The Influence of Neighbors' Family Size Preference on Progression to High Parity Births in Rural Nepal

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Large families can have a negative impact on the health and well-being of women, children, and their communities. Seventy-three percent of the individuals in our rural Nepalese sample report that two children is their ideal number, yet about half of the married women continue childbearing after their second child. Using longitudinal data from the Chitwan Valley Family Study, we explore the influence of women's and neighbors' family size preferences on women's progression to high parity births, comparing this influence across two cohorts. We find that neighbors' family size preferences influence women's fertility, that older cohorts of women are more influenced by their neighbors' preferences than are younger cohorts of women, and that the influence of neighbors' preferences is independent of women's own preferences. (Studies in Family Planning 2013; 44[1]: 67–84)

Most countries have experienced rapid fertility decline over the last half century (Caldwell 2001; Thornton et al. 2012), in part because of the global dissemination of Western ideals that favor smaller families. This dissemination has occurred both through the nondeliberate diffusion of ideas within and between populations (Watkins 1987; Casterline 2001; Hornik and McAnany 2001; Thornton 2005) and more deliberate family planning initiatives to alter individuals' preferences and make those preferences achievable (Thornton et al. 2012). These values have been successfully circulated in rural Nepal, where 73 percent of the population in the Southern region of Chitwan say that two children is the ideal. Yet fertility behavior in this area is slower to change: approximately half of all married women have more than two children.[1]

Understanding why women may choose to have more than two children is important because having a large family can have negative effects on the health and well-being of both mothers and children. Compared with small families, larger families tend to have more closely

1 The percentage and the proportion are drawn from data from the 2008 Chitwan Valley Family Study, which contained a sample of 5,190 men and women aged 12–59 and their spouses, as well as parents of those younger than age 35 and recontacts from the sample of 15–59-year-olds in 1996. Reported family size preference might be influenced by social desirability bias, particularly in this context, where the government has been promoting a two-child family for decades. Achieved fertility in Nepal, however, has yet to match the reported desired fertility (Dahal, Padmadas, and Hinde 2008).

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spaced births. With more mouths to feed and less time for a mother to recuperate between births, mothers and children of these growing families may be at risk of nutritional deprivation or other negative health outcomes (Winikoff 1983; Curtis, Diamond, and McDonald 1993; Desai 1995; Wu and Li 2012; Magvanjav et al. 2013). Furthermore, parents have finite resources to distribute among their children, and the resources available to each child are reduced as family size increases (Powell and Steelman 1990; Zajonc and Mullally 1997). For example, parents may invest less in each child's education when they have more children (Blake 1981; Knodel, Havanon, and Sittitrai 1990; Kessler 1991; Knodel 1991). Additionally, larger families may reduce parental emotional investment in each child (Kidwell 1981), which can impede social and emotional growth. These negative consequences are likely if one or more of the births is unintended (Barber and East 2009 and 2011), and higher parity births are more likely to be unintended (Eggleston 1999; Marston and Cleland 2003).[2]

Despite these negative consequences, women who prefer large families may choose to have more than two children. Substantial evidence links external as well as personal preferences to fertility behaviors (Axinn, Clarkberg, and Thornton 1994; Barber 2001; Jennings, Axinn, and Ghimire 2012). In this rural South Asian setting, where individuals are closely connected to families and communities, neighbors' preferences are likely to have considerable influence on women's behavior, including their fertility (Moursund and Kravdal 2003). Neighbors are often aware of other individuals' actions, and these actions may have consequences for neighbors' well-being, providing an incentive to encourage those living in their community or neighborhood to behave in certain ways. Furthermore, we would expect individuals in this setting to be aware of their neighbors' preferences and to feel pressure to behave in ways that maintain good standing with them. Recent social changes, however, may have reduced the influence of neighbors among younger cohorts, who have greater exposure than do older cohorts to more individualistic ideas because they have spent more time outside their homes and communities (Axinn and Yabiku 2001; Yabiku 2005; Ghimire et al. 2006).

This study explores the influence of neighbors' family size preferences on women's progression to high parity births—a third or fourth live birth—and compares this influence across cohorts to assess whether younger women are less responsive than older women to neighbors' preferences. We use unique data concerning attitudes and preferences from a rural Nepalese setting. Inclusion of these types of measures is rare in South Asian surveys. Because our data include preference measures at the individual level garnered from interviews with every member of each sampled neighborhood, they allow us to construct a measure of preferences at the neighborhood level (average preference across residents) and investigate this neighborhood-level influence on individual behavior. We investigate influences of neighbors' family size preferences on individual fertility behavior in the decade after these preferences were measured. In doing so, we consider whether these neighbor influences operate by way of shaping women's preferences or whether they assert pressure independent of women's own preferences.

2 Because of the prevalence of son preference in Nepal, this may not be true for couples who have only daughters and continue to have births so that they can have a son (Stash 1996; Leone, Matthews, and Zuanna 2003; Dahal, Padmadas, and Hinde 2008). In these instances, couples may have intended to have only two children, but continue to give birth in the hope of having a son.

CONCEPTUAL FRAMEWORK

Many models of behavior share the assumption that behavior results from a reasoned process in which individuals consider their options, evaluate the consequences, and make decisions regarding how to act. For example, the reasoned action and planned behavior frameworks (Fishbein and Ajzen 1975) have been used to refine demographic theories of fertility decline such as the concept of the KAP-gap (Freedman et al. 1974), in which the gap between the desire to stop childbearing and the lack of contraceptive use was referred to as "discrepant behavior." Coale (1973) and Lesthaeghe and Vanderhoeft (2001) also employed the reasoned action and planned behavior frameworks to posit that individual's attitudes must be favorable toward smaller families before they choose to adopt family planning methods.[3]

The influence of neighbors' preferences on women's behavior can be expected in this setting for many reasons. The theory of planned behavior posits that individuals are directly influenced by consideration of others' attitudes (Fishbein and Ajzen 1975). Ample evidence shows, for example, that individuals behave in accordance with their parents' preferences (Bengtson 1975; Axinn and Thornton 1993; Barber 2000; Jennings, Axinn, and Ghimire 2012). Similarly, friends and peers can influence behavior through social norms and stigma that directly guide behavior and may shape preferences (Rutenberg and Watkins 1997; Stuber, Galea, and Link 2008). We expect neighbors to have a similar influence. One study in rural Egypt found that neighbors' preferences for a small family was associated with an increased likelihood for young men to desire a small family, though neighbors' preferences did not have the same influence on young women (Harbour 2011).

In this rural Nepalese context, neighbors are likely to be among an individual's most important social networks. Neighborhoods in Nepal tend to be fairly ethnically homogenous, and residents tend to be stable. Because land is acquired almost solely through inheritance, individuals usually reside within the neighborhood in which their parents (in the case of men) or in-laws (in the case of women) reside. Individuals are greatly exposed to their neighbors because housing is open: windows are not covered with glass, front doors are often left open, and whole families sometimes sleep in the yard during periods of hot weather. When one is sitting on the front porch visiting a Nepalese family, one can often see toothbrushes, birth control pills, and the family's other personal items stuffed into the thatched roof of the porch where all can view. Additionally, neighbors interact with one another on a daily basis during their routine activities, such as collecting water or firewood (Cameron 1998). As a result, neighbors' preferences and behaviors are likely to be known and to be a part of every resident's daily life (Barber 2004).

Mechanisms of Neighbors' Influence

Because individuals in rural Nepal tend to be aware of their neighbors' preferences, ample opportunity exists for such preferences to influence women's behaviors. This influence can occur by means of neighborhood socialization, in which neighbors' preferences influence

3 This may not hold true for couples who practice contraception to defer a first birth or to space births but who intend to have many children.

women's behavior through women's own preferences (Barber 2000; Katz, Joiner, and Kwon 2002). Neighbors' close and constant interaction allows for new ideas to diffuse among them (Lesthaeghe 1977; Bongaarts and Watkins 1996; Cleland 2001; Behrman, Kohler, and Watkins 2002; Barber 2004). This diffusion process may lead women to internalize their neighbors' preferences and develop or change their own preferences to align with that of their neighbors.

The influence of neighbors' preferences on women's behavior can also occur through social pressure, wherein neighbors' preferences compel women to choose behaviors that run counter to their own personal preferences (Troyer and Younts 1997; Barber 2000; Fishbein and Ajzen 2010). Neighbors may exert social pressure on women by embodying and enforcing social norms, which guide women's behavioral choices. Neighbors also have the power to punish, by way of stigmatization, if someone does not behave as deemed appropriate (Coleman 1990; Stuber, Galea, and Link 2008). These forces may lead women to set aside their own desires in order to appease their neighbors. For example, a woman may want a large family but may be aware that this is socially undesirable in her neighborhood. Therefore, she may limit her fertility to avoid being stigmatized or ostracized.

Cohort Differences in Neighbors' Influence

The influence of neighbors' preferences relative to individuals' preferences may change over time, as collective values become less common. Rural Nepal has experienced rapid social change in recent decades (Axinn and Yabiku 2001; Yabiku 2005), including an increase in the number of schools, easier access to nearby cities via the bus system, an increase in the number of markets, and greater opportunities for employment. As a result of improved access to nonfamily institutions and experiences, individuals spend more time outside their communities than they did in the past. Given the timing of these social changes, younger cohorts of women have had greater exposure to nonfamily experiences and experiences outside their immediate community, compared with older cohorts who, for much of their lives, have had limited access to schools, public transportation, nonfamily employment, and city life. Additionally, younger cohorts have had more exposure to the new ideas and values that accompany these "outside" experiences. As a result, younger cohorts of women may be less influenced than their older counterparts by their neighbors' preferences, choosing to follow ideas acquired from outside their neighborhoods.

Older cohorts of women, on the other hand, who grew up with fewer opportunities or reasons to venture outside their neighborhood, are likely to have placed more importance on behaving in accordance with their neighbors' preferences, and thus may have been more susceptible to both neighborhood socialization and social pressure. These older, more community-centric, cohorts have had less exposure to experiences and ideas from outside their community that might compete with the preferences of their own neighbors. For example, a woman from an older cohort may have perceived that her neighbors preferred large families and, therefore, may bear many children of her own. A younger woman living in the same neighborhood, however, may weigh the ideas she has acquired from school or media more heavily and opt to stop her childbearing after she has had only one or two children.

Fertility and Family Size Preference

In Nepal, as in other South Asian countries, a rapid decline in fertility rate took place after family planning initiatives began in the late 1950s. The total fertility rate fell from 6.1 in the early 1950s to 4.4 in the late 1990s, and was down to 2.6 in 2012 (UNDESA 2011; PRB 2012; Thornton et al. 2012). The most popular contraceptive method in Nepal is vasectomy, which can be obtained easily and at no cost (Tuladhar 1987; Labrecque et al. 2005). In deciding when to stop childbearing, Nepalese couples are often influenced by the desire to have sons. The preference for having a son reflects, in part, sons' permanency in the natal home and their role in caring for elderly parents, compared with daughters, who move to their husbands' home upon marriage (Bennett 1983; Cameron 1998). Even sons, however, present a cost to their parents, because they must be provided with needed fees and supplies for their education (Caldwell 1982). Furthermore, mothers are responsible for providing childcare even while they work in the fields to contribute to their household subsistence (Cameron 1998). These characteristics of childbearing and childrearing may influence fertility preferences at both the individual and community levels.

Identifying how family size preferences influence childbearing has important implications. Although family planning initiatives in Nepal have largely been successful in decreasing the desire for and achievement of large families, high parity births are still plentiful. As noted earlier, approximately half of all married women in Nepal have more than two children. Whether instances of high fertility are a consequence of women's own childbearing desires or of structural impediments to achieving their preferences for smaller families is unclear. Women having neighbors who prefer larger families may be motivated to have more children than women whose neighbors prefer smaller families. This pressure or desire to have a larger family is likely to lead women to have more closely spaced births and greater total fertility.

Beyond women's and neighbors' preferences, other confounding factors exist that could influence progression to higher parity. For example, limited access to contraceptives may hamper women's ability to implement their preferences. Women living in neighborhoods that are far from a health center where contraceptives are distributed may not be able to achieve a small family, even if that is what they or their neighbors prefer. In addition to neighbor-level confounders, women's family size preferences may be confounded by their preference for sons. In this setting, couples typically prefer to have at least one son; therefore, they may continue to have children until their goal of having one or more sons is reached (Stash 1996; Leone, Matthews, and Zuanna 2003; Dahal, Padmadas, and Hinde 2008), regardless of their or their neighbors' overall family size preference.

Hypotheses

We investigate the influences of neighbors' preferences on transitions to high parity births across two cohorts of women, exploring whether older women followed their neighbors' preferences more than younger women, and whether the influence of neighbors' preferences decreased over time. Finally, we investigate whether the influence of neighbors operates through neighborhood socialization or through social pressure.

We approached our analyses with three main hypotheses, following from the theoretical framework described above.

1. Neighbors' family-size preferences will be associated with individual childbearing behavior. Specifically, women whose neighbors prefer more children will have more high parity births than women whose neighbors prefer smaller families.
2. Neighbors' preferences will have a greater influence on the behavior of older than younger cohorts of women.
3. Neighbors' preferences will influence women independent of their own preferences.

METHODS

To test our hypotheses, we use longitudinal data from the Chitwan Valley Family Study conducted in rural Nepal. The data were collected from individuals in 171 neighborhoods, sampled from three strata of varying distance from the nearest city. These neighborhoods typically consist of naturally occurring clusters of 5–15 households that are collectively surrounded by farmland. (Where a neighborhood consisted of more than 15 households, one contiguous section of the neighborhood was chosen.) The Chitwan Valley Family Study includes a baseline interview (averaging 72 minutes), consisting of a structured questionnaire and a semi-structured Life History Calendar interview, which was conducted in 1996. These interviews collected information concerning both the attitudinal and experiential measures used here. A Neighborhood History Calendar was also used in 1996 to document neighborhood characteristics, such as distance to the nearest health center. The Chitwan Valley Family Study interviewed all household members aged 15–59 and their spouses (even if outside this age range or living elsewhere) in the sampled neighborhoods. The number of respondents in the baseline sample was 5,271, and the overall response rate for the survey was 97 percent.

Monthly follow-up interviews were conducted with individuals in 151 neighborhoods, beginning in 1997.[4] In these follow-up interviews, information concerning a range of demographic events, including childbearing, was also collected from household members. We use 147 months (12.25 years) of data from these interviews, into the year 2009. This prospective design allows us to accurately model the influence of neighbors' childbearing preferences on women's subsequent behavior. The study is particularly well suited for examining community influences on behavior because it includes data from interviews with each resident in each of the sampled neighborhoods.

Our analytic sample consists of all women aged 15–34 in 1996 who were at risk of having another birth after their second or third live birth (N = 594). Of these women, 446 are in the younger cohort (aged 15–24 in 1996) and 148 are in the older cohort (aged 25–34 in 1996). Our independent variable—a measure of family size preference—comes from the baseline study conducted in 1996, whereas the dependent variable for high parity births comes from the monthly interviews that began in 1997.

4 Twenty of the 171 neighborhoods sampled in the 1996 baseline Chitwan Valley Family Study were selected as an oversample for ethnic representation. Only the original 151 neighborhoods were followed for monthly interviews; therefore, we limit our investigation to these neighborhoods.

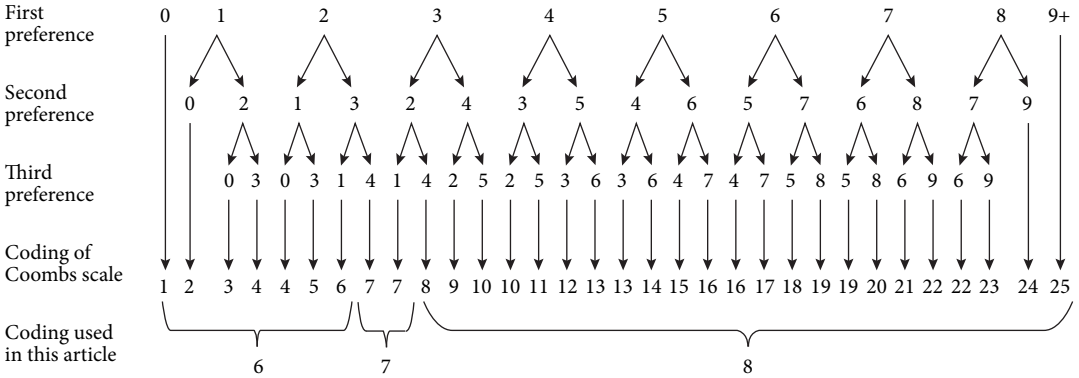
Measures

The dependent variable is a monthly time-varying dichotomous variable indicating whether the respondent had a high parity birth (a third or fourth live birth). This variable is coded as 0 for every month up to the ninth month prior to the birth, and as 1 in the ninth month prior to the birth. Respondents do not contribute to person-months of exposure to risk of birth for the eight months prior to the birth month and for three months after the birth.

We measure family size preference using the Coombs scale (Coombs 1974 and 1979). This measure allows for variance in respondents' reports of family size preference, which is useful because the majority of respondents in our sample stated a preference for two children. The Coombs scale allows us to differentiate between those respondents who want two children at most and those who want two children at least. Figure 1 illustrates the sequence of the coding scheme for the Coombs scale measure. Respondents were first asked, "If you could have exactly the number of children you want, how many children would you want to have?" (First row, Figure 1.) (Respondents who already had children were asked how many children they would like to have if they could start life over.) Respondents were then asked how many children they would like to have if they could not have their first choice (second row, Figure 1). Finally, they were questioned about how many children they would have if they could have neither of their first two choices (third row, Figure 1). Originally, this item was coded on a scale of 1–25 (fourth row, Figure 1). We have collapsed the item into three categories because few neighbors fall below a Coombs scale value of 6 and few individuals fall above a value of 8 (last row, Figure 1).

For neighbors' preferences, we employ the same measure and coding scheme. We constructed a neighborhood-level average from each neighbor sampled in each of the 151 neighborhoods. Thus, the average childbearing preference for each neighborhood is constructed by summing the values of the measure for each resident and dividing by the number of residents. The respondent's own preferences, household members' preferences, and neighboring relatives' preferences are not included in these averages; therefore, the neighborhood average differs for each respondent in each neighborhood.

FIGURE 1 Coding scheme used for Coombs scale measure of family size preference



To properly specify our models, we control for characteristics of the respondents that may influence both family size preference and likelihood of high parity birth. To control for fecundity, we use a monthly time-varying covariate of respondents' age (in years). We also control for ethnicity. Ethnicity in Nepal is complex, multifaceted, and associated with religion. We control for five classifications of ethnicity, coded as dummy variables, because of their different propensities to have large families: Brahmin/Chettri (high-caste Hindu), Dalit (low-caste Hindu), Newar, Hill Indigenous, and Terai Indigenous.[5]

We control for respondents' experiences with childbearing by including a time-varying covariate for the respondent's monthly parity status—that is, whether they have had two or three live births. We also include a measure of the number of sons the respondent had as of 1996, because number of sons may influence respondents' childbearing preferences and their subsequent childbearing behavior (Dahal, Padmadas, and Hinde 2008). Many women will have an additional child in an attempt to reach their preferred number of sons—usually one or two—in spite of having met their family size preference. Therefore, we also control for respondents' son preference. This preference measure comes from a survey item specifically designed for this Nepalese population. Respondents were asked to agree or disagree with a common Nepali phrase: *"Yota aka, ke aka? Yota chora, ke chora?"* This roughly translates to "Having only one son is the same as having only one eye," which means that having an extra son is good, just in case. Responses are coded on a scale of 1–4: strongly disagree, disagree, agree, strongly agree.

We include a measure to indicate the number of children the respondent gave birth to who subsequently died, as of 1996. Experiencing the death of a child may motivate women to exceed their family size preference in order to ensure that infant mortality does not cause them to fall short of their family size goal. We also control for respondents' age at time of first birth, because women who began childbearing later in life may be inclined to speed the succession of their births.

Additionally, we control for respondents' nonfamily experiences. Exposure to activities and ideas outside the family home can influence the value women place on having a large family (Barber and Axinn 2004; Ghimire et al. 2006). We include a measure of the respondents' accumulated years of education in 1996. We also include a dummy variable for whether respondents have ever worked for wages as of 1996, coded 0 if they never held a wage labor job and 1 if they did. Similarly, we include a variable for whether respondents ever lived away from their family as of 1996 (coded 1 for yes, 0 for no). We also include a dummy variable for whether respondents were ever a member of a youth club (coded 1 for yes, 0 for no). As a final indicator of exposure to nonfamily ideas, we include a measure that is the sum of three dummy variables: ever listened to the radio, ever watched television, and ever watched a movie.

To account for the potential confounding influence of access to contraceptives, we include three indicators of the respondents' individual-level and neighborhood-level access. First, we control for respondents' perceived access to contraceptives. We use the mean value of responses to eight survey items, asking whether obtaining contraceptives was easy (coded

5 A full description of the ethnic groups residing in this setting is beyond the scope of this study. For detailed descriptions of these groups, see MacFarlane 1976; Gurung 1980; Acharya and Bennett 1981; Bennett 1983; Fricke 1986; Guneratne 1994; Gellner and Quigley 1995; Cameron 1998.

as 1) or difficult (coded as 0) for eight different methods—pill, IUD, Norplant, Depo Provera, foam, condom, male sterilization, female sterilization—and one "other" method the respondent was given the opportunity to mention. Second, we control for an indicator of neighbors' contraceptive use. This is coded as the mean value of whether neighbors (excluding household members and related neighbors) have ever used any of the eight methods of contraception. Third, we control for the distance from the neighborhood to the nearest health center. We use a measure that indicates whether the nearest health center is within a five-minute walk from the respondent's neighborhood, coded as 1 if this is so and 0 if it takes longer.

To account for the length of exposure to others in the women's current neighborhood, we control for the duration of respondent's residence, in years, as of 1996. Finally, to account for the duration of the exposure to birth risk, we control for the time-varying duration of months lapsed since the first monthly interview.

Analytic Method

Using 147 months of data, we employ event history methods to model the risk of having a third or fourth birth. Because the data are precise to the month, we use discrete-time methods to estimate these models, with person-months of exposure as the unit of analysis. We consider women to be at risk of a high parity birth after they are married and have two or three children. Women are removed from the risk set during the months that they are not exposed to the risk of becoming pregnant with their third or fourth child. Women who have a third child are removed for the eight months following the first month of their pregnancy and for a three-month period of amenorrhea following the birth. Women pregnant with their fourth child are removed completely as of the eighth month prior to the birth. Sterilization is treated as a competing risk: women who are sterilized or whose husbands are sterilized after the start of the hazard cease to contribute to the person-months of exposure to risk of birth as of the first month of sterilization.[6]

We use logistic regression to estimate the discrete-time hazard models. The discrete-time approach yields results similar to a continuous approach because the incidence of birth in any one month is low, but the approach allows us to avoid making any parametric assumptions regarding the distribution of the underlying baseline hazard (Yamaguchi 1991). Our time-varying measures of respondent characteristics are lagged by one month.

Women who are at risk of a third- or fourth-parity birth are included in our sample, allowing for repeatable events in the hazard. In the sample, 201 women had at least one birth (either a third or fourth). Of these, 28 women had two births (a third and fourth), for a total of 229 births. These data allow for parity variation both within and between individuals (Teachman 2011). The repeated birth events can introduce potential bias in the estimates. To account for this potential bias, we estimate three-level models: births nested within individuals, nested

6 We also ran the models to include women who were sterilized or whose husbands were sterilized after the 1996 interview through the end of the hazard. Additionally, we ran separate models with a time-varying control for whether respondents were sterilized after 1996. Results were similar to those we obtained when we treated sterilization as a competing risk, though slightly diluted because women who had made the choice to remove themselves from the risk of birth were treated as continuing to be at risk. We believe it appropriate to remove these women from the risk. A couple's choice to become sterilized after 1996 is influenced by their attitudes in 1996, just as their choice to have a birth is influenced by their attitudes.

within neighborhoods. We use one-tailed tests of significance to investigate our unidirectional theory for the influence of family size preferences and two-tailed tests to investigate the influence of the control measures. We discuss the results as additive influences on the log odds of having a birth.

RESULTS

Table 1 presents descriptive statistics of neighbors' and individual women's family size preferences for each cohort. The table reveals that neighbors have a higher ideal family size preference (mean of 6.72 for all neighbors) than individual women (mean of 6.41). The average age of women at the time of their first monthly observation was about 25 years, although most

TABLE 1 Descriptive statistics for sample of 594 women, rural Nepal, 1996

Characteristic	Mean	Standard deviation	Minimum value	Maximum value
Family size preference				
Neighbor (cohorts combined)	6.72	0.68	6.00	8.00
Neighbor (younger cohort)	6.72	0.70	6.00	8.00
Neighbor (older cohort)	6.71	0.61	6.00	8.00
Individual (cohorts combined)	6.41	0.68	6.00	8.00
Cohort/age				
Older cohort	0.25	0.43	0.00	1.00
Age (first month of hazard)	24.76	3.61	17.00	38.00
Ethnic Group				
Brahmin/Chettri	0.49	0.50	0.00	1.00
Dalit	0.09	0.29	0.00	1.00
Newar	0.06	0.24	0.00	1.00
Hill Indigenous	0.15	0.36	0.00	1.00
Terai Indigenous	0.21	0.41	0.00	1.00
Fertility				
Parity (first month of hazard)	2.15	0.36	2.00	3.00
Number of sons born	0.56	0.77	0.00	3.00
Son preference	2.78	0.86	1.00	4.00
Number of children who died	0.07	0.28	0.00	2.00
Age at first birth	20.28	2.91	13.00	33.00
Nonfamily				
Education (years)	5.04	3.94	0.00	14.00
Ever worked for wages	0.45	0.50	0.00	1.00
Ever lived away from family	0.07	0.25	0.00	1.00
Ever member of youth club	0.03	0.17	0.00	1.00
Ever exposed to radio, television, movies (sum)	2.76	0.55	0.00	3.00
Access to contraceptives				
Perceived availability of contraceptives	0.70	0.30	0.00	1.00
Neighborhood contraceptive use (mean)	0.44	0.17	0.00	1.00
Health center within five-minute walk	0.26	0.44	0.00	1.00
Length of exposure				
Duration of residence in neighborhood (years)	7.90	6.89	0.00	30.00
Time (first month of hazard)	40.01	41.39	0.00	142.00
Total women in sample	(594)			
Total births	(229)			
Third-parity birth (percent)	26.4			
Fourth-parity birth (percent)	12.1			
Third- and fourth-parity birth (percent)	4.7			

women (75 percent) fall into the younger cohort (that is, most were aged 15–24 in 1996). Fertility among this sample began at about the age of 20, on average, and as of 1996 women had an average of 0.56 sons and 0.07 children that had died. Son preference seems to be moderate among this sample, with a mean of 2.78 on a scale of 1 to 4. Additionally, contraception appears to be available in the neighborhoods represented, because most women (70 percent) perceive that they have easy access to contraceptives and nearly half of their neighbors (44 percent) have practiced contraception.

Table 2 displays the relationship between neighbors' preferences and the log odds of a high parity birth. We test three hypotheses: that neighbors' preferences influence women's behavior, that the influence of neighbors is greater among the older cohort of women, and that the influence of neighbors is independent of women's own preferences. Model 1 displays the re-

TABLE 2 Log odds from logistic regression estimates of neighbors' attitudes predicting the hazard of women's high parity births (third or fourth birth), rural Nepal, 1996–2009

Characteristic	Model 1	Model 2	Model 3
Family size preference			
Neighbor[a]	−0.30	−0.70 } *b	−0.70 } *b
Neighbor (older cohort)[a]		2.03**	2.27**
Individual (cohorts combined)[a]			1.15***
Cohort/Age			
Older cohort		12.02*	−13.80*
Age	0.21***	0.12	0.13*
Ethnic group			
Brahmin/Chettri (r)	0.00	0.00	0.00
Dalit	−0.17	0.44	0.46
Newar	−0.39	−0.44	−0.44
Hill Indigenous	−1.71*	−1.65*	−1.54*
Terai Indigenous	1.17	1.17	1.07
Fertility			
Parity	−4.89***	−4.94***	−4.96***
Number of sons born	−0.44	−0.60	−0.65
Son preference	0.03	0.02	−0.02
Number of children who died	3.28***	3.11***	3.05***
Age at first birth	−0.31***	−0.36***	−0.37***
Nonfamily			
Years of education	−0.36***	−0.35***	−0.31***
Ever worked for wages	−0.75	−0.68	−0.80
Ever lived away from family	1.24	1.03	0.99
Ever member of youth club	0.39***	0.39***	0.39***
Ever exposed to radio, television, movies (sum)	−0.61	−0.64	−0.63
Access to contraceptives			
Perceived availability of contraceptives	1.19	1.34	1.51
Neighborhood contraceptive use (mean)	−0.10	−0.36	−0.24
Health center within five–minute walk	−1.35*	−1.31*	−1.15*
Length of exposure			
Duration of residence in neighborhood (years)	−0.11**	−0.12**	−0.11**
Time	0.02***	0.03***	0.03***
N (person–months)	(37,655)	(37,655)	(37,655)
N (persons)	(594)	(594)	(594)

*Two–tailed tests significant at $p < 0.05$; **$p < 0.01$; ***$p < 0.001$. (r) = Reference category.
[a] Test for significance was one tailed.
[b] Test for whether sum is significantly different from 0.

sults for neighbors' preferences. This model does not support our first hypothesis; neighbors' preferences are not significantly associated with women's parity progression.

In Model 2, we interact neighbors' preferences with each cohort. We find that neighbors' family size preferences are associated with older women's parity progression but have no significant relationship with younger women's parity progression, relative to younger women. Specifically, women in the older cohort have 1.33 greater log odds (2.03–0.70) for each one-unit increase in neighbors' average family size preferences. Because of the difficulty of interpreting the meaning of the difference in log odds, we computed estimated probabilities using the mean (or mode) for each variable, for the mid-point of the time to higher parity birth, which was 40 months. Although the predicted probabilities are small for each group, comparing them across neighbors' family size preference scores by cohort is illustrative. For women in the older cohort whose neighbors are at the bottom of the scale (average family size preference = 6), the probability of having a high parity birth in the subsequent month (given that a high parity birth has not yet been experienced) is 0.000174. The equivalent probability for women in the younger cohort is 0.000148. Thus, for women whose neighbors are at the bottom of the family size preference scale, those in the older cohort have 1.17 times higher probability than those in the younger cohort. Moving to the mid-point of the scale (average family size preference = 7), the corresponding probabilities are 0.000658 for the older cohort and 0.0000732 for the younger cohort, or almost 9 times higher probability for the older cohort. At the top of the scale (average family size preference = 8), the older women have 68 times higher probability than the younger women (0.00248 and 0.0000363, respectively). Because these are very small monthly transition probabilities, the differential between the cohorts can easily be quite large. Model 2 offers support for the hypothesis that neighbors' preferences are more strongly associated with older women's high parity births than with younger women's high parity births.[7]

In Model 3, we add women's individual preferences.[8] Adding individual preferences to the model does not reduce the significant link between neighbors' preferences and individual behavior, compared with Model 2. In Model 3, women of the older cohort have 1.57 greater log odds of experiencing a high parity birth for each one-unit increase in their neighbors' family size preference, relative to women of the younger cohort. Individuals' own family size preferences are associated with their high parity birth rates as well, even net of neighbors' preferences: women have 1.15 greater log odds of experiencing a high parity birth for each one-unit increase in their family size preference. To facilitate interpretation of the magnitude of this effect, we calculated the predicted probability for women in the older cohort, again setting each variable to its mean or mode, and setting duration to 40.01. Women whose family size preference score was 6 had a 0.000254 probability of having a high parity birth in the subsequent month, relative to 0.000802 for those with family size preference score 7, and 0.00253 for family size preference score of 8. Thus, women at the top of the scale had a nearly ten times higher probability of a high parity birth in the subsequent month than did women at the bottom of the scale. (Note that this same multiplier holds true for women in the younger cohort as well, because there is no interaction effect for individual family size preferences.) Individual

7 We also investigated interactions of neighbors' attitudes with respondents' cohort/age, ethnicity, fertility experiences, nonfamily experiences, and duration of residence in neighborhood. These interactions did not reveal consistent significant influences.

8 Neighbors' and individual women's family size preference are correlated at only 0.09 on a scale from 0 to 1.

preferences for family size do not explain the relationship between neighbors' preferences and individual behavior.

Many of the control measures are significantly associated with women's parity progression. For example, in Model 1 the baseline hazard, represented by age, is associated with the risk of a high parity birth. During the years in our analytic sample, women experience a linearly increasing risk of a high parity birth. This is consistent with previous research on women in this age group.

Ethnicity is associated with women's risk of high parity birth. Hill Indigenous women have fewer high parity births relative to Brahmins/Chettris. Fertility experiences generally operate as would be expected: women who have three children have fewer additional births than women who have only two children. Additionally, women who were older at the time of their first birth have fewer high parity births. Also consistent with expectations, women who experienced the death of a child had more high parity births with each additional child that died.

Nonfamily experiences do not consistently influence parity progression. Women who are more educated have fewer high parity births than their counterparts, as expected. An unexpected finding, however, is that women who were ever members of a youth club have more high parity births. As an indicator of access to contraception, living within a five-minute walk to a health center is associated with parity progression in the expected direction: women who live within a five-minute walk to a health center have fewer high parity births than women who live farther from a health center.

DISCUSSION AND CONCLUSION

This study moves beyond individual-level determinants of fertility behavior to examine the influence of neighbors' preferences on women's progression to high parity births, and whether neighbors' preferences influence fertility through socialization or social pressure. Our results offer evidence that the fertility outcomes of women in rural Nepal were influenced by neighbors' preferences. Specifically, neighbors' family size preferences appear to have independently, positively, and significantly influenced progression to larger families among women, even independent of their own preference.

Neighbors' influence on high parity births emerge when examining these relationships separately by cohort. In fact, we only find a significant relationship between neighbors' preferences among the older cohort of women, as compared with the younger cohort of women. We suggest that this difference may be at least partly attributed to the rapidly changing social climate of Chitwan, Nepal, which has provided increasing access to opportunities, experiences, and ideas emanating from outside the immediate community (Axinn and Yabiku 2001; Barber 2004). During their youth, and cumulatively throughout their life course, the younger cohort of women has had more exposure to these new experiences, whereas the older cohort had less contact with individuals, organizations, and ideas outside their immediate community. The daily social interactions of the older cohort were more confined to their own neighborhood, likely causing them to pay more attention to their neighbors' attitudes and preferences. Over time and across cohorts, as the social context changed, family size preference may have become more individualized.

Furthermore, women's preferences do not explain the relationship between neighbors' preferences and women's behavior. This supports the social pressure hypothesis: women may respond to neighbors' preferences regardless of what they, themselves, desire. The association between neighbors' family size preferences and women's high fertility behavior is both independent of and stronger than women's own preferences. By extension, this does not support neighborhood socialization theory—that is, we find no evidence that neighbors' preferences influence behavior by means of their influence on women's preferences. When we include measures of women's own preferences in our model, the relationship between neighbors' preferences and individual behavior is not attenuated.

Although this study suggests the importance of the influence of neighbors on individual fertility behaviors, limitations exist. Studies of neighbors' influence on individuals inevitably face issues of selection and directionality of influence. In this Nepalese setting, selection may be a lesser issue, because of limited mobility in housing (resulting from inheritance practices) and because individuals are usually selected into their neighborhoods based on family lineage. The direction of influence can go both ways, however: individuals have the same potential to influence their neighbors as neighbors have to influence them. Additionally, a number of community-level factors could explain the relationship that we attribute to neighbors' preferences. We have attempted to account for many of these factors by including direct measures—for example, neighborhood-level distance to health clinics and neighbors' contraceptive use—to account for individuals' access to contraceptives. We cannot account for every potential confounder in the model, however, and therefore the results should be interpreted with caution. Additionally, the study that produced the data used here began more than 15 years ago. Thus, the assessments of individuals' and neighbors' preferences are from 1996. To assess the relationship between preferences and subsequent behavior throughout the childbearing years, having a relatively long period of observation is necessary. Fortunately, the data concerning preferences are combined with a household registry system that includes observations of more than a decade of subsequent fertility behavior, with observations into the year 2009. Nonetheless, fertility preferences can change (Kodzi, Casterline, and Aglobitse 2010), and we do not have measures of these changes. If we had time-varying information concerning neighbors' preferences, the relationships in our models could be even stronger. Finally, this sample is limited to a single district in Nepal and is not generalizable to neighbor influences in other settings. Despite these issues, we hope that our analyses motivate further research on neighbor influences and on the potential decline of this influence over time.

These findings may be relevant to policymakers who aim to further decrease fertility in this and similar regions. Promoting favorable attitudes toward smaller families at the community-level may influence fertility at the individual level. But this community-level influence may diminish over time, because young women are increasingly exposed to other messages from outside their communities. Investing in attitude transmission through schools and the media, for example, may have greater payoff among women who are just entering, or recently entered, their reproductive years.

Overall, these results may indicate a decline in collectivism in South Asia, particularly in rural areas where historically isolated individuals have come to be exposed to outside influences via increased access to cities, education, employment, and the media. Older women, whose

exposure to experiences and ideas prior to their reproductive years was largely constrained to their own neighborhoods, tend to be greatly influenced by their neighbors' preference for family size relative to younger women. But for younger women, the influence of neighbors' ideas, preferences, and attitudes may have been partially replaced by ideas that accompany the exposure to social life outside the immediate community (Barber 2004). With these changes, neighborhood collectivism, socialization, and social pressure may have a decreasing influence on individual childbearing preferences and behavior. Instead, over time, women may respond more to an infiltration of Western ideas and values, as their immediate surroundings and social interactions become only a fraction of the stimuli to which they are exposed.

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