however, be found in Appendix Tables 1 and 2. In general, when examined one by one, the measures share significant negative associations with marriage timing. Many of these measures, however, have correlations with each other: the number of students in the nearest school will be correlated with the number of teachers. Therefore, I do not present the results of models that contain all nine measures together in one model: high collinearities between variables may give distorted conclusions.

Instead, I present the results of models in which I include from each domain of school characteristics (volume, quality, and content) the strongest single predictor. For volume, the variable was the number of students. For quality, it was whether or not the school had a standard curriculum in place. For ideational content, it was the percent of teachers in the school who were female. Table 2 presents the modes with a single measure from each school characteristic domain.

(Table 2)

Model 1 of Table 2 examines the rate of first marriage for females. Each of the three measures of school characteristics (the number of students, a standardized curriculum, and the percent of female teachers) has a significant association with marriage timing in the expected direction: these variables are associated with lower marriage rates. For example, when an unmarried female's nearest school had a standardized curriculum, her rate of marriage was 51% less (1.00 - .49 = .51) than if the school did not have a standard curriculum. It is also notable that all three of the school characteristic variables are significant: it suggests that these qualities represent independent domains.

The remaining variables in the model have coefficients as expected. For example, mother's schooling is associated with lower rates of marriage, and older cohorts had higher rates of marriage than more recent cohorts. The baseline hazard, which represents the age pattern of marriage, has the expected quadratic, upside-down "U" shape.

In model 2, I test if two measures of individual schooling experience (school enrollment and school accumulation) act as mechanisms between school characteristics and marriage. In other words, is the pathway such that individuals near these school themselves enroll and accumulate schooling, which then delays marriage? For women, school enrollment had an expected, strongly negative effect: when enrolled in school, women marry at rates that are 68% lower than non-enrolled women. Years of schooling accumulated, however, does not have a significant association with their marriage rates. And importantly, the coefficients for the three schooling characteristics are little changed from model 1 to

model 2. This suggests that individual schooling experiences do not mediate the effects observed in model 1.

In model 3, I repeat these analyses for males. The pattern of coefficients is similar for men, but not as strong. All coefficients shared negative associations with the rate of marriage, but only the percent of female teachers is significant at the .05 level. Having a standard curriculum at the nearest school is not significant, and the number of students is significant only at $p<.10$. In model 4, I add measures of the males' schooling experience. For men, enrollment and accumulation have significant and opposite effects, as expected: enrollment is negatively associated with marriage rates, yet accumulation is positively associated: men with more schooling are clearly viewed as more desirable marriage partners, and they marry more quickly. But as with the results for women, the inclusion of the schooling experiences does not reduce the coefficients for the school variables: the coefficients for students, curriculum, and percent female teachers remain largely unchanged in models 3 and 4.

Discussion and Future Steps

Although the effects of school characteristics on educational outcomes have been extensively studied, relatively few studies have examined how these characteristics play a role in influencing nonacademic outcomes, such as family behaviors. This paper has examined how school characteristics influence marriage timing by focusing on multiple aspects of school characteristics across three dimensions: volume of schooling, quality of schooling, and the ideational content of the schooling experience. The results showed that school characteristics are associated with marriage timing in Chitwan, Nepal. Individuals married later when they lived in areas where the nearest school had more volume, higher quality, and coeducational and egalitarian content.

Measures of individuals' actual schooling experience—their enrollment and years schooling accumulated—did little to explain these associations. It is difficult to make strong conclusions about this,

but it may be that individuals do not need to participate directly in the schooling process to be affected by nearby schools. In this setting in Nepal, especially in early settlement of the valley in the 1950s and 1960s, schools are novel, notable institutions. Observing children going to school, observing that both boys and girls go to school, and seeing that females serve as teachers: these are mechanisms that may influence the marriage patterns of individuals who do not even enroll in school.

There are several next steps planned for the manuscript for the final version to be presented at PAA. First, I currently use the time-varying characteristic of the nearest school as a predictor of an individual's marriage timing. There are alternative specifications, such as geographically weighting all schools in Chitwan or geographically weighting the characteristics of all schools within 2 miles, which will be explored. This may give a more accurate depiction of the schooling context. Second, additional sensitivity tests for investigating the influence of migration will be explored. Currently, the analysis includes a simple dichotomous control for migration, but other approaches will be tried, such as excluding migrants or excluding migrant person-years. Third and finally, the issue of selection into neighborhoods will be explored. The association between school characteristics and marriage will be overestimated if there are other, non-controlled factors that are related to the placement of an individual near a school and that individual's entry into marriage. The main issue here is if parents are choosing to live near certain types of school and these same parents influence their children's marriage patterns in unmeasured or unobservable ways. Of course, this issue is impossible to solve with non-experimental data. Additional insight can be learned, however, with an approach such as propensity scores. I am currently examining ways of creating time-varying propensity scores. For each year of an individual's life, there is a predicted probability that the individual lives within a given distance to a school. I then use this predicted probability as a control in the models of marriage timing. These time-varying propensity scores are no "magic bullet" for selection issues, but they do represent a way to

concisely control for selection processes that can be reasonably assumed to be captured with the observed variables.

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Table 1: Descriptive Statistics

	Women		Men	
	Mean	Std.Dev.	Mean	Std.Dev.
Married during period of observation	.78	.41	.72	.45
School Characteristics (time-varying)				
Volume				
Number of rooms	5.79	4.69	6.57	5.77
Number of students	2.58	2.59	2.92	3.06
Number of teachers	7.25	7.00	8.28	8.60
Quality				
% of Teachers with degree	.10	.21	.12	.21
Has standardized curriculum	.97	.16	.99	.09
Ideational Content				
% Female teachers	.12	.17	.14	.18
% Female students	.35	.17	.37	.16
Instruction in English	.29	.45	.35	.48
Family planning curriculum	.15	.35	.17	.37
Individual Schooling Experiences (time-varying)				
School enrollment (yes/no)	.29	.46	.34	.47
School accumulation (years)	4.37	5.06	7.38	5.41
Controls				
Father ever went to school	.32	.47	.29	.45
Mother ever went to school	.07	.26	.08	.26
Parent ever worked outside home	.48	.50	.53	.50
Parent ever saw movie	.46	.50	.41	.49
Mother's children ever born	5.96	2.62	5.56	2.47
Birth Cohort:				
Born 1972-1981	.40	.49	.34	.47
Born 1962-1971	.24	.42	.26	.44
Born 1952-1961	.19	.39	.20	.40
Born 1937-1951	.17	.37	.20	.40
Caste/Ethnicity:				
High Caste Hindu	.47	.50	.46	.50
Low caste Hindu	.11	.31	.12	.32
Newar	.07	.25	.06	.23
Hill Tibeteoburmese	.17	.38	.18	.38
Terai Tibetoburmese	.18	.38	.19	.39
Distance to Narayangaht, miles	8.52	3.84	8.38	3.99
Outside sample neighborhood (time-varying)	.32	.47	.31	.46
N	2522		2305	

Table 2: Relationships between school characteristics and rate of first marriage

	Women		Men	
	1	2	3	4
School Characteristics (time-varying)				
Volume: Number of students	0.96**	0.97*	0.98+	0.98
	(-3.17)	(-2.37)	(-1.66)	(-1.47)
Quality:Has standardized curriculum	0.49***	0.51***	0.71	0.77
	(-4.58)	(-4.36)	(-1.33)	(-1.03)
Ideational Content: % Female teachers	0.65*	0.64*	0.63*	0.63*
	(-2.45)	(-2.54)	(-2.40)	(-2.43)
Individual Schooling Experiences (time-varying)				
School enrollment (yes/no)		0.32***		0.57***
		(-12.24)		(-6.87)
School accumulation (years)		1.01		1.04***
		(0.77)		(4.72)
Controls				
Father ever went to school	0.94	1.03	0.86+	0.86+
	(-0.87)	(0.38)	(-1.83)	(-1.80)
Mother ever went to school	0.64***	0.80	0.54***	0.53***
	(-3.41)	(-1.64)	(-3.63)	(-3.66)
Parent ever worked outside home	1.03	1.00	0.97	0.95
	(0.51)	(-0.05)	(-0.48)	(-0.79)
Parent ever saw movie	0.90+	0.98	1.07	1.05
	(-1.79)	(-0.28)	(1.00)	(0.72)
Mother's children ever born	1.00	0.99	1.03*	1.03*
	(0.38)	(-0.55)	(2.45)	(2.28)
Born 1962-1971 (ref=1972-1981)	1.86***	1.42***	1.57***	1.56***
	(8.58)	(4.64)	(4.77)	(4.67)
Born 1952-1961 (ref=1972-1981)	2.77***	1.87***	1.89***	1.95***
	(12.28)	(7.04)	(6.09)	(6.26)
Born 1937-1951 (ref=1972-1981)	2.66***	1.83***	1.58***	1.74***
	(9.99)	(5.81)	(4.01)	(4.59)
Low caste Hindu (ref=High caste Hindu)	1.04	0.81*	1.54***	1.51***
	(0.38)	(-2.28)	(4.52)	(4.18)
Newar (ref=High caste Hindu)	0.53***	0.49***	0.97	0.91
	(-5.60)	(-6.33)	(-0.26)	(-0.76)
Hill Tibeteoburmese (ref=High caste Hindu)	0.56***	0.47***	0.84*	0.83*
	(-7.40)	(-9.66)	(-2.03)	(-2.19)
Terai Tibetoburmese (ref=High caste Hindu)	0.79**	0.58***	1.57***	1.57***
	(-2.81)	(-6.29)	(5.06)	(4.82)
Distance to Narayangaht	1.00	0.99	1.01	1.01
	(-0.53)	(-0.80)	(0.94)	(0.98)
Outside sample neighborhood (time-varying)	1.14*	1.05	0.95	0.89+
	(2.21)	(0.78)	(-0.84)	(-1.83)
Time (baseline hazard)	3.29***	3.33***	2.60***	2.41***
	(26.82)	(26.93)	(24.61)	(22.25)
Time-Squared (baseline hazard)	0.97***	0.97***	0.98***	0.98***
	(-21.01)	(-21.45)	(-19.33)	(-17.89)
Intercept	0.00***	0.00***	0.00***	0.00***
	(-32.80)	(-31.09)	(-30.12)	(-28.19)
N (person-years)	41758	41758	46441	46441

+p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests
Coefficients are odds ratios, with z-statistics in parentheses

Appendix Table 1: Relationship between school characteristics and rate of first marriage, women

	1	2	3	4	5	6	7	8	9	10	11	12
School Characteristics												
Volume												
Number of rooms	0.97**			1.00								
	(-3.19)			(-0.16)								
Number of students		0.96***		0.99								
		(-3.36)		(-0.19)								
Number of teachers			0.98***	0.99								
			(-3.68)	(-1.38)								
Quality												
% of Teachers with degree					0.67*		0.70*					
					(-2.57)		(-2.25)					
Has standardized curriculum						0.46***	0.48***					
						(-4.97)	(-4.77)					
Ideational Content												
% Female teachers								0.65*				0.68*
								(-2.49)				(-2.12)
% Female students									0.71			0.65+
									(-1.40)			(-1.73)
Instruction in English										0.84+		0.86
										(-1.81)		(-1.46)
Family planning curriculum											0.73***	0.73***
											(-3.40)	(-3.36)
Controls												
Controls and baseline hazard not shown												

+p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests
Coefficients are odds ratios, with z-statistics in parentheses

N=41758 person years in all models

Appendix Table 2: Relationship between school characteristics and rate of first marriage, men

	1	2	3	4	5	6	7	8	9	10	11	12
School Characteristics												
Volume												
Number of rooms	0.99			1.00								
	(-1.37)			(-0.11)								
Number of students		0.98+		0.97								
		(-1.71)		(-1.03)								
Number of teachers			0.99	1.00								
			(-1.35)	(0.36)								
Quality												
% of Teachers with degree					1.19		1.20					
					(1.01)		(1.07)					
Has standardized curriculum						0.67	0.66					
						(-1.60)	(-1.64)					
Ideational Content												
% Female teachers								0.62*				0.63*
								(-2.48)				(-2.33)
% Female students									0.63+			0.62+
									(-1.78)			(-1.80)
Instruction in English										0.97		0.98
										(-0.32)		(-0.19)
Family planning curriculum											0.77**	0.77*
											(-2.61)	(-2.56)
Controls												
Controls and baseline hazard not shown												

+p<.10, *p<.05, **p<.01, ***p<.001, two-tailed tests
Coefficients are odds ratios, with z-statistics in parentheses

N=46441 person years in all models