

Contraceptive Behavior in the Western Chitwan Valley of Nepal: Effects of Season,  
Natural Resource Responsibility, Women's Status, and Accessibility of Family  
Planning Services

by  
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## **ABSTRACT**

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Contraceptive Behavior in the Western Chitwan Valley of Nepal: Effects of Season, Natural Resource Responsibility, Women's Status, and Accessibility of Family Planning Services

(Under the direction of Dr. Siân Curtis)

The main objective of this study was to examine the potential for a host of contextual factors at multiple levels (including season, natural resource responsibility, women's status, and service accessibility) to affect contraceptive behavior and fertility in the Western Chitwan Valley of Nepal. This question was addressed using data from the Chitwan Valley Family Study, a long running and data intensive data collection effort based at the Population Studies Center at the University of Michigan.

This dissertation found evidence to support the hypothesis that unmet need for contraception and past contraceptive discontinuation are both significantly related to and interact to affect future fertility and contraceptive behavior. It was also found that there were seasonal patterns in contraceptive use in the Western Chitwan Valley, suggesting that the monsoon was a particularly vulnerable time for potential and actual contraceptive users. Finally this research concludes that women's status, natural resource responsibility, and accessibility of services have the potential to interact to affect contraceptive behavior.

Overall it can be concluded from this dissertation research that contextual factors directly affect and interact to affect contraceptive behavior. This research demonstrates that multiple factors have the potential to interact both within (such as individual unmet need and contraceptive histories) and across (such as season and natural resource responsibility) levels of contextual hierarchies to influence contraceptive use dynamics. This more thorough contextual understanding of contraceptive behavior in Nepal provides insights into some of the barriers to contraceptive use in this setting, such as seasonal disruption in contraceptive use, which have never before been examined. This dissertation also represents a wider and more unique line of inquiry into the broader contextual influences on behavior than is currently represented in the literature on contraceptive use dynamics.

## **DEDICATION**

In loving memory of my grandmother, Shirley Brandon, for a lifetime of unswerving faith, love, and support

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## **CHAPTER 1**

### **INTRODUCTION**

Providing universal access to safe and effective contraception remains a critical human rights and public health objective worldwide. However, simply making contraceptive technology available is not enough to ensure that women and couples have the ability to meet their reproductive goals. Many social and environmental barriers have the potential to affect the ability of women to adopt and continue using family planning, even when they wish to limit or delay births. Therefore, a clearer understanding of the causes and consequences of contraceptive behavior is necessary in order to better meet the needs of women who wish to manage their fertility.

This dissertation addressed this larger problem using data from a comprehensive data collection effort in the Western Chitwan Valley of Nepal. The main objective of this study was to examine the potential for a host of contextual factors at multiple levels (including season, natural resource responsibility, women's status, and service accessibility) to affect contraceptive behavior and fertility in the Western Chitwan Valley of Nepal. This is a unique contribution to the literature on contraceptive behavior because of the examination of many factors that have never before been empirically examined at the population level in relationship to contraceptive use dynamics, such as season and natural resource activities.

Furthermore, this research provides an assessment of potential interactions between contextual variables at multiple levels, which has also not been previously examined in regard to contraceptive behavior. This more thorough contextual understanding of contraceptive behavior in Nepal can provide insights into some of the barriers to contraceptive use in this setting.

In this introduction some background is provided to the study of contraceptive behavior and the study site. A summary is also provided of each of the main study aims together with a rationale that highlights the significance of each aim. Finally, a step back is taken from the individual study questions to provide a larger theoretical justification for the dissertation as a whole.

## **Background and Study Setting**

One main goal of family planning programs worldwide is to provide effective contraceptives to all women who wish to use them to limit or space births. Despite the seeming straightforwardness of this objective, the task of meeting demand for family planning services in many instances remains challenging. The challenge arises largely because the demand for contraceptives is a function of many costs and benefits beyond the desire to limit or space births that must be weighed by each potential user. This potential conflict between fertility intentions and contraceptive behavior are reflected in high levels of unmet need for contraception and high rates of discontinuation of contraceptive use in many settings (1). In order to resolve this conflict, family planning programs must strive to minimize the costs of contraceptive use in order to maximize the benefits to service users.

Designing interventions to minimize the costs associated with contraceptive use is predicated on a good understanding of the barriers to adopting and continuing family planning. This dissertation uses data from the Chitwan Valley Family Study, a longitudinal research study located in the Western Chitwan Valley of South-Central Nepal's Chitwan District. The goal of this research is to better understand contraceptive behavior and unmet need for contraception, with the aim of providing a better contextual understanding of potential obstacles to the successful adoption and continuation of contraceptive use by women in this region who wish to manage their fertility. Specific contextual factors considered in this dissertation include season, natural resource responsibility, women's status, and the accessibility of family planning services. Many of these factors have never before been empirically explored at the population level in relation to contraceptive behavior, either alone or in interaction with one another, despite their importance in the larger social context.

This area of Nepal is an interesting setting in which to explore the interactions between these contextual factors as well as their effect on contraceptive behavior for a number of reasons. The Western Chitwan Valley is a rural, agrarian area where many women are active in agriculture and the collection of water, fuelwood, and fodder, often on a seasonal basis (2-6). Also, gender is an especially important consideration in this area given the traditional patriarchal society, strong son preference, and societal norm of universal and early marriage and childbearing (5, 7-11). Furthermore, given the country's limited health infrastructure and ongoing political instability, and in light of the fact that the family planning services that do exist are characterized by a mix of ever-changing government and nongovernmental

efforts and seasonal mobile sterilization camps, accessibility of contraceptive services is variable (12-16). Within this larger socioecological context, contraceptive prevalence is low, around 30%, and unmet need is high, suggesting the existence numerous barriers to contraceptive use by the women in this area.

### **Dissertation Aims and Rationale**

The specific aims of this dissertation are outlined more fully below and a brief rationale provided for each study aim. Each aim is explored in depth in a dissertation chapter to follow.

**Aim 1:** To determine if the experience of unmet need for contraception (being at risk of conception, wishing to limit or space births, but not using contraception) or past contraceptive use and discontinuation predicts future individual-level differences in contraceptive and fertility behavior among women of reproductive age.

**Rationale:** Given competing costs and benefits of using contraception, it is possible that a woman at risk of conception would wish to limit or space births but still does not use contraception. This condition is referred to as unmet need for contraception. Unmet need for contraception is often assessed through a cross sectional instrument that asks about fertility preferences and contraceptive use. The use of this cross sectional measure as an indicator for the success of family planning programs is based on the assumption that having unmet need for contraception at one time point confers greater individual risk for unintended pregnancy in the future. This research aims to examine the validity of that assumption.

Three previous studies look prospectively at unmet need for contraception and unintended fertility. Jain found in Peru that most unintended fertility occurred as a result of contraceptive failure or discontinuation rather than of unmet need for contraception prior to conception (17). Westoff and Bankole in Morocco and Casterline in Egypt found that the majority of unintended births occur to those with unmet need for contraception and those who have never used contraception (18, 19). Casterline attributes this discrepancy as due to the low rates of contraceptive use in Morocco and Egypt as compared to Peru and a higher dependence on highly effective methods. This dissertation addressed this conflict in the literature by examining the relative importance of unmet need for contraception and past contraceptive history in explaining future contraceptive behavior and fertility by women in the Western Chitwan Valley of Nepal.

**Aim 2:** To explore the relationship between season and women's contraceptive behavior and to determine if women's natural resource collection and management responsibilities (i.e. collection of fuelwood, fodder, and water, and involvement with agriculture) modify this relationship in the Western Chitwan Valley of Nepal.

**Rationale:** Worldwide, women carry the majority of household natural resource responsibilities (20), including the collection of water, fodder, and fuelwood, tending crops, managing livestock, and a host of other agricultural duties. These responsibilities are time consuming and tie women closely to home, especially during the height of the agricultural season. This has been found to be the case in southern Nepal, where even in November, an off-peak agricultural season, women

spend approximately 9 hours of every day engaged in natural resource activities including water and forest product collection, livestock management, and crop production (5).

Time demands associated with greater natural resource participation are often seasonal in nature, with the greatest time commitment to agricultural activities occurring during planting and harvesting times. Previous qualitative research from the Western Chitwan Valley in Nepal has found that women, citing a lack of time for seeking health services and for recuperation from the surgery, are less likely to be sterilized in June- August when agricultural demands are the highest(21). June through August is also a time when travel is slower due to monsoon rains, increasing the time needed to reach service delivery points. Women in previous studies have expressed concern that side effects from any means of contraception would prevent them from being as productive in natural resource activities as they could be (13, 22).

Because natural resource activities play such an important role in women's daily lives throughout the year, it is important to understand how these activities influence contraceptive use. Family planning programs that take these factors into account might better meet the needs of women in rural, agricultural areas. This study has further significance because no prior study has quantitatively examined the effects of season or natural resource responsibilities on the timing of contraceptive use by women in rural agrarian areas.

**Aim 3:** To investigate the relationship between access to local family planning services and contraceptive use (adoption and discontinuation) and to examine whether women's status and/or natural resource responsibility modify this relationship.

**Rationale:** The 1994 International Conference on Population and Development in Cairo, Egypt (Cairo) was a watershed moment for the field of international family planning (13, 23). One of the key messages from Cairo is that family planning programs should aim to help all women, despite their background or status, meet their individual fertility preferences by providing access to good-quality family-planning services (24). To date, the differential impact of service accessibility factors on the contraceptive use dynamics of vulnerable subgroups of women has not been well evaluated.

This dissertation chapter examines the role of family planning service accessibility in determining the probability of adoption and discontinuation of contraception and to examine disparities among groups that are potentially more limited in their ability to access what services are available. Specific groups examined include women with lower status and those carrying more natural resource responsibilities. Women who are engaged in more natural resource activities may not have time to seek services not immediately available, and women with lower status and restricted freedom of movement may not be empowered to seek out services very actively. (25-27).

Understanding the role of local service accessibility in contraceptive adoption and discontinuation, and understanding the disparities that exist in the significance

of that role, could be important in understanding the value of accessible local health services among vulnerable populations. Furthermore, household responsibility has not been considered as a potential obstacle to health seeking in previous studies, adding to the significance of this dissertation research.

### **Dissertation Aims in a Theoretical Context**

After having reviewed the background, study setting, and the major aims and contributions of this dissertation, it is important to step back and to put the dissertation as a whole into a larger theoretical context. Perhaps the two most well known theories regarding contraceptive use are Bongaart's proximate determinants of fertility framework (28) and the rational actor (or economic) theories of contraceptive use and fertility (29). Both theories contribute to our fundamental understanding of contraceptive behavior. The proximate determinants framework emphasizes that contraceptive use is one of many behaviors and biological factors that govern fertility outcomes. Other important behaviors include, but are not limited to, marriage, breast-feeding, and sexual taboos (1). The rational actor theory of fertility and contraceptive use, however, stresses that not only is contraceptive use one of many proximate determinants of fertility, but there are manifold costs and benefits influencing the contraceptive behavior of any individual, and a woman will act in such a way as to maximize the benefits while minimizing the costs (29). Blending these two theoretical perspectives provides the foundation for the premise that multiple factors at multiple levels influence individual contraceptive behavior and

fertility, a central idea behind this dissertation's goal to assess contextual factors influencing contraceptive use dynamics.

Taking a theoretical step backwards from the Bongaart's framework, which highlights how contraceptive use directly affects fertility, the Jain framework examines the role of various factors influencing contraceptive use (1). The Jain Framework emphasizes that contraceptive use is a dynamic behavior, with an individual women adopting and discontinuing contraception, as well as switching methods and experiencing contraceptive failure, all perhaps multiple times in her reproductive lifespan. Ultimately, fertility is then a result of the aggregate contraceptive use behaviors experienced by individual women. Furthermore, each facet of contraceptive use behavior can be influenced by a multitude of different individual, social, and health service related factors, although Jain emphasizes health service factors in his original framework (30). The Jain Framework provides the theoretical justification for studying contraceptive adoption and discontinuation as separate behaviors influencing contraceptive behavior over time, the approach taken in this dissertation research, as opposed to examining contraceptive behavior as a simple binary variable of use/nonuse.

The final model that informs the theoretical context of this dissertation is social ecological theory (30). Social ecological theory emphasizes that while health behaviors are individual, each individual is embedded within a social context, and within a particular health service and physical environment. This theory, like the economic theories, emphasizes the ability of multiple factors at multiple scales to influence individual level health behaviors. This theory also allows that due to the

"embedded" nature of individuals within a larger context from which they cannot be separated, variables explaining contraceptive behavior might also interact across levels to influence individual decisions. The social ecological theory thus provides justification for examining the potential for interactions among different contextual variables at multiple levels, a central component of my dissertation. For example, one can examine interactions between season (a physical environmental factor) and natural resource responsibility (an individual level variable). For a pictorial depiction of the way in which social ecological theory views behavior as embedded within multiple levels of social and environmental context, see Figure 1-1.

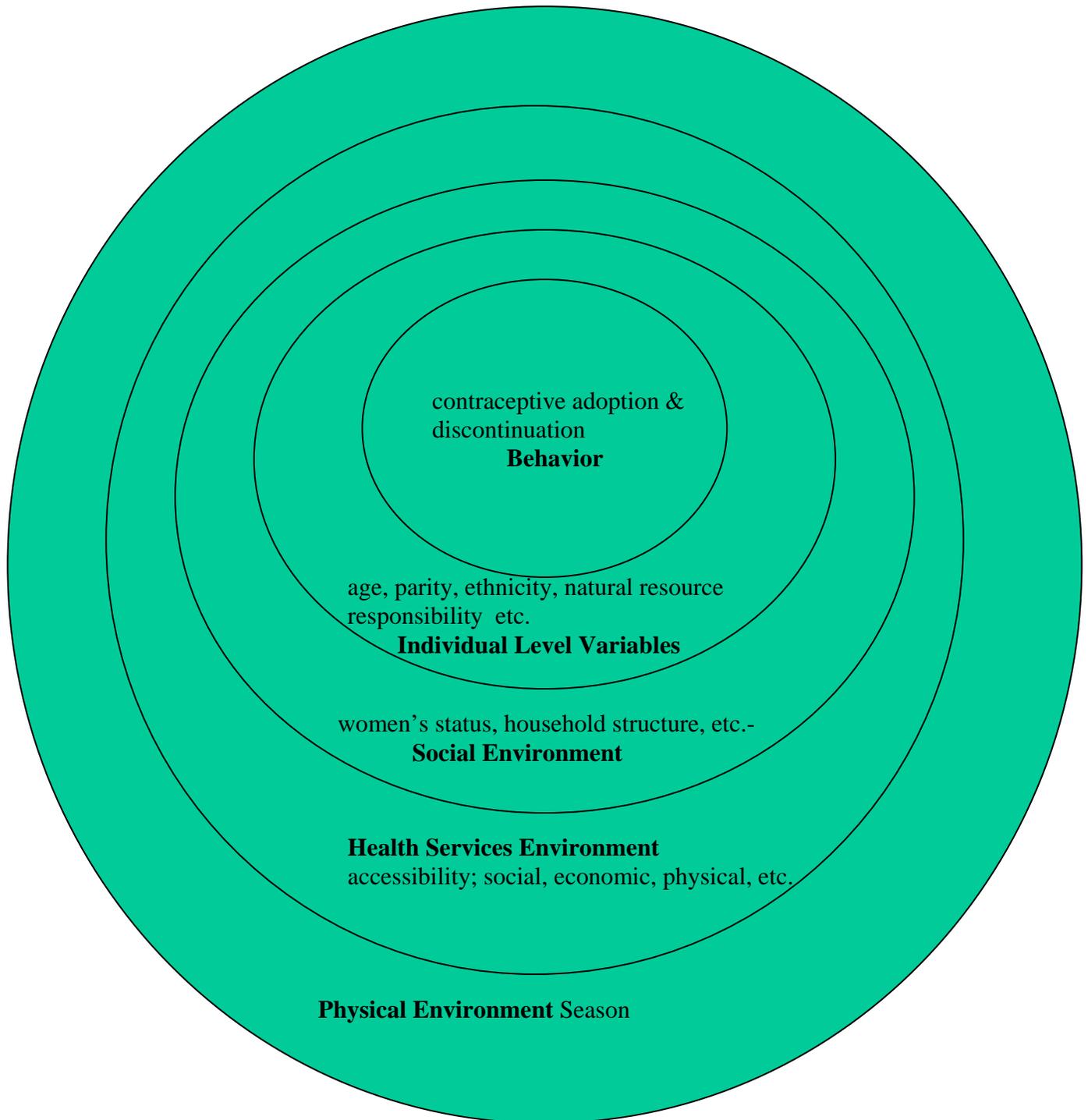


Figure 1-1, Depiction of the multiple contextual levels in which behavior is embedded with examples of variables from the dissertation

## CHAPTER 2

### UNMET NEED FOR CONTRACEPTION, PAST CONTRACEPTIVE USE, AND THE CONSEQUENCES FOR FUTURE CONTRACEPTIVE BEHAVIOR AND FERTILITY

#### Abstract

Past studies have attempted to determine how useful cross-sectional unmet need status is as a predictor of future fertility. This study utilizes logistic regression, ordered logistic regression, and multilevel discrete-time event history models to determine the interactive effects of past contraceptive use and discontinuation with unmet need status at baseline on future contraceptive behavior and fertility. The analysis shows that unmet need status and contraceptive histories were both important for predicting future contraceptive adoption, while neither were important in predicting future discontinuation. Contraceptive history had a different effect on future fertility depending on unmet need status. Women with a history of contraceptive use were less likely to have a future birth among women with unmet need. Women with a history of contraceptive use were more likely to have a future birth among women with no need. The overall conclusion of this paper is that both contraceptive history and unmet need status are important predictors of future contraceptive use and fertility, and family planning programs should aim to meet unmet need, especially among those who have never used contraception, as well as improve

contraceptive continuation among method adopters in order to reduce unintended fertility in the Western Chitwan Valley of Nepal.

## **Introduction**

One of the key messages from the 1994 International Conference on Population and Development in Cairo, Egypt (Cairo) was that family planning programs should aim to help women and couples to meet their individual fertility preferences by providing access to “good-quality family-planning services” (31). In order to evaluate progress, the United Nations recommended that “all governmental goals for family planning... be defined in terms of unmet need” *ibid*. These points from Cairo’s Programme of Action have led to a renewed emphasis on the idea of unmet need for contraception as the primary outcome of interest for family planning programs.

The ascendancy of unmet need for contraception as a preeminent indicator for family planning programs came about largely as a result of studies that indicated that meeting the demand for contraception posed by those with unmet need would enable countries to meet demographic goals without resorting to population targets, method distribution quotas, and other potentially coercive program elements (25). This new emphasis on unmet need for contraception has generated fresh discussion on exactly what the term should mean and how it should be measured. For example, much discussion has surrounded the idea of defining unmet need at the level of the couple rather than, as has been traditionally the case, the individual woman. In addition, since Cairo there has

also been an interest in expanding the definition of unmet need for services to include need for complete reproductive health services as well as basic family planning services, in some instances (32).

Although the preferred definition of unmet need for contraception is somewhat controversial, unmet need is most often attributed to fecund women engaging in sexual activity, who are not currently using contraception, but who wish to delay or terminate childbearing (22, 33). The Demographic and Health Surveys also define women who are pregnant with or amenorrheic due to an unintended pregnancy as having unmet need (22). An unintended pregnancy is considered to be a pregnancy that is either unwanted (i.e. either no or no more children were desired) or mistimed (i.e. a pregnancy occurring earlier than desired) (11, 21).

Unmet need for contraception is often assessed through a cross sectional survey instrument that asks about fertility preferences and both current and past contraceptive use. The use of this cross sectional measure as a relevant programmatic indicator of the need for greater access to quality family planning services is based on the assumption that being designated as having unmet need for contraception at one time point confers greater individual risk for unintended pregnancy in the future unless that need is met and contraceptive use is initiated. In other words, unmet need for contraception is a reflection of a mismatch between intention and motivation regarding future births and contraceptive behavior at one instant in time, and does not take into consideration past or future contraceptive behavior.

In one study of the correlation between a cross sectional measure of unmet need and future fertility, Jain (33) found that, given the high prevalence and dynamic use of both modern and fairly ineffective traditional methods of contraception in Peru, most unintended fertility occurred as a result of contraceptive failure or discontinuation among women with met need at baseline rather than among those with unmet need for contraception and among those who had never used contraception prior to conception. Jain attributed this result to the instability of unmet need status for contraception in this study setting and on the basis of these results, suggests that family planning programs should invest more effort in preventing discontinuation among current users than in targeting non-users and those with unmet need for contraception.

John Casterline, in contrast, asserts that despite the failure of many studies of unintended pregnancy to take contraceptive dynamics into account, that unmet need remains a valid predictor of future unintended pregnancy. Westoff and Bankole in Morocco (22) and Casterline(17) in Egypt found that the majority of unintended births in these settings occurred to those with unmet need for contraception at baseline and among those who have never used contraception. Casterline asserts that low rates of contraceptive use and a high reliance on permanent methods of contraception make unmet need status fairly stable (few women switch in and out of unmet need). He suggests that in these types of settings, unmet need for contraception is, then, a valid programmatic indicator and focus.

It is important to remember that despite this juxtaposition in the literature between the relative importance of unmet need for contraception and contraceptive discontinuation, the two are related concepts. Women categorized as having unmet need for contraception have either never used contraception or have used contraception in the past but have since discontinued use. Individuals with met need (i.e. those who are using contraception at the time of a particular data collection effort) may go on to discontinue use of contraception or to change fertility preferences in the future, thus transitioning later into a state of unmet need and higher risk for an unintended pregnancy (19). This prompts the question, of, not only which is more important, unmet need status or contraceptive discontinuation in explaining fertility outcomes, but also whether women with unmet need due to past discontinuation or women with unmet need who have never used contraception are more or less likely to adopt contraception in the future. Which group is more or less likely to experience future fertility? Do women with a history of contraceptive discontinuation have a higher likelihood of discontinuing following a future adoption, regardless of a desire to limit births? None of the above-mentioned studies, however, have addressed how unmet need status and past contraceptive use and discontinuation might interact to affect future contraceptive behavior as well as fertility.

The aim of this study is to determine how, in the Western Chitwan Valley of Nepal, the experience of both unmet need for contraception for limiting (being at risk of conception, wishing to limit births, but not using contraception) and past contraceptive behavior predicts future individual-level differences in fertility and

contraceptive behavior among women of reproductive age. Because Nepal has relatively low rates of contraceptive use and the majority of users rely upon highly effective forms of contraception (sterilization, Depo Provera, and oral contraceptive pills) (18), it would be expected that, if Casterline's contraceptive use transition hypothesis is correct, in this setting there will be a higher likelihood of pregnancy among those with unmet need for contraception at baseline and among those who have never used contraception, than among those with a met need for contraception and those who have used contraception in the past, even if they have since discontinued using contraception. Such a result would support the continued use of a reduction in unmet need for contraception as the major goal for family planning programs in Nepal. These hypotheses are tested by utilizing a retrospective and prospective contraceptive calendar from a large (n=1,805) sample of women from the Western Chitwan Valley.

## **Methodology**

### **Data**

Data were collected in the Western Chitwan Valley of south-central Nepal between 1996 and 2003. The Western Chitwan Valley covers an area of 100 square kilometers and is bordered to the south by Royal Chitwan National Park and to the east by Barandabar Forest. A random sample of all communities within the Western Chitwan Valley was taken, with oversampling to ensure representation by each of the five major ethnic groups inhabiting the area: high caste Hindus, hill Tibeto-Burmese (such as Gurung, Tamang, and Magar),

indigenous Terai Tibeto-Burmese (such as Tharu, Darai, and Kumal), Newar, and other caste Hindus. A total of 171 communities were included in the sample. Within the 171 sample neighborhoods, every resident (regardless of sex) between the ages of 15 and 59 and their spouses were asked to participate in the research. The response rate was over 97% and the total sample was 5,271 individuals, of which 2,663 were women. For this study the sample will include all married women of reproductive age (between 15 and 49) in the overall sample (n=1,751).

The Chitwan Valley Family Study consists of many different data collection efforts, involving more than ten different survey instruments and including thousands of variables. For the purposes of this study, data from several different instruments were used. The first source of information comes from the 1996 Individual Baseline Survey, which was administered to every individual survey participant. The baseline survey includes information on family relationships, living arrangements, educational attainment, parity, and marriage. A second instrument, the personal Life History Calendar, collects retrospective information related to the timing of major life events, including education, marriage, childbirth, and use of family planning occurring prior to the 1996 baseline surveys. A third instrument, the monthly Family Planning Data Sheet and Household Registry, has been administered to each woman in the sample on a monthly basis since the 1996 baseline sample. This monthly update is the source of data on contraceptive behavior and fertility of individual women from 1996 up to 2003. Finally a household survey of agriculture and consumption was used to construct

land ownership variables used as a proxy for socioeconomic status in this analysis.

Each respondent was interviewed in Nepali by a trained interviewer of the same sex. All interviews, except the monthly family planning updates, were conducted in 1996. Since 1996 each woman in the sample was subsequently followed monthly for updates in her contraceptive use and pregnancy status using the Family Planning Data Sheet. Even women who subsequently moved out of the study area were kept in the study and were followed up monthly where possible. Interviewers recorded all responses to the baseline questionnaires and monthly contraceptive use updates on paper and pencil. The data from these paper and pencil surveys were then entered into a database separately by two different analysts. Discrepancies were reconciled before the data file was considered complete.

## **Measurement**

In this study unmet need for contraception to limiting births was measured at baseline as a binary variable. A woman was considered to have unmet need if she was married, of reproductive age (15-49), declared a desire to have no more children, was not currently pregnant or using any form of contraception. Women with met need are those who declared a desire to have no more children, were not currently pregnant, but were using contraception. Women with a desire for more children were considered to have no need of contraception.

Future fertility, the outcome of interest in this study was defined in a number of ways, depending on the hypothesis being tested. In order to test whether women with unmet need at baseline (as opposed to those with either met or no need) were at an increased risk of experiencing a future pregnancy, future fertility was defined as a binary variable on the basis of whether an individual woman experienced a live birth subsequent to the baseline interview. In order to test the hypothesis that women with unmet need were at a higher risk of having higher subsequent fertility than women with met need, future fertility was defined as an ordinal variable on the basis of the subsequent number of live births.

As part of the investigation into the relationship between unmet need status at baseline, past contraceptive history, and future contraceptive behavior, duration models of contraceptive adoption and discontinuation were estimated. Contraceptive adoption was defined as a transition from a state of nonuse to a state of use of a contraceptive method. Episodes of nonuse were constructed from 1996 onwards and left-truncated episodes were included in the analysis by using non-zero entry times. The sample for the analysis of contraceptive adoption included all women in the baseline sample who were not currently using any method of contraception. The analysis period extended from baseline until the first method adoption. Women who did not adopt a method of contraception were censored at the end of the data collection period. Women were also excluded from the analysis during pregnancy but reentered immediately upon the

termination of pregnancy, with the duration of the episode continuing where the count left off prior to pregnancy.

Contraceptive discontinuation was defined as the transition from a state of use of any method to a state of nonuse of any method for any reason (including pregnancy). Voluntary discontinuation refers to discontinuation for any reason other than method failure. A method failure was considered to occur when discontinuation resulted from pregnancy. The monthly risk of users of temporary methods discontinuing the use of contraception was examined in this study. Interruptions in use of 1 month or greater were considered to be a discontinuation. In addition to all method discontinuation rates, discontinuation was also disaggregated by most recent method used prior to the discontinuation of contraceptive use. Episodes of use were constructed from 1996 onwards and missing and left-censored episodes were dropped. All initial episodes were considered left-censored and no attempt to create left-truncated episodes was attempted.

In the Western Chitwan Valley of Nepal, as in many other rural agrarian settings, one of the best indicators of socioeconomic status (SES) is land ownership. This is because, with almost 95% of Nepal's labor force engaged in agriculture, land is an important measure of production, and thus, wealth. Land ownership in the Western Chitwan Valley is measured as a series of three dichotomous variables representing the ownership of any of three types of land. The first is the ownership of any khet, or wet, land. This type of land is low-lying and the most valuable for production because it can support 2 rice crops per year

without irrigation. The second type of land is bari, or dry uplands. This type of land requires irrigation in order to support a rice crop and often supports other crops, such as millet and maize. The third type of land is house plots. These small land parcels cannot support a large crop but can be used for small kitchen and truck gardens or to support a small business. The ownership of these three types of land have been found to correlate well with more traditional consumption based indicators of SES (such as consumer durables, electricity and toilet facilities) in the Western Chitwan Valley. Land ownership has furthermore been found to provide a more direct wealth measurement than consumption measures such as asset indices, which in rural settings tend to be less reliable (19).

### **Statistical Approach**

Data were analyzed using STATA 8.0 S.E. statistical computing software. Different types of models were estimated depending on the hypothesis to be tested. The hypothesis regarding whether any future pregnancies occurred was tested using a logistic regression model selected on the basis of the binary outcome variable (any subsequent live birth 0/1). The hypothesis regarding the number of future pregnancies was tested using an ordered logistic regression model selected on the basis of the ordinal outcome variable (subsequent number of live births).

Hypotheses regarding the duration specific hazard of future contraceptive behavior according to unmet need status at baseline were tested using multilevel discrete time hazard models. Hazard models, also called survival or duration

models, or event history analyses, are appropriate for use in this context because pregnancy, contraceptive adoption, and contraceptive discontinuation represent time dependent transitions in state (2, 11, 34). Because there were women who did not change state during the length of data collection, observations are censored, making traditional regression analyses biased and inefficient. Because information on pregnancy and contraceptive use was collected at discrete time intervals (monthly) rather than continuously, discrete time hazard models are appropriate. Multilevel models are estimated because the data structure is inherently multilevel, with the unit of analysis being an episode of use or nonuse of contraception experienced by an individual woman living in a sample neighborhood, making it necessary to account for random error at these multiple levels.

In STATA, duration models were fitted using the SVYLOGIT command, modeling the hazard as a logit function and with neighborhoods as the primary sampling unit. Time is included in the model as both a period effect (month 1-72 of data collection) as well as representing the length of a single continuous episode of contraceptive use or nonuse in months. Adjusting for episode length is important since it allows us to account for changes in the hazard over the interval. For example, most studies find that the hazard of discontinuing contraception decreases the longer a woman uses family planning (35-38)

All models included control variables for age, education, parity, SES/land ownership, and caste/ethnic group. In the duration models, age and live births subsequent to baseline were modeled as time dependent covariates. In the

logistic regression and ordered logistic regression models age and parity were measured at baseline. For a complete description of model variables see Table 2-1.

## **Results**

### **Unmet Need for Contraception for Limiting**

Of the total eligible sample of 1,347 women, 323 women (24%) were classified as having no need for contraception at baseline due to a desire to have more children. 488 women (36%) desired to limit births but were classified as having a met need as a result of current use of contraception. An additional 533 women (40%) were classified as having unmet need for contraception. The remaining individuals in the sample could not be classified due to missing data (see Table 2-2).

A comparison of past contraceptive histories shows that 36.8% of women with unmet need for limiting have used a modern method of contraception in the past while only 19% of those with no need and desiring another birth have ever used a modern method (see Table 2-3). Of the 488 women who desired to limit births and who were currently using a modern method at baseline, all were relying on sterilization, either through tubal ligation (22%) or spousal vasectomy (78%). Of the small fraction of women with no need for contraception currently, but who had used a modern method in the past, the majority had discontinued. Only one individual who desired more children was currently using a contraceptive method at baseline. Of those with unmet need for contraception

with a history of contraceptive use, all had discontinued, thus being categorized as having unmet need despite their wish to limit births. In both groups, 60 to 70% (no need and unmet need groups respectively) had discontinued prior to their most recent birth and never re-adopted contraceptive use following the birth (see Table 2-3).

### **Future Births**

In order to examine the role of unmet need in predicting future pregnancies, the analysis of fertility must focus on those women who wish to limit future births (intentions to delay or space births were not captured in this dataset). When the analysis is limited to only those women who wished to limit births at baseline, the results indicate that women with unmet need for contraception at baseline were, in fact, significantly more likely than those with met need to experience a future birth and to have a greater number of subsequent births (data not shown). This is not surprising given that 100% of women with a met need for contraception reported being either sterilized or married to a vasectomized spouse at baseline. Nevertheless, 10 (or 2%) of the women with met need due to contraceptive use at baseline went on to have a future birth either due to being mistaken about a spouse's status, a failure, or as a result of a change in partners.

Given that 100% of the sample with met need at baseline reported the use of sterilization (see Tables 2.2-2.3), this group was dropped from all further analyses of future contraceptive behavior and fertility. Instead we perform the

analysis with 4 groups: those with unmet need who have ever used contraception, those with no need who have ever used contraception, and those with unmet and no need who have never used contraception. In this analysis, we see that women with no need who have ever used are the most likely to experience a future birth, followed by those with unmet need who have never used, those with unmet need who have used in the past, and leaving those with no need and no history of contraceptive use being the least likely to experience at least one future birth (see Table 2-4, Figure 2-2). Results from the ordered logistic regression analysis indicate that women with unmet need who have never used and women with no need who have ever used are more likely to have a greater number of subsequent births than either those with unmet need who have ever used contraception or those with no need who have never used contraception (see Table 2-5).

### **Future Contraceptive Behavior**

In the 72 months of the prospective study period, there were 664 eligible episodes of nonuse contributed by 664 women and 618 eligible episodes of temporary method use contributed by 427 individual women. In order to be at risk for discontinuation a woman must have adopted a method other than sterilization during the prospective study period. Women who never used contraception and those who were sterilized were also considered to be not at risk of discontinuing and were therefore excluded from the analysis. All told, in the study period there were 206 eligible adoptions and 422 eligible discontinuations. Adoptions during

this period consisted predominantly of Depo Provera (n=88) followed by oral contraceptive pills (n=42), condoms (n=38), and sterilization (n=37). The one remaining adoption was of an Intrauterine Device. Similarly, discontinuations were predominantly of Depo Provera, followed by the pill, and condoms (see Tables 2.6-2.7).

As has been documented in other study settings, both adoption and discontinuation were more likely early in an episode, with the percent adopting and discontinuing dropping off sharply and then leveling off. The 12-month voluntary discontinuation rate is high, averaging at 73.7% for all modern methods (see Table 2-6). The all-method adoption rate is relatively low at just under 38% at 12 months (see Table 2-7). When comparing adoption patterns among those with unmet and no need, not only are those with unmet need much more likely to adopt any method, but the method mix of adoption is different, as well, with the pill and condoms relatively more popular among women with no need and those with unmet need opting more often for sterilization (see Table 2-8).

Model estimates show that women with unmet need for contraception and a past history of contraceptive use were most likely to go on to adopt a modern method, followed by women with no need and a history of contraceptive use and those with unmet need and no history of contraceptive use (see Table 2-9). Women with no need and no history of contraceptive use were the least likely to adopt a contraceptive method during the prospective study period (see Figure 2-3). Women with unmet need for contraception were no more or less likely than

women who desired more births at baseline to discontinue once a method is adopted, regardless of her past contraceptive use history.

A second variable of interest in this analysis was the number of live births subsequent to baseline, modeled as a time dependent covariate. Women with a birth subsequent to baseline were much more likely than women with no additional births to adopt any method of contraception. The number of live births subsequent to baseline had no significant effect on the likelihood of discontinuing a method, once it has been adopted.

A host of control variables were included in the models, including age, education, parity, etc. Educational attainment is of limited importance in predicting contraceptive adoption; however, women with a school leaving certificate or higher education were half as likely as those with no education to discontinue using contraception. One reason why education may not have a large independent effect on the probability of adoption is because it is acting through past contraceptive history, an important predictor of future contraceptive behavior. Most recent method used prior to discontinuation also showed a significant association with the likelihood of discontinuation. Women who last used the pill were 1.3 times more likely than those who last used Depo Provera to discontinue and those who last used condoms were almost twice as likely as those who last used Depo Provera to discontinue.

## Discussion

The aim of this paper was to examine the relationship between unmet need for contraception at baseline, past contraceptive behavior, and subsequent contraceptive use and fertility in the Western Chitwan Valley of Nepal.

According to Casterline, in Egypt, unintended fertility results primarily from unmet need for contraception and occurs mostly among women who never have used contraception. Jain argues that unintended fertility is mostly the result of discontinuation of past contraceptive use and is not affected by unmet need status at baseline. One of the main objectives in this study was to address this question of the relative importance of contraceptive discontinuation and unmet need in predicting future fertility in the Western Chitwan Valley of Nepal. In the initial analysis of fertility among women with met and unmet need, women with unmet need are more likely to experience a future birth, as predicted by Casterline. However, this analysis was somewhat limited since all women with met need were relying on sterilization. Looking deeper into the behaviors preceding unmet need in this population, nearly 40% of women had unmet need arising from past method discontinuation. This led to interesting questions about the relative importance of contraceptive history as well as need status as possible predictors of future fertility and future contraceptive behavior.

In delving deeper into this analysis evidence was found of an interaction between past contraceptive discontinuation and unmet need status to affect future fertility. Among women with no need due to a desire to have children, a past history of contraceptive use (and subsequent discontinuation) is associated

with a greater likelihood of future births. Among those with unmet need, women with a past history of contraceptive use were less likely to have a future birth than those who had never used contraception. Overall, women with unmet need were less likely than those with no need and a history of contraceptive use to experience a future birth, though more likely than those who had no need and had never used to experience a future birth. It is perhaps initially surprising that among women with a desire to have more children, those who have a history of contraceptive use were so much more likely than women who had never used contraception to have a future birth. This result could be in part, an artifact of the fact that this relatively small group of women (n=62) who wished to have more children but also had experience with contraceptives may represent a select population of more sophisticated contraceptive users who were using temporary methods to delay or space births.

In the analysis of future contraceptive behavior, women with unmet need were, overall, more likely than those with no need to adopt contraceptive use and more likely to adopt a permanent method. Furthermore, within each group, those who have used contraception in the past were more likely to adopt a method in the future, despite the fact that this past contraceptive use ended in discontinuation. These results indicate that both unmet need for contraception at baseline and past contraceptive history are valid predictors of future contraceptive behavior. However, those who have never used contraception were the least likely to adopt, and may represent a reasonable target for contraceptive programs, given that these women are no more likely to

discontinue once they begin using. In fact, neither past discontinuation of contraceptives nor unmet need status at baseline was significantly related to method discontinuation. Discontinuation was more significantly affected by the specific method used.

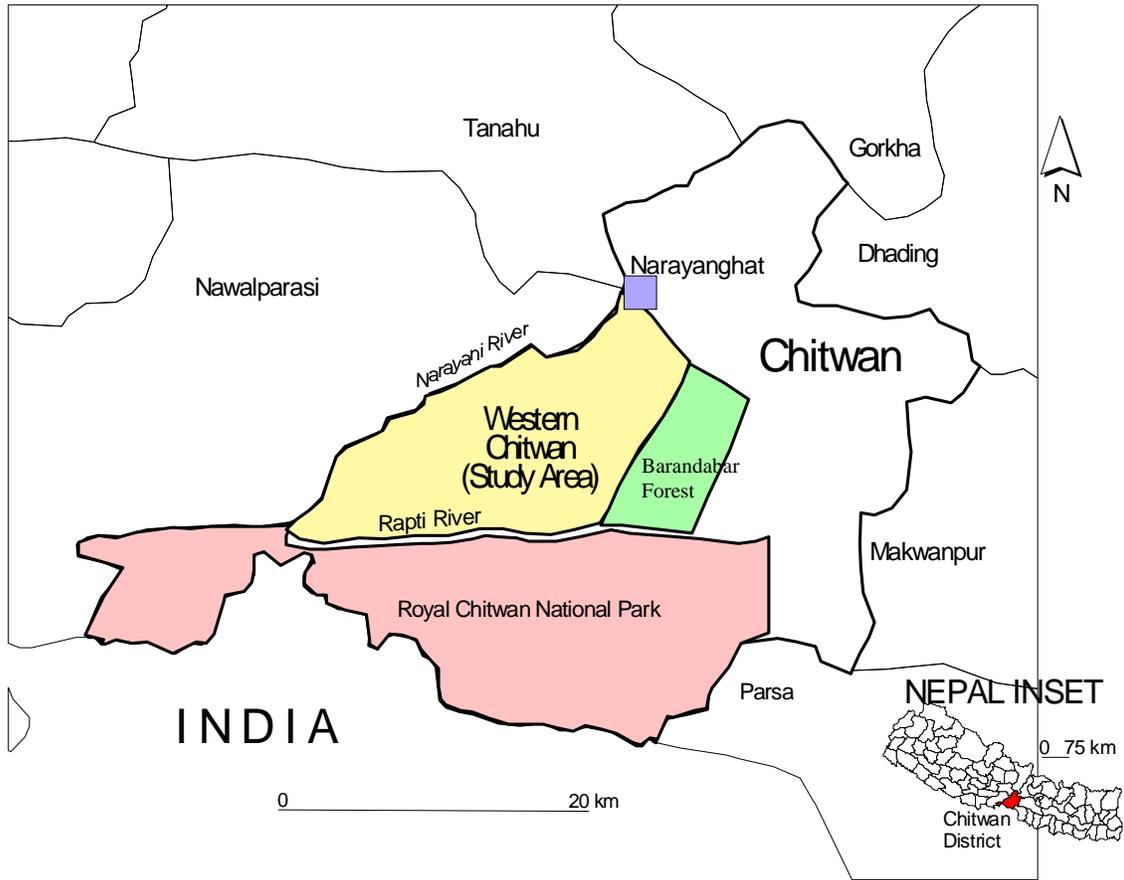
There are, of course, limitations to this study, largely around the issue of measurement. While information was collected at baseline during this study on the desire to limit births, women were never asked again about their intentions making it impossible to assess how many women moved in and out of unmet need for limiting as a result of changing fertility preferences over the study period. In addition, no information was gathered at any time on the desire to delay or space births, even though about 8% of women who wished to have more children at baseline had a history of contraceptive use indicating that contraceptives had perhaps been used to delay or space births in the past. Also, because 100% of women with a met need for contraception at baseline due to contraceptive use reported using sterilization, it was not very interesting or useful to compare the fertility behavior of those with unmet need at baseline to those with met need, since all of those with met need were sterilized. Instead women with unmet need at baseline were compared to women with no need due to a desire for more children.

Despite these limitations, this study was able to address its main aim which was to understand the implications of a cross sectional measure of unmet need and past contraceptive discontinuation for future contraceptive behavior and fertility. Past use (and discontinuation) of contraception did have differing

implications for future fertility on the basis of unmet need status at baseline, indicating that unmet need remains a demographically relevant concept in the Western Chitwan Valley of Nepal. Furthermore, an examination of past and future contraceptive behavior revealed interesting implications for family planning programs striving to lower unintended fertility in this setting. A large percentage of women with unmet need at baseline have unmet need for contraception following an earlier method discontinuation. Women with unmet need for limiting also have higher adoption rate than women with no need at baseline, however, women with a past history of contraceptive use are also more likely to adopt, regardless of need at baseline. Therefore, family planning programs should address contraceptive discontinuation and effective use among method adopters as well as aiming to increase method adoption among those who have never adopted if they wish to have an impact on unintended fertility among women with unmet need for contraception. The debate, then, between Jain's assertion that effective and continued use of contraception is more important for fertility than unmet need status and Casterline's argument that in settings with low prevalence and widespread use of effective modern methods, unmet need for contraception remains an important predictor of fertility does not, at least in this study setting, really capture the complexities of behavior. While unmet need for contraception remains relevant, unmet need status itself is a consequence of past contraceptive discontinuation and an important predictor of future contraceptive behaviors including method adoption. Addressing unmet need for contraception,

then, requires a focus on effective and continued use of contraception as well as an increase in method adoption.

**Figure 2-1.** Map of Study Area



**Table 2-1. Model Variable Descriptions**

<b>Variable</b>	<b>Description</b>
<b>Dependent Variables (Model Specific)</b>	
Future births	binary, 1 if woman experienced a live birth subsequent to baseline
Number of future births	ordinal, 0-5
Contraceptive adoption	binary, 1 if a woman adopts any or a specific method (model specific)
Contraceptive discontinuation	binary, 1 if a woman discontinues any temporary method
<b>Independent Variables</b>	
Unmet need for contraception at baseline	binary, 1 if a married woman of reproductive age with at least one child who did not want more children and was not pregnant or currently using contraception at baseline
Ever use of contraception at baseline	binary, 1 if at baseline a woman had ever used a modern method of contraception before
age at baseline (time varying covariate in contraceptive behavior models )	Age of a woman (classified as under 20, 20-29, 30-39, or 40-49)
education	Highest educational level obtained by a woman (classified as none, some primary, some secondary, or S.L.C. or higher)
parity at baseline	Number of living children at baseline (classified as none, 1, 2-5, >5)
number of live births subsequent to baseline (time varying covariate in contraceptive behavior models)	The number of live births a woman had subsequent to baseline (classified as none, 1, 2, or 3-5)
caste/ethnic group	Caste or ethnicity of a woman (classified as low class hindu, high class hindu, hill tibetan burmese, terai tibetan, and newars)
<b>Land Ownership (SES)</b>	
own khet land (at baseline)	A household owns khet (wet) farmland
own bari land (at baseline)	A household owns bari (dry) farmland
own houseplot (at baseline)	A household owns their own houseplot
<b>Last Method Used (for Discontinuation only)</b>	
Pills	Last method used before discontinuation was pill
Condoms	Last method used before discontinuation was condoms
Depo Provera	Last method used before discontinuation was Depo Provera

**Table 2-2.** % of total sample (n=1805) with unmet need at baseline, and percentages of those groups who have ever previously used contraception, and who experience a future live birth

<i>Status at Baseline</i>	<i>% of total sample</i>	<i>% who have ever used contraception</i>	<i>% with future birth</i>
No need/desires more children	24.0	19.2	62.3
Met need/ using contraception	36.2	100.0	NA
Unmet need	39.5	36.8	28.0

**Table 2-3.** % of sample with no need and unmet need (n=1313) who have discontinued using contraception at least once prior to baseline, and the % of those discontinuations occurring subsequent to the most recent live birth

<i>Status at Baseline</i>	<i>% of total sample who ever used</i>	<i>% discontinuing subsequent to most recent live birth</i>
No need/desires more children	19.2	41.9
Unmet need	36.8	30.1

**Table 2-4.** Parameter estimates (with standard errors) from the logistic regression analysis of having a future live birth

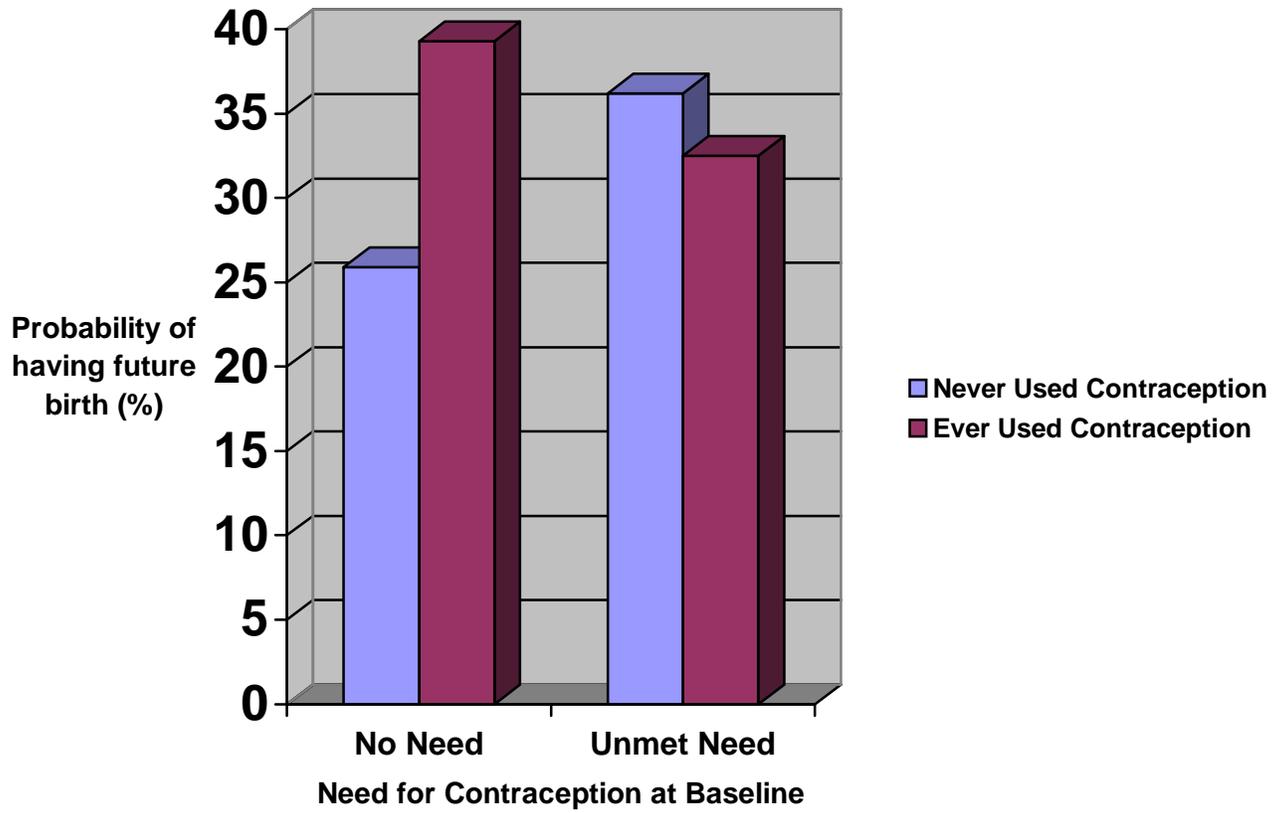
<b>Independent Variable</b>		
<b>Unmet need status and past contraceptive history at baseline</b>		
No need, never used (desires more children) (ref)		
No need, ever used contraception	0.50*	(0.23)
Unmet need, never used	0.76***	(0.19)
Unmet need, ever used	0.97***	(0.35)
<b>Parity at baseline</b>		
0 (ref)		
1	-0.10	(0.25)
2-5	-1.23***	(0.20)
>5	-1.67***	(0.27)
<b>Age</b>		
15-19 (ref)		
20-29	-1.50***	(0.40)
30-39	-2.87***	(0.43)
40-49	-5.32***	(0.63)
<b>Education</b>		
None (ref)		
Some primary	-0.41	(0.23)
Some secondary	-0.27	(0.23)
S.L.C. or higher	0.14	(0.31)
<b>Caste/ethnicity</b>		
High caste Hindu (ref)		
Low caste Hindu	0.67*	(0.21)
Hill Tibetan Burmese	0.42	(0.23)
Terai Tibetan	0.87***	(0.22)
Newar	0.07	(0.35)
<b>Land Ownership (SES)</b>		
own khet land	0.27	(0.17)
own bari land	0.01	(0.16)
own houseplot	-0.19	(0.22)
<b>Constant</b>	<b>2.00***</b>	<b>(0.45)</b>

(ref) reference category    --not applicable  
 \* Significant at p<0.05    \*\* Significant at p<0.01    \*\*\* Significant at p<0.001

**Table 2-5.** Parameter estimates (with standard errors) from the ordered logistic regression analysis of number of future live births

Independent Variable		
<b>Unmet need status at baseline</b>		
No need, never used (desires more children) (ref)		
No need, ever used contraception	0.35	(0.22)
Unmet need, never used	0.60***	(0.18)
Unmet need, ever used	0.67**	(0.27)
<b>Parity at baseline</b>		
0 (ref)		
1	-0.64**	(0.23)
2-5	-1.98***	(0.24)
>5	-1.46***	(0.36)
<b>Age</b>		
15-19 (ref)		
20-29	-0.94**	(0.25)
30-39	-2.31***	(0.15)
40-49	-4.81***	(0.55)
<b>Education</b>		
None (ref)		
Some primary	-0.39	(0.21)
Some secondary	-0.37	(0.20)
S.L.C. or higher	0.15	(0.28)
<b>Caste/ethnicity</b>		
High caste Hindu (ref)		
Low caste Hindu	0.56*	(0.24)
Hill Tibetan Burmese	0.32	(0.20)
Terai Tibetan	0.82***	(0.20)
Newar	-0.11	(0.32)
<b>Land Ownership (SES)</b>		
own khet land	-0.23	(0.15)
own bari land	0.01	(0.15)
own houseplot	-0.30	(0.20)

(ref) reference category    --not applicable  
 \* Significant at p<0.05    \*\* Significant at p<0.01    \*\*\* Significant at p<0.001



**Figure 2-2.** Probabilities of having a future live birth as a function of unmet need status at baseline and prior contraceptive history

**Table2- 6.** 12-month life table method discontinuation, failure, and voluntary discontinuation rates by method

<i>Rates</i>	<i>%</i>
<b>Total Discontinuation rate</b>	76.92
<b>Failure rates</b>	
All methods	3.26
Condom	2.91
Depo Provera	5.13
Oral contraceptive pill	2.48
<b>Voluntary Discontinuation rates</b>	
All methods	73.66
Condom	78.64
Oral contraceptive pill	69.80
Depo Provera	72.65

**Table 2-7.** Overall 3, 6, and 12 month method adoption rates by method

<i>Rates</i>	<i>3 month</i>	<i>6 month</i>	<i>12 month</i>
All methods	18.7	26.8	37.7
Condom	3.6	5.3	7.3
Oral contraceptive pill	3.3	4.8	7.3
Depo Provera	9.8	13.1	17.2
Sterilization	2.0	3.7	6.0

**Table 2-8.** % of women who were not using any contraception at baseline (n=664) who went on to adopt any method (by unmet need status and initial method choice)

<i>Method</i>	<i>% of those with no need</i>	<i>% of those with unmet need</i>
Any methods	15.7	44.4
Pills	3.4	8.9
Depo Provera	5.6	6.2
Condoms	6.3	19.2
Sterilization	0.7	9.5

**N=268**

**N=369**

**Table 2-9.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive adoption

Independent Variable	Any Method	
<b>Unmet need status at baseline</b>		
No need, never used (desires more children) (ref)		
No need, ever used contraception	1.69***	(0.21)
Unmet need, never used	0.79***	(0.22)
Unmet need, ever used	0.76**	(0.27)
<b># Live births subsequent to baseline</b>		
None (ref)		
1	1.92***	(0.56)
<b>Age</b>		
15-19 (ref)		
20-29	0.24	(0.37)
30-39	0.07	(0.40)
40-49	-0.87	(0.44)
<b>Education</b>		
None (ref)		
Some primary	0.17	(0.18)
Some secondary	0.13	(0.20)
S.L.C. or higher	0.16	(0.27)
<b>Caste/ethnicity</b>		
High caste Hindu (ref)		
Low caste Hindu	0.10	(0.21)
Hill Tibetan Burmese	0.13	(0.17)
Terai Tibetan	-0.30	(0.25)
Newar	-0.19	(0.23)
<b>Land Ownership (SES)</b>		
own khet land	-0.05	(0.16)
own bari land	-0.20	(0.14)
own houseplot	0.20	(0.23)
<b>Constant</b>	-2.40***	(0.46)
<b>Study Month (1-75)</b>	-0.02	(0.02)
<b>Study Month squared (1-75)</b>	0.00	(0.00)
<b>Duration</b>	-0.24***	(0.03)
<b>Duration squared</b>	0.00***	(0.00)

(ref) reference category    --not applicable  
 \* Significant at p<0.05    \*\* Significant at p<0.01    \*\*\* Significant at p<0.001

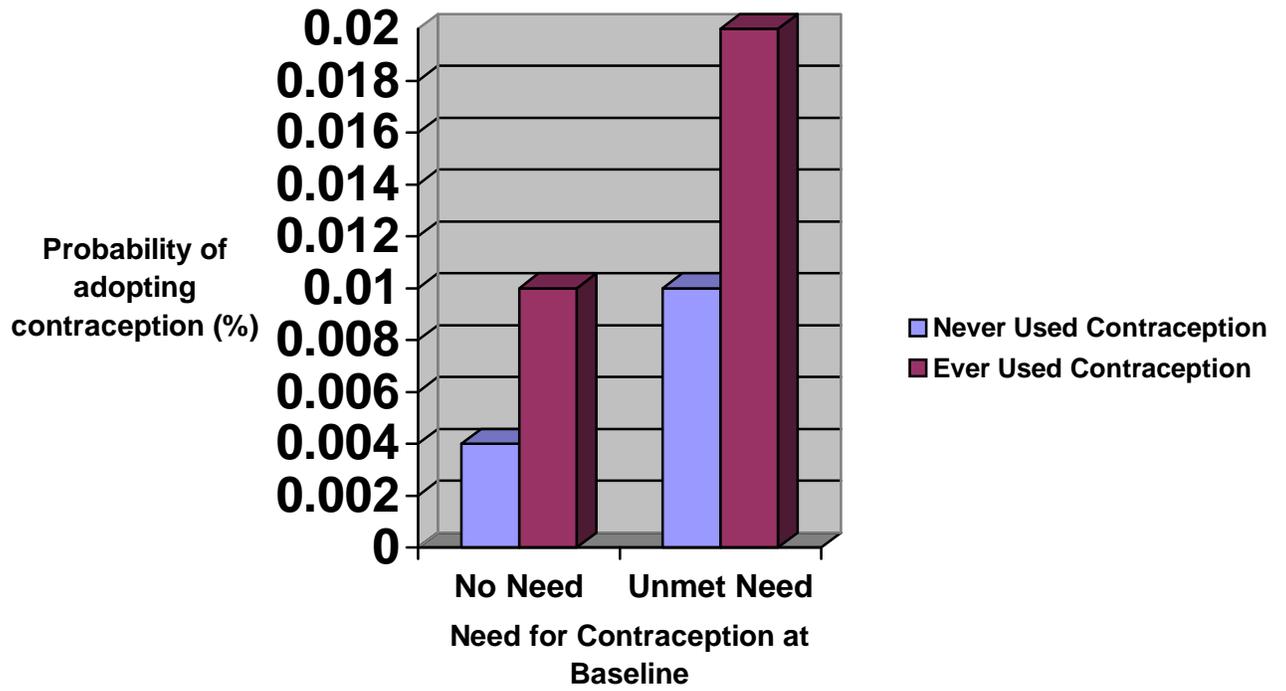


Figure 2-3. Probability of adopting contraception as a function of unmet need status at baseline and prior contraceptive history

**Table 2-10.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive discontinuation

<b>Independent Variable</b>		
<b>Unmet need status at baseline</b>		
No need, never used (desires more children) (ref)		
No need, ever used contraception	0.14	(0.21)
Unmet need, never used	0.10	(0.15)
Unmet need, ever used	0.07	(0.20)
<b># Live births subsequent to baseline</b>		
None (ref)		
1	-0.04	(0.11)
2	0.23	(0.17)
3-5	0.13	(0.41)
<b>Age</b>		
15-19 (ref)		
20-29	0.23	(0.27)
30-39	0.02	(0.32)
40-49	-0.00	(0.37)
<b>Education</b>		
None (ref)		
Some primary	0.13	(0.16)
Some secondary	0.25	(0.17)
S.L.C. or higher	-0.52***	(0.16)
<b>Caste/ethnicity</b>		
High caste Hindu (ref)		
Low caste Hindu	-0.07	(0.17)
Hill Tibetan Burmese	-0.06	(0.15)
Terai Tibetan	0.08	(0.18)
Newar	0.04	(0.20)
<b>Land Ownership (SES)</b>		
own khet land	0.06	(0.11)
own bari land	-0.15	(0.10)
own houseplot	0.04	(0.16)
<b>Constant</b>	-2.40***	(0.33)
<b>Study Month (1-72)</b>	-0.01	(0.01)
<b>Study Month squared (1-72)</b>	0.00	(0.00)
<b>Duration</b>	-0.00	(0.01)
<b>Duration squared</b>	0.00***	(0.00)
<b>Last Method Used</b>		
Depo Provera (ref)		
Oral Contraceptive Pills	0.32**	(0.12)
Condoms	0.62***	(0.13)

(ref) reference category

--not applicable

\* Significant at p<0.05

\*\* Significant at p<0.01

\*\*\*Significant at p<0.001

## **CHAPTER 3**

### **NATURAL RESOURCE RESPONSIBILITIES AND SEASONAL PATTERNS IN CONTRACEPTIVE BEHAVIOR**

#### **Abstract**

This paper explores the effects of natural resource responsibility and season on contraceptive adoption and discontinuation between 1997 and 2003 in the Western Chitwan Valley of Nepal using discrete-time multilevel hazard models. Data from the Chitwan Valley Family Study, containing a sample of 1,761 married women of reproductive age, were used for this analysis. Women in this study were found to be less likely to adopt any method and more likely to discontinue non-permanent methods in the monsoon months than in the winter. There is little evidence to suggest that this seasonal pattern in contraceptive behavior was significantly stronger among women with greater natural resource responsibilities, although more sensitive measures of seasonal responsibility would be desirable for better assessing this relationship. This study contributes to the literature by looking beyond seasonality in births to examine the effects of season and natural resource responsibility on contraceptive behavior.

#### **Introduction**

Seasonality of conceptions and births is a widely recognized phenomenon occurring across cultures. Explanations of the relationship between season and

fertility are divided into two categories, biological and behavioral. The best studied of these suggested mechanisms are biological. Temperature, photoperiod, and seasonal fluctuations in food security and physical activity (at least among marginal subsistence groups), have all been hypothesized to have an effect on fecundability (36). In fact, Panter-Brick has demonstrated that increased physical activity, associated with agricultural responsibilities, leads to suppressed ovulation in the monsoon season for non-contracepting Tamang women of central Nepal (39). The same relationship between agricultural season and fecundity has also been documented in Bangladesh (40).

Less research has been done regarding behavioral determinants of seasonal fertility patterns. Some research suggests that where there is significant seasonal migration, spousal separation is a small but significant predictor of seasonal fertility (41). One recent European study found that sociodemographic factors are a strong predictor of seasonal fertility in the Czech Republic (42). These authors suggest that the stronger seasonality in births among older and more educated mothers may reflect widespread and very effective use of family planning among these women, leading to fewer unplanned pregnancies and a greater tendency to plan conceptions for the culturally preferred summer holiday season. An earlier study in Egypt suggests that women may time marriage and periodic abstinence to avoid pregnancies and births during the busy agricultural season (43). Despite this suggestion of seasonality in fertility regulation behavior as well as births, no studies have directly examined disparities in seasonality of contraceptive use among women.

Worldwide, women carry the majority of household natural resource responsibilities(44), including the collection of water, fodder, and fuelwood, tending crops, managing livestock, and a host of other agricultural duties. These responsibilities are time consuming and tie women closely to home, especially during the height of the agricultural season. This has been found to be the case in southern Nepal, where women spend approximately 9 hours of every day engaged in natural resource activities including water and forest product collection, livestock management, and crop production (45) in November's millet season (5). Resource collection activities are more time consuming in the dry season (20, 46). Women have to go farther to find water because ephemeral water sources are dry. Additionally, preferred fodder and fuelwood sources are unavailable during the dry season and many people are driven into protected park and forest land to collect illegally during this time of the year. The pressure is so great that Royal Chitwan National Park allows for some legal collection of fuelwood and fodder during the dry season (47, 48). As far as agriculture, there are three cropping seasons in a year: Monsoon (from June to September) winter (from October to February) and summer (from March to May). The important crops are paddy, maize and millet in monsoon, wheat lentil, potato and buckwheat in winter, and paddy and maize in summer (47). The cropping patterns are paddy-based in low lands and maize based in uplands.

Time demands associated with greater natural resource participation are often seasonal in nature, with the greatest time commitment to agricultural activities occurring during planting and harvesting times. A previous small (n=98) study from the Western Chitwan Valley in Nepal found that women were less likely to be

sterilized and slightly less likely to adopt other methods in June-August when agricultural demands were the highest. This study did not examine the timing of discontinuation of temporary methods. In semi-structured interviews women cited a lack of time for seeking health services and for recuperation from the surgery, as well as a fear of infection following surgery during the monsoon, as reasons for preferring to be sterilized in the winter(48). A second study in the Terai (n=189) also found a midwinter peak in sterilization, suggesting the presence of mobile camps and the relative freedom from agricultural duties as possible hypotheses for this observed seasonality in sterilization (6). The Thapa study also noted that June-August is also a time when travel is slower due to monsoon rains, increasing the time needed to reach service delivery points and making contracepting easier in the winter. This study did not examine possible seasonality in other methods of birth control. Women have expressed concern in interviews that side effects from any means of contraception would prevent them from being as productive in natural resource activities as they could be (13, 14). This concern may translate into less patience with seeking contraceptives and tolerating side effects during the summer months among women with greater natural resource responsibilities, and therefore, a greater rate of contraceptive discontinuation and a lower rate of contraceptive adoption during this time, or may influence the method chosen during these months.

The aim of this study was to empirically examine the relationship between season and both contraceptive adoption and discontinuation by utilizing a prospective contraceptive calendar from a large (n=1,761) sample of women from the Western Chitwan Valley. Various hypotheses explaining the role of season in the

timing of contraceptive use, including the role of seasonal natural resource responsibility, were also assessed. Because natural resource activities play such an important role in women's daily lives throughout the year, it is important to understand how these activities influence contraceptive use. Family planning programs that take these factors into account might better meet the needs of women in rural, agricultural areas.

## **Methodology**

### **Data**

Data were collected in the Western Chitwan Valley of south-central Nepal between 1996 and 2003. The Western Chitwan Valley covers an area of 100 square kilometers and is bordered to the south by Royal Chitwan National Park and to the east by Barandabar Forest (see Figure 3-1). A random sample of all communities within the Western Chitwan Valley was taken, with oversampling to ensure representation by each of the five major ethnic groups inhabiting the area: high caste Hindus, hill Tibeto-Burmese (such as Gurung, Tamang, and Magar), indigenous Terai Tibeto-Burmese (such as Tharu, Darai, and Kumal), Newar, and other caste Hindus. A total of 171 communities were included in the sample. Within the 171 sample neighborhoods, every resident (regardless of sex) between the ages of 15 and 59 and their spouses were asked to participate in the research. The response rate was over 97% and the total sample was 5,271 individuals, of which 2,663 were women. For this study the sample will include all married women of reproductive age (between 15 and 49) in the overall sample (n=1,761).

The Chitwan Valley Family Study consists of many different data collection efforts, involving more than 10 different survey instruments and including thousands of variables. For the purposes of this analysis, data from four different instruments were used. The first of these is a household level survey called the 1996 Agriculture and Consumption Survey. This survey yielded information on different household natural resource activities such as the collection of fuelwood, water, and fodder, and different livestock and cultivation activities.

A second source of information comes from the 1996 Individual Baseline Survey, which was administered to every individual survey participant. The baseline survey includes information on family relationships, living arrangements, educational attainment, parity, and marriage. A third instrument, the personal Life History Calendar, collects retrospective information related to the timing of major life events, including education, marriage, childbirth, and use of family planning occurring prior to the 1996 baseline surveys. A fourth instrument, the monthly Family Planning Data Sheet and Household Registry, has been administered to each woman in the sample on a monthly basis since the 1996 baseline sample. This monthly update is the source of data on contraceptive behavior of individual women from 1996 up to 2003.

Each respondent was interviewed in Nepali by a trained interviewer of the same sex. All interviews, except the monthly family planning updates, were conducted in 1996. Since 1996 each woman in the sample was subsequently followed monthly for updates in her contraceptive use and pregnancy status using the Family Planning Data Sheet. Even women who subsequently moved out of the

study area were kept in the study and were followed up monthly where possible. Interviewers recorded all responses to the baseline questionnaires and monthly contraceptive use updates on paper and pencil. The data from these paper and pencil surveys were then entered into a database separately by two different analysts. Discrepancies were reconciled before the data file was considered complete.

## **Measurement**

For the purposes of this study, contraceptive adoption was defined as a transition from a state of nonuse to a state of use of a contraceptive method. The monthly risk of contraceptive adoption among nonusers was examined separately by method and for the adoption of any method, the adoption of non-permanent and permanent methods, and the adoption of supply and non-supply methods, as sample size allowed. When examining contraceptive adoption by method, all adoptions of other methods were treated as censored. Episodes of nonuse were constructed from 1996 onwards and left-censored episodes were excluded from the analysis. Episodes containing missing contraceptive information were also excluded from the analysis. Women who were sterilized exited the analysis and never reentered since they were no longer at risk for adoption. Women were also excluded from the analysis during pregnancy and reentered the analysis immediately upon the end of pregnancy.

Contraceptive discontinuation was defined as the transition from a state of use of any method to a state of nonuse of any method for any reason (including

pregnancy). Voluntary discontinuation refers to discontinuation for any reason other than method failure. A method failure was considered to occur when discontinuation resulted from pregnancy. The monthly risk of users of temporary methods discontinuing the use of contraception was examined in this study. Interruptions in use of 1 month or greater were considered to be a discontinuation. In addition to all method discontinuation rates, discontinuation was also disaggregated by most recent method used prior to the abandonment of contraceptive use. Episodes of use were constructed from 1996 onwards and missing and left-censored episodes were dropped.

A measure of natural resource responsibility was constructed as a part of this research. Natural resource responsibility has two dimensions. The first of these is participation in agriculture, and the second is engagement in the collection of natural resources such as fuelwood, water, and fodder. A complete definition of natural resource responsibilities can be found in Table 3-1.

In the Western Chitwan Valley of Nepal, as in many other rural agrarian settings, one of the best indicators of socioeconomic status (SES) is land ownership. This is because, with almost 95% of Nepal's labor force engaged in agriculture, land is an important measure of production, and thus, wealth. Land ownership in the Western Chitwan Valley is measured as a series of three dichotomous variables representing the ownership of any of three types of land. The first is the ownership of any khet, or wet, land. This type of land is low-lying and the most valuable for production because it can support 2 rice crops per year without irrigation. The second type of land is bari, or dry uplands. This type of land requires irrigation in

order to support a rice crop and often supports other crops, such as millet and maize. The third type of land is house plots. These small land parcels cannot support a large crop but can be used for small kitchen and truck gardens or to support a small business. The ownership of these three types of land have been found to correlate well with more traditional consumption based indicators of SES (such as consumer durables, electricity and toilet facilities) in the Western Chitwan Valley. Land ownership has furthermore been found to provide a more direct wealth measurement than consumption measures such as asset indices, which in rural settings tend to be less reliable (22).

### **Statistical Approach**

Data were analyzed using STATA 8.0 S.E. statistical computing software. All models are estimated using multilevel discrete time hazard models. Hazard models, also called survival or duration models, or event history analyses, are appropriate for use in this context because both contraceptive adoption and contraceptive discontinuation represent transitions in state (2, 13, 34). Because there were women who did not change state during the length of data collection, observations are censored, making traditional regression analyses biased and inefficient. Because information on contraceptive use is collected at discrete time intervals (monthly) rather than continuously, discrete time hazard models are appropriate. Multilevel models are estimated because the data structure is inherently multilevel, with the unit of analysis being an episode of use or nonuse of contraception, experienced by an individual woman living in a sample neighborhood, making it necessary to

account for random error at these multiple levels. In STATA, models were fitted using the SVYLOGIT command, modeling the hazard as a logit function and with neighborhoods as the primary sampling unit. Time is included in the model as both a period effect (month 1-72 of data collection) as well as representing the length of a single continuous episode of contraceptive use or nonuse in months. Adjusting for episode length is important since it allows us to account for changes in the hazard over the interval. For example, most studies find that the hazard of discontinuing contraception decreases the longer a woman uses family planning (35-38)

This study examined the effect of season and natural resource responsibility on contraceptive adoption and discontinuation. In order to assess this effect, all natural resource responsibility variables were examined independently and selected variables were examined as interaction terms with season. Interactions to be evaluated were selected on the basis of theory and to test specific hypotheses. For example, women who participate in agriculture may be particularly tied to home during the rice planting and harvesting times in the monsoon months. Therefore, these women may be particularly prone to prefer winter to monsoon for adopting a contraceptive method and may be more likely to discontinue using a temporary method during the busy monsoon months. Average predicted probabilities were used to determine the degree to which interaction terms modify the main effect of season and natural resource responsibility on contraceptive adoption and discontinuation. Because true statistical significance of interaction terms is difficult to assess in a logistic model (used to fit the hazard model), interaction terms in this study were evaluated through a Wald test for joint significance with the individual

variables that make up the interaction. Other independent variables were included in the model as controls. Control variables included age, education, parity, SES/land ownership, and caste/ethnic group. For a complete description of model variables see Table 3-1.

## **Results**

In the 72 months of the study period, there were 1,347 eligible episodes of nonuse contributed by 1,355 women, and 618 eligible episodes of temporary method use contributed by 427 individual women. In order to be at risk for adoption in this sample, one must have discontinued contraceptive use or been pregnant during the study period (first time adopters who have never been pregnant would have a left censored episode of nonuse and be dropped from the sample). In order to be at risk for discontinuation a woman must have adopted a method other than sterilization during the 72-month period. Women who continuously used contraception through the 72-month period would have had a single left-censored episode and would have been dropped. Women who never used contraception and those who were sterilized were also considered to be not at risk of discontinuing and were therefore excluded from the analysis. All told, in the study period there were 781 eligible adoptions and 422 eligible discontinuations. Adoptions during this period consisted predominantly of Depo Provera (41%) followed by oral contraceptive pills (22%), sterilization (18%), and condoms (18%). Similarly, discontinuations were predominantly of Depo Provera (49%), followed by the pill (26%), and condoms (22%).

As has been documented in other study settings, both adoption and discontinuation were more likely early in an episode, with the percent adopting and discontinuing dropping off sharply and finally leveling off. A look at discontinuation rates during the study shows a similar pattern for all method discontinuation. The 12-month voluntary discontinuation rate averaged at 73.7% for all modern methods (see Table 3-2). These rates are high when compared to similar rates calculated using demographic and health survey calendar methods, which range from 19 to 65% (36). The all-method failure rate in this study was 3.3%, which, while on the low end, is comparable to that found in other countries including, Bangladesh, Indonesia, and Zimbabwe (39). The 12-month all-method adoption rate was relatively high at 51.5% (see Table 3-3).

### **Adoption**

Model coefficients and standard errors from the multilevel discrete-time event history analysis of contraceptive adoption (excluding interaction terms) are presented in Table 3-4. As hypothesized, season played a role in the timing of contraceptive adoption in the Western Chitwan Valley of Nepal, where women were much less likely to adopt any method during the monsoon months. As expected, seasonality in adoption was particularly pronounced for sterilization, which was less likely to be adopted in the summer or monsoon than in the winter. However, season was not a consistently significant factor in the timing of temporary method adoption. Women were significantly less likely to adopt oral contraceptive pills during the

monsoon months, but the timing of Depo Provera and condom adoption seemed unaffected by season, at least by itself.

Natural resource responsibilities by themselves did not seem to have a major role in predicting the probability that a woman will adopt any method of contraception, although women who spent moderate amounts of time collecting water (an average of 2-5 minutes/woman) were less likely to adopt a method. Natural resource responsibility seemed to have a greater effect on method choice, with women who spent greater amounts of time collecting fuelwood, fodder, and water being significantly less likely to adopt the pill.

As far as explaining the seasonal patterns observed for contraceptive adoption, there were some small but significant interactions between natural resource responsibility and season to suggest that the seasonal pattern of adoption was much stronger or weaker among those with greater resource responsibilities. An example of these interactions is shown graphically in Figure 3-2. These interactions suggested that women who lived in farming households were slightly less likely than other women to adopt any method of contraception in the monsoon (see Figure 3-2a), and that women who spent 5 minutes or more on average collecting water were marginally less likely than others to be sterilized in the monsoon months (not shown).

In addition to season and natural resource responsibility, travel time to clinic was examined as a factor that could influence the overall and seasonal likelihood of contraceptive adoption. Women who lived more than 30 minutes from a clinic were less likely to adopt any method of contraception, and in particular, less likely to adopt

Depo Provera. There were, however, no significant interactions between season and physical accessibility of services to suggest that women who must travel longer to obtain family planning were significantly more affected by season.

As expected, demographic factors, namely age and parity had a significant, consistent effect, with older women and women with moderate numbers of living children being significantly more likely to adopt any and all methods. Education, surprisingly, showed little effect on the probability of adopting any method, although women in the highest education group, with a school leaving certificate or higher, are more likely than women with no formal education to adopt condoms. Education was not a significant factor even in bivariate analyses, as the proportion of those in each education group among those who ever adopted contraception matching the proportions in each group in the overall sample. As was expected, however, ethnicity had a strong influence in this region on the overall probability of contraceptive adoption and the probability of adopting a specific method. For example, low caste Hindus were more likely than higher caste Hindus to adopt any method of contraception, but this result was driven by a greater likelihood among low caste Hindus to adopt oral contraceptive pills and Depo Provera. Both groups are equally likely to adopt condoms and sterilization.

### **Discontinuation**

Model results for contraceptive discontinuation are summarized in Table 3-5. Season was an important factor in predicting method discontinuation as well as method adoption. Women were much more likely to discontinue using contraception

during the monsoon months. Natural resource responsibility was not an extremely strong predictor of method discontinuation, although there is some evidence that women who spent moderate to large amounts of time collecting fuelwood and water were actually less likely to discontinue using contraception. No strong evidence was found that season and natural resource responsibility interacts such that those with greater natural resource responsibility showed a greater or less seasonal relationship with the likelihood of method continuation. However, a marginally significant interaction was found between the monsoon season and farming households, such that women who lived in non-farming households showing a greater propensity than those in farming households to discontinue during the non-monsoon than the monsoon (see Figure 3-2b).

Finally, in addition to season and natural resource responsibility, travel time to the nearest family planning provider was examined as a factor influencing contraceptive discontinuation. Women with a greater than 30 minute travel time to the nearest family planning provider showed a significantly increased likelihood of discontinuation. However, there was no evidence of any interaction between season and travel time to services.

Demographic factors do not seem as important for predicting discontinuation as for predicting contraceptive adoption. Age was unimportant, and with increasing parity this research finds that, although women are more likely to adopt contraception, they are also more likely to discontinue using temporary methods. This effect does not seem to be explained by a switch to sterilization. While 73 discontinuations were followed by an adoption of sterilization, only 1 of these

switches was among the highest parity group. Education is largely not significant, although women with a school leaving certificate or higher are much less likely than women with no formal education to discontinue using a temporary method. We find that women whose last method was the pill or condoms are much more likely to discontinue than a woman who last used Depo Provera.

## **Discussion**

The aim of this research was to determine if and how season plays a role in the timing of contraceptive adoption and discontinuation. Previous studies had found some evidence of a peak in sterilization (39) and, to a lesser extent, other methods (14) during the winter in South Central Nepal. This study also finds evidence of this seasonal pattern in adoption of sterilization, and also finds that the adoption of oral contraceptive pills is significantly less likely in the monsoon months of June-September. However, after further investigation into the relationship between season and contraceptive behavior, this research found the discontinuation of temporary methods also showed evidence of seasonality, with discontinuation significantly more likely to occur in the monsoon months.

Given the seasonal pattern that exists for the discontinuation of temporary methods and the seasonality found for the adoption of pills as well as for the adoption of sterilization, the hypothesis that seasonal patterns of contraceptive (sterilization) adoption is due to the presence during the winter months of mobile sterilization units(13) is insufficient to explain the full range of seasonal contraceptive behavior found in the Western Chitwan Valley. As suggested by the Stash and

Thapa studies, the presence of mobile sterilization units together with the cultural preference expressed in semi structured interviews to avoid surgery during the monsoon as a preventative to infection may help to explain the especially strong seasonality in the adoption of sterilization, which is much less likely in both the summer and the monsoon than in the winter. However, these hypotheses do little to explain seasonality in the adoption of other methods, or the increased likelihood of method discontinuation during the monsoon months.

A second possible explanation for a decrease in adoption and an increase in discontinuation of contraception during the monsoon months is that the monsoon rains make travel to clinics more difficult, thus increasing the probability that women will delay adoption and lapse in current use of a temporary method (13). Travel time to the nearest family planning provider is significantly related to the overall likelihood of adoption of any method (and particularly of Depo Provera) and to the likelihood of discontinuing any non-permanent method. However, travel time to the nearest facility does not seem to act as a modifier of the season-adoption or season-discontinuation relationship.

A third possible explanation of the seasonal pattern in contraceptive adoption and discontinuation that has been suggested in the literature and emerged also from past qualitative work is that women are less likely to adopt or continue using contraception during times of increased household responsibility, such as during the planting and harvest of rice (13, 14). Women cited a fear of side effects (and recovery time in the case of female sterilization) that would compromise their ability to fulfill their household responsibilities as well as the lack of time to seek services

(13, 14). While some weak evidence that resource collection time had some influence on the overall likelihood of adopting contraception and more particularly on method choice (those with greater responsibility are less likely to adopt the pill), overall these effects were small. Furthermore, a variety of marginally significant interactions were found which suggest that overall, women with greater responsibilities were marginally less likely than other women to adopt contraception in the monsoon and those in farming households were a bit less likely to discontinue during non-monsoon rather than monsoon months than other women.

While the interactions between natural resource responsibility and seasonal patterns of contraceptive behavior were small and weak in this study, the hypothesis that seasonal workloads influence the probability of adopting or discontinuing contraception cannot be completely dismissed and is worthy of further investigation with more refined measures. The data used in this study had only a household level measure of the amount of time women spent collecting fuelwood, fodder, and water. This measure did not assess seasonal variation in these tasks, nor did it specify how individual women in the household delegated these tasks among themselves. It was, therefore, necessary to assume an equal distribution of labor and create an average collection time for each woman in the household. Furthermore, the most seasonal of household responsibilities is likely to be participation in important agricultural events such as planting and harvesting rice. However, the only measure of women's participation in agriculture in the data set was a measure of whether her household engaged in any farming. There was not much variation in this measure as the vast majority of households engage in some type of farming. Also problematic, this

measure did not capture individual women's participation in agriculture, seasonal variation in women's participation in agriculture, or what types of agriculture families engaged in. This last could have a substantial influence on seasonal workloads, as there are different crops requiring different labor intensities for different seasons. Once again, it was necessary to assume that women whose households were engaged in agriculture and who reported the greatest average collection times were also the women with the greatest seasonal variation in workload. Further research that captures women's individual workloads, by season, would be more useful for understanding the relationship between seasonal contraceptive behavior and natural resource responsibilities.

It is ultimately important to understand that there is a seasonal pattern in contraceptive behavior because a season of low adoption and high discontinuation represents a seasonal barrier to the successful, effective use of family planning by women in the Western Chitwan Valley and in other areas where seasonal contraceptive behavior may not have yet been recognized. This barrier could create a window of time when a woman risks an unintended pregnancy while waiting for a more convenient time to adopt or resume contraceptive use. Better understanding why this seasonality occurs may help family planning providers to better help couples in overcoming this barrier to effective contraceptive use in rural, agrarian settings.

Figure 3-1. Map of Study Area

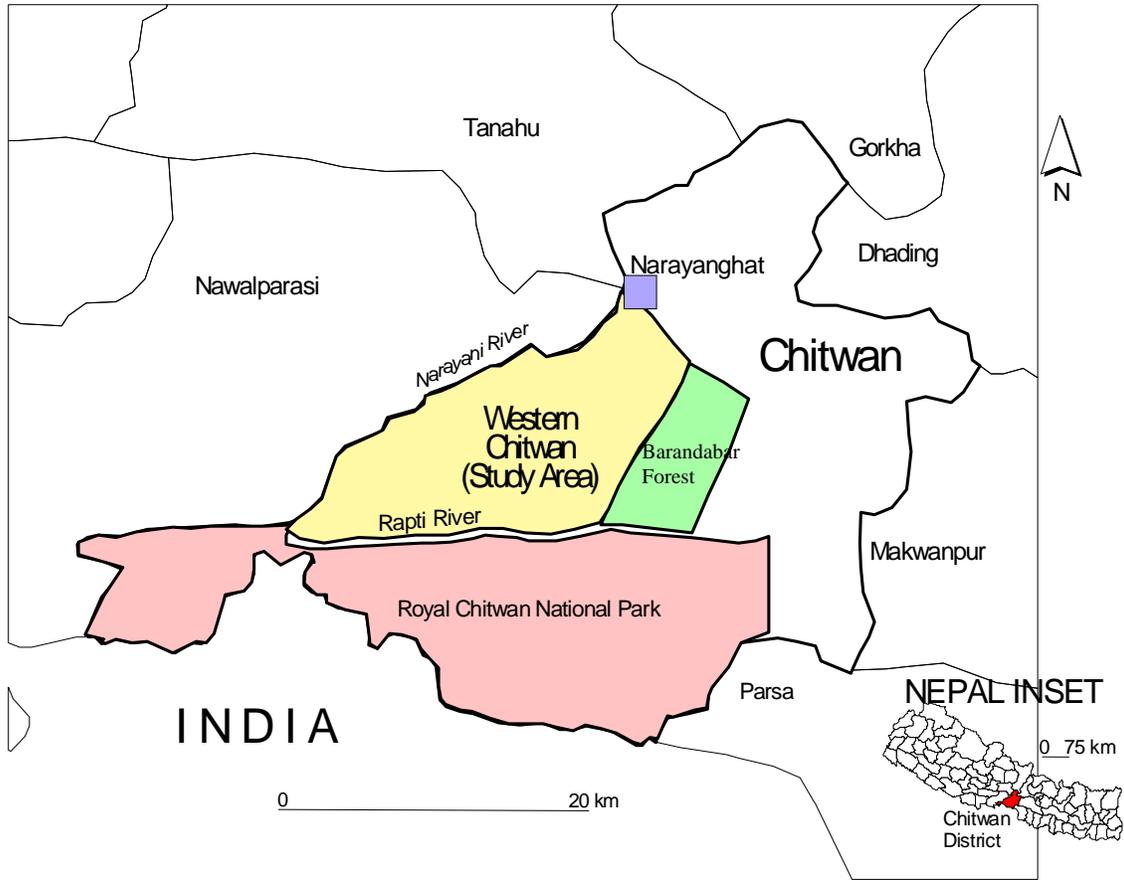


Table 3-1. Model Variable Descriptions

<b>Variable</b>	<b>Description</b>
<b>Physical Accessibility</b>	
Travel time to nearest clinic	Travel time on foot to nearest clinic (classified as <15 min, 15-30 min, 30+ min)
<b>Natural Resource Responsibility</b>	
Farming	Household engages in agriculture
Fodder	Time spent by women in the household collecting fodder for livestock in hours (categorized as less than 1 hr, 1 to 2 hrs, 2+hrs)
Water	Time spent by women in the household collecting water in minutes (categorized as water onsite, or less than 1-5 min, 5+min)
Firewood	Time spent by women in the household collecting fuelwood in hours (categorized as less than 2 hrs, 2 to 4 hrs, 4+hrs)
<b>Season</b>	
monsoon	Months June-September
summer	Months March-May
winter	Months October-February
<b>Other Explanatory Variables</b>	
<b>Demographic Characteristics</b>	
age (time varying covariate)	Age of a woman (classified as under 20, 20-29, 30-39, or 40-49)
education	Highest educational level obtained by a woman (classified as none, some primary, some secondary, or S.L.C. or higher)
number of living children (time varying covariate)	The number of living children to whom a woman has given birth
caste/ethnic group	Caste or ethnicity of a woman (classified as low class hindu, high class hindu, hill tibetan burmese, terai tibetan, and newars)
<b>Land Ownership (SES)</b>	
own khet land	A household owns khet (wet) farmland
own bari land	A household owns bari (dry) farmland
own houseplot	A household owns their own houseplot
<b>Last Method Used (for Discontinuation only)</b>	
Pills	Last method used before discontinuation was pill
Condoms	Last method used before discontinuation was condoms
Depo Provera	Last method used before discontinuation was Depo Provera

**Table 3-2.** 12-month life table method discontinuation, failure, and voluntary discontinuation rates by method

<i>Rates</i>	<i>%</i>
Total Discontinuation rate	76.9
Failure rates	
All methods	3.3
Condom	6.9
Depo Provera	5.1
Oral contraceptive pill	2.5
Voluntary Discontinuation rates	
All methods	73.7
Condom	78.6
Oral contraceptive pill	69.8
Depo Provera	72.7

**Table 3-3.** 3- 6- and 12-month life table modern method adoption rates by method

<i>Rates</i>	<i>3 months</i>	<i>6 months</i>	<i>12 months</i>
All methods	6.6	19.9	51.5
Pills	1.5	3.6	10.8
Depo Provera	2.2	8.4	21.9
Condoms	1.7	4.6	11.1
Sterilization	1.3	3.3	7.8

**Table 3-4.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive

<i>Variable</i>	<i>Pills</i>		<i>Condoms</i>		<i>Depo Provera</i>		<i>Sterilization</i>		<i>Any Method</i>	
<i>Physical Accessibility</i>										
Clinic 0-14 minutes by foot (ref)										
Clinic 15-29 minutes by foot	0.60*	(0.25)	-0.15	(0.50)	-0.11	(0.20)	-0.32	(0.31)	-0.01	(0.12)
Clinic 30 or more minutes by foot	-0.33	(0.47)	-0.30	(0.43)	-0.55*	(0.28)	-0.06	(0.36)	-0.36*	(0.12)
<i>Natural Resource Responsibility</i>										
<i>Farming</i>										
Fodder <1hr (ref)										
Fodder 1-2hrs	-0.45	(0.33)	0.10	(0.36)	0.34	(0.22)	0.13	(0.28)	0.11	(0.16)
Fodder 2 plus hrs	-0.42	(0.51)	0.75	(0.75)	-0.45	(0.56)	0.10	(0.47)	-0.30	(0.25)
<i>Fuelwood &lt;1 hr (ref)</i>										
Fuelwood 1-4 hrs	-0.50*	(0.23)	-0.07	(0.35)	0.12	(0.19)	0.37	(0.37)	-0.04	(-0.10)
Fuelwood 4plus hrs	-0.80*	(0.36)	0.35	(0.46)	0.29	(0.24)	0.46	(0.43)	-0.12	(-0.15)
<i>Water onsite (0 minutes) (ref)</i>										
Water 1-4 minutes	-0.48	(0.24)	-0.18	(0.33)	-0.33	(0.18)	-0.10	(0.23)	-0.20*	(0.11)
Water 5 or more minutes	-0.58*	(0.33)	-0.13	(0.61)	0.13	(0.18)	-0.40	(0.35)	-0.14	(0.15)
<i>Season</i>										
<i>Winter (ref)</i>										
Summer	0.08	(0.22)	0.35	(0.30)	-0.17	(0.17)	-1.47***	(0.42)	-0.34**	(0.13)
Monsoon	-0.38*	(0.20)	-0.14	(0.22)	-0.06	(0.14)	-0.92**	(0.31)	-0.23**	(0.10)
<i>Other Explanatory Variables</i>										
<i>Demographic Characteristics</i>										
<i>Under 20 years old (ref)</i>										
20-29 years	0.21	(0.54)	0.47	(0.59)	0.64*	(0.31)	1.01	(0.76)	0.61**	(0.23)
30-39 years	0.70	(0.62)	1.21	(0.64)	0.59	(0.37)	0.44	(0.88)	0.71**	(0.28)
40-49 years	1.03	(0.73)	-0.73	(0.75)	-0.46	(0.61)	-1.13	(1.38)	-0.21	(0.37)
<i>No education (ref)</i>										

Some or completed Primary	0.04	(0.40)	-0.19	(0.41)	-0.19	(0.23)	0.34	(0.35)	-0.17	(0.12)
Some or completed Secondary	0.59	(0.39)	-0.03	(0.47)	-0.10	(0.20)	-0.18	(0.34)	-0.06	(0.14)
S.L. C. or Higher	0.25	(0.39)	0.79*	(0.34)	0.09	(0.24)	-0.48	(0.37)	0.24	(0.18)
No living children (ref)										
1 child	0.39	(0.42)	0.16	(0.34)	0.11	(0.18)	0.59	(0.43)	0.06	(0.14)
2-5 children	1.17**	(0.36)	0.08	(0.34)	0.02	(0.20)	1.23***	(0.38)	0.40*	(0.14)
5 or more children	0.58	(0.67)	0.29	(0.65)	0.11	(0.33)	1.33*	(0.66)	0.26	(0.24)
High caste Hindu (ref)										
Low caste Hindu	1.41**	(0.37)	-0.93	(0.77)	0.54**	(0.22)	-0.22	(0.37)	0.39*	(0.16)
Hill Tibetan Burmese	1.19**	(0.28)	-1.81*	(0.60)	0.10	(0.21)	-0.80*	(0.35)	0.05	(0.14)
Terai Tibetan	-0.23	(0.41)	-0.77	(0.51)	-0.15	(0.24)	-0.07	(0.34)	-0.23	(0.16)
Newar	0.28	(0.42)	-1.55*	(0.68)	0.23	(0.24)	0.15	(0.55)	-0.11	(0.18)
Land Ownership (SES)										
own khet land	0.21	(0.23)	-0.25	(0.37)	-0.41*	(0.17)	-0.22	(0.32)	-0.14	(0.11)
own bari land	-0.00	(0.30)	-0.14	(0.39)	-0.38*	(0.16)	0.15	(0.32)	-0.11	(0.11)
own houseplot	-0.51	(0.31)	-1.02*	(0.52)	-0.35	(0.23)	-0.57	(0.31)	-0.58***	(0.15)
Constant	-6.30***	(0.82)	-3.90***	(1.06)	-4.18***	(0.55)	-5.65***	(1.02)	-3.31**	(0.39)
Study Month (1-72)	0.01	(0.02)	0.01	(0.02)	0.01	(0.01)	-0.01	(0.02)	0.00	(0.01)
Study Month squared (1-72)	-0.01	(0.00)	-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)	-0.00	(0.00)
Duration	-0.00**	(0.01)	-0.03	(0.01)	-0.01**	(0.00)	0.01*	(0.01)	-0.00*	(0.00)
Duration squared	-0.00**	(0.00)	-0.00*	(0.00)	-0.00**	(0.00)	-0.00**	(0.00)	-0.00***	(0.00)

(ref) reference category --not applicable

\* Significant at  $p < 0.05$  \*\* Significant at  $p < 0.01$

**Table 3-5.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive discontinuation

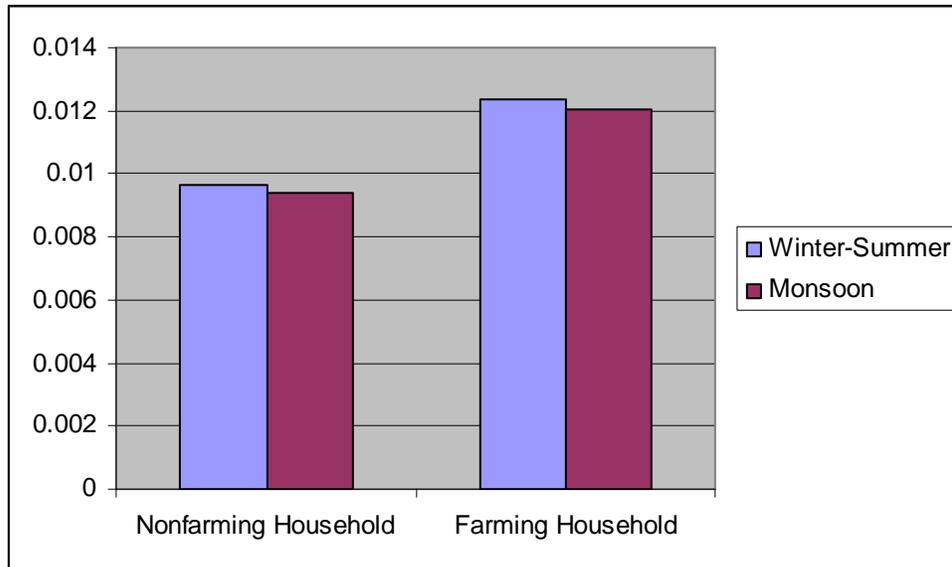
<i>Variable</i>		
<b>Physical Accessibility</b>		
Clinic 0-14 minutes by foot (ref)		
Clinic 15-29 minutes by foot	0.15	(0.14)
Clinic 30 or more minutes by foot	0.30*	(0.14)
<b>Natural Resource Responsibility</b>		
<b>Farming</b>		
Fodder <1hr (ref)		
Fodder 1-2hrs	-0.01	(0.21)
Fodder 2 plus hrs	0.08	(0.15)
<b>Fuelwood &lt;1 hr (ref)</b>		
Fuelwood 1-4 hrs	-0.28	(0.16)
Fuelwood 4plus hrs	-0.24	(0.16)
<b>Water onsite (0 minutes) (ref)</b>		
Water 1-4 minutes	-0.30*	(0.13)
Water 5 or more minutes	-0.09	(0.13)
<b>Season</b>		
Winter (ref)		
Summer	0.03	(0.14)
Monsoon	0.27*	(0.11)
<b>Other Explanatory Variables</b>		
<b>Demographic Characteristics</b>		
<b>Under 20 years old (ref)</b>		
20-29 years	0.01	(0.30)
30-39 years	-0.31	(0.34)
40-49 years	-0.58	(0.41)
<b>No education (ref)</b>		
Some or completed Primary	0.22	(0.17)
Some or completed Secondary	0.31	(0.18)
S.L. C. or Higher	-0.57**	(0.17)
<b>No living children (ref)</b>		
1 child	0.12	(0.17)
2-5 children	0.29	(0.17)
5 or more children	0.67**	(0.27)
<b>High caste Hindu ( ref)</b>		
Low caste Hindu	0.04	(0.16)
Hill Tibetan Burmese	-0.08	(0.15)
Terai Tibetan	0.10	(0.18)
Newar	0.12	(0.21)
<b>Land Ownership (SES)</b>		
own khet land	0.08	(0.12)
own bari land	0.01	(0.12)
own houseplot	0.10	(0.15)
Constant	-2.19	(0.37)

Study Month (1-72)	-0.00	(0.01)
Study Month squared (1-72)	0.00	(0.00)
Duration	0.00	(0.01)
Duration squared	-0.00**	(0.00)
Last Method Used		
Depo Provera (ref)		
Oral Contraceptive Pills	0.26*	(0.11)
Condoms	0.65**	(0.12)

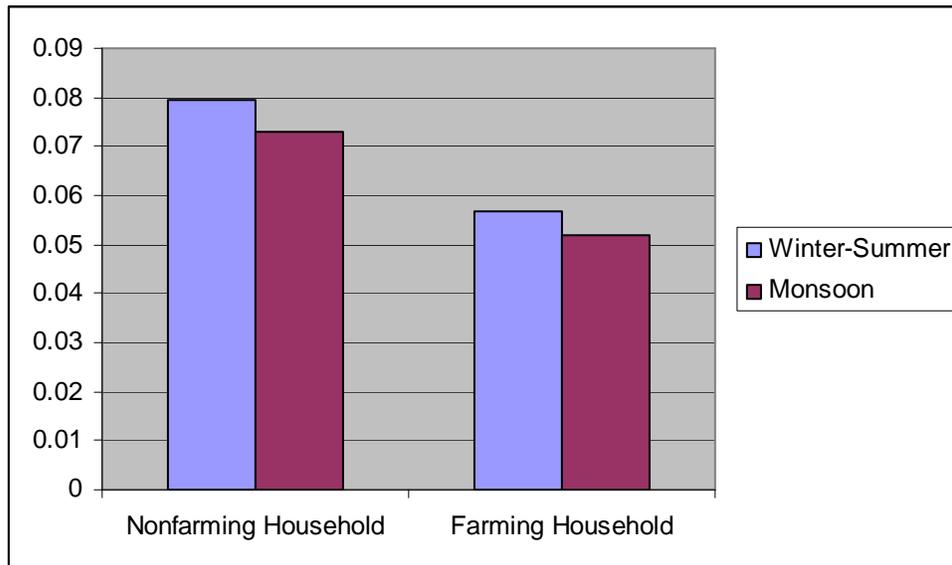
(ref) reference category    --not applicable  
\* Significant at p<0.05    \*\* Significant at p<0.01

**Figure 3-2.** The predicted probabilities of a) adopting any method of contraception and b) of discontinuing a temporary method as a function of both season and natural resource responsibility

**a)**



**b)**



## CHAPTER 4

### THE EFFECTS OF ACCESSIBLE FAMILY PLANNING SERVICES, WOMEN'S STATUS, AND NATURAL RESOURCE RESPONSIBILITY ON CONTRACEPTIVE BEHAVIOR

#### **Abstract**

This paper uses discrete-time multilevel hazard models to explore the effects of natural resource responsibility, women's status, and family planning service accessibility on contraceptive adoption and discontinuation between 1997 and 2003 in the Western Chitwan Valley of Nepal. Data from the Chitwan Valley Family Study, containing a sample of 1,761 women of reproductive age, were used for this analysis. Women in this study were found to be more likely to adopt pills the greater the perceived method choice at the nearest family planning facility. Women were less likely to discontinue the more days per week the nearest facility was open and more likely to discontinue if they lived greater than 30 minutes by foot from the nearest facility. There is little evidence to suggest that contraceptive behavior was greatly altered among women with greater natural resource responsibilities or lower status, although more sensitive and specific measures of seasonal responsibility and women's status would be desirable for better assessing this relationship. This study contributes to the literature by looking beyond family planning services to examine the effects of women's status and natural resource responsibility on contraceptive behavior.

## **Introduction**

Changes in fertility and contraceptive use from the latter half of the 20<sup>th</sup> century to the turn of the millennium have been characterized as a global “reproductive revolution”. This revolution has been marked by dramatic declines in fertility rates around the world and equally remarkable concurrent increases in the use of contraception. Rapid increases in contraceptive use are still in progress or even just beginning in some regions of the world, such as Sub-Saharan Africa and parts of South Asia. However, in every nation where the “reproductive revolution” has begun, contraceptive rates have eventually either leveled off at high rates or continued to quickly rise (14).

Despite these global trends in increasing contraceptive prevalence at the population level, at the individual level contraceptive use is extremely dynamic. A woman may adopt a method, switch methods, discontinue using altogether, or experience method failure many times over the course of her reproductive years. This dynamic nature of contraceptive use helps to explain why there is a high rate of unintended pregnancy even in populations where the contraceptive prevalence rate is extremely high. Understanding the factors that explain the dynamics of individual level contraceptive behavior is crucial to the design of successful interventions which promote the adoption and continued effective use of contraception among women who wish to limit or space births.

Empirical research on the subject of contraceptive use dynamics has been largely guided by an influential conceptual model presented by Arundh Jain (13).

This framework suggests that the quality of accessible family planning services together with “other” sociodemographic factors influence the likelihood that a woman will adopt and then continue using contraception. Research guided by this framework has found some significant effects of family planning services, particularly physical accessibility and method availability, on the likelihood of adoption and discontinuation. Many studies find, however, that there is still a great deal of unexplained variability in rates of adoption and discontinuation, even after also controlling for critical sociodemographic factors with known effects on contraceptive use and fertility, such as age, parity, ethnicity, and socioeconomic status (30, 36, 38, 49, 50). The goal of this research is to explore the effects of “other” potential factors that might explain the likelihood of adopting and discontinuing contraception, as well as the ability of family planning services to ameliorate or exacerbate these effects. The specific factors we have chosen to explore in depth are women’s status and women’s natural resource related responsibilities.

Women’s status has emerged in a number of studies as an important factor in health and health seeking behavior and other both individual and household level decision-making behavior by women, both for themselves and for their children (27, 35, 39, 51-55). This is especially true in many parts of South Asia, where women’s status and empowerment can vary widely and can affect women’s use of a range of Maternal and Child Health services including prenatal care and childhood immunization clinics. While no studies have explicitly examined the role of women’s status on the likelihood of contraceptive

discontinuation, some relevant factors associated with women's status, such as spousal communication and education, have been examined in some settings. For example, one study from Java found that women are less likely to discontinue contraception when their husbands knew about and approved of her contraceptive use (7). Also, several other studies have failed to find a relationship between education and contraceptive discontinuation and failure (8, 53, 56). The key lesson from these studies is that women's status is a complicated concept with many dimensions, some of which may be important in predicting contraceptive behavior while others are not. This multidimensionality leads to questions of how exactly does women's status affect the likelihood of adoption and discontinuation, and which domains of women's status are most likely to affect adoption and discontinuation. Furthermore, from a programmatic perspective it is interesting to ask whether low status women with ready access to family planning services are more likely to adopt than those with less accessible family planning services. These questions can only be addressed through a specific investigation into the role of women's status on contraceptive behavior.

It has long been known that women's employment outside the home, often presented as a dimension of women's status, can have dramatic impacts on her likelihood to use contraception. However, newly emerging literature suggests that her specific responsibilities inside the home can also have important impacts on her health and health seeking behavior. Women can spend varying lengths of time on a number of critical household tasks including the collection of fuelwood,

fodder, and water, and involvement with agriculture. These responsibilities can be slight or heavy depending on the local or market availability of water and natural resources, and on whether the woman is expected to engage in resource-gathering responsibilities. Previous research in a variety of lesser developed country settings has indicated that women who engage in or who spend more time performing these necessary natural resource responsibilities are less likely to have ever used or be currently using contraception, or to have used prenatal care during their most recent pregnancy (2, 35, 38, 42, 57, 58). However, the question remains whether these women are less likely to be using contraception because they are less likely to adopt it in the first place or because they are more likely to quickly discontinue using contraception (4). It is also possible that the lower rates are due to both lower rates of adoption and higher rates of discontinuation. Qualitative research undertaken in a rural setting in Nepal has suggested that women actively weigh the urgency and degree of their natural resource related activities against the potential benefits of limiting or spacing births, with consideration for the potential loss of their labor as a result of seeking care or suffering from method-related side effects (59). These findings suggest that women's natural resource responsibilities could influence not only their likelihood of adoption or discontinuation but also their choice of method, should they adopt, if they perceive a particular method to have fewer side effects or be less burdensome to maintain in terms of supply.

This research investigates the role of women's status and natural resource responsibilities on the likelihood of contraceptive adoption and discontinuation,

as well as to assess the possibility that the accessibility of family planning services may have a modifying effect on this relationship. In order to pursue this investigation, data from the Chitwan Valley Family Study, an ongoing data collection effort in South Central Nepal have been utilized. This dataset provides a unique opportunity to assess multilevel factors influencing contraceptive use dynamics, as it includes information on tasks performed by women in the household, family structure, and characteristics of the individual, household, and neighborhood, including family planning services. Prospective monthly contraceptive use histories were collected for 1,761 women over a 72-month period, allowing for the use of multilevel discrete time event history models to determine the monthly hazard of adopting or discontinuing contraceptive use. The advantage of using prospective data to address these research questions is that such data are less prone to recall bias since they are collected monthly. Further, the attrition rate for this study is very small when compared to other data sources, such as the DHS panel studies in Morocco and Egypt (13, 60).

Nepal's Western Chitwan Valley is an especially interesting place in which to study contraceptive use behavior. The rugged terrain and poor infrastructure in Nepal have contributed to a high urban vs. rural differential in family planning outcomes and a high dependence on local services (37). Total fertility rates in the country average 5 children per woman while wanted fertility is closer to 2 to 3 children per woman (36). Overall contraceptive use remains low, with less than a third of sexually active women currently using a modern method. It is important to recognize that total fertility rates in Nepal have begun to decline slightly over the

past two decades, and a recent study attributes most of the recent decline in marital fertility to an increase in the proportion of the population that is sterilized (11). Female sterilization remains the most popular method of contraception in the country (11).

The Western Chitwan Valley, though largely rural, has a high density of services relative to many parts of the country, perhaps due to its role as a national transportation hub, its fairly recent and planned settlement history, and its relatively flat terrain. There are 113 permanent health facilities in the study area, and mobile sterilization units often move through the district (61). Although fertility and contraceptive prevalence in the Chitwan as a whole are similar to national averages (11), the most popular form of contraception in the Western Chitwan Valley has been found to be male, as opposed to female, sterilization, with 27.3% of the population having ever relied upon vasectomies for birth control. This interesting result has been found elsewhere in the Chitwan District, with a JHPIEGO baseline assessment finding that 51% of the study population relied on male sterilization (62). While no explanation has been presented on the high rates of male sterilization in Chitwan vis a vis female sterilization, the barriers to women's contraceptive adoption and continuation explored in this study may have shifted greater responsibility for family planning to men. In the Western Chitwan Valley, the second most popular method is injectables with 11.1% of all adoptions. Injectables are followed in popularity by female sterilization (9.2%), oral contraceptives (8.9%), and condoms (6.1%). Other methods show negligible use.

Nepal and the Western Chitwan Valley are also ideal settings in which to investigate the role of women's status and natural resource related responsibilities on health behavior. Natural resource responsibilities are time consuming and tie women closely to home, especially during the height of the agricultural season. Women in southern Nepal spend approximately 9 hours of every day engaged in natural resource activities including water and forest product collection, livestock management, and crop production in November's millet season (11). Qualitative studies from the Western Chitwan Valley have found that women consider these responsibilities to weigh heavily in their decision to use contraception (63).

Nepal is also situated in an interesting region in which to study the effects of women's status on contraceptive behavior. South Asia has been the home of a preponderance of research on the role of gender in health behavior and outcomes. This is due to largely traditional societies with strict notions regarding gender norms and relationships between genders. These traditional norms have led to widespread social and health disparities between genders, and a strong son preference, all of which are likely to affect fertility behavior. Many studies from Nepal, and the Western Chitwan Valley itself, have demonstrated the role of many dimensions of women's status and autonomy in influencing a range of factors from parity, history of contraceptive use, to attitudes regarding contraceptive use (5, 13, 60). It does seem likely, therefore, that women's status may also affect contraceptive dynamics and method choice.

## **Methodology**

### **Study Setting**

Data were collected in the Western Chitwan Valley of south-central Nepal between 1996 and 2003. The Western Chitwan Valley covers an area of 100 square kilometers and is bordered to the south by Royal Chitwan National Park and to the east by Barandabar Forest (see Figure 4-1). A random sample of all communities within the Western Chitwan Valley was taken, with oversampling to ensure representation by each of the five major ethnic groups inhabiting the area: high caste Hindus, hill Tibeto-Burmese (such as Gurung, Tamang, and Magar), indigenous Terai Tibeto-Burmese (such as Tharu, Darai, and Kumal), Newar, and other caste Hindus. A total of 171 communities were included in the sample. Within the 171 sample neighborhoods, every resident (regardless of sex) between the ages of 15 and 59 and their spouses were asked to participate in the research. The response rate was over 97% and the total sample was 5,271 individuals, of which 2,663 were women. For this study the sample includes all married women of reproductive age (between 15 and 49) in the overall sample (n=1,761).

The Chitwan Valley Family Study consists of many different data collection efforts, involving more than 10 different survey instruments and including thousands of variables. For the purposes of this analysis, data from five different instruments were used. The first of these was a household level survey called the 1996 Agriculture and Consumption Survey. This survey yielded information on different household natural resource activities such as the collection of fuelwood,

water, and fodder, and different livestock and cultivation activities.

A second source of information comes from the 1996 Individual Baseline Survey, which was administered to every individual survey participant. Data from the baseline survey include information on family relationships, living arrangements, educational attainment, parity, and marriage. The information from the Individual Baseline Survey is used to measure different dimensions of women's status. A third instrument, the personal Life History Calendar, collected retrospective information related to the timing of major life events, including education, marriage, childbirth, and use of family planning occurring prior to the 1996 baseline surveys. A fourth instrument, the monthly Family Planning Data Sheet and Household Registry, was administered to each woman in the sample on a monthly basis since the 1996 baseline sample and data collection is ongoing. This monthly update is the source of data on contraceptive behavior of individual women from 1996 up to 2003.

The fifth instrument from the Chitwan Valley Family Study that was used in this analysis is the 1996 Health Services Calendar. This was a clinic-based survey which records information for each source of contraception in the Western Chitwan Valley for the 42 years prior to the 1996 survey date. This information includes distance and travel time to sample neighborhoods, and numerous service accessibility variables including number and type of providers, methods offered, hours of operation, and cost of methods offered.

Each respondent, whether an individual, household head, or health clinic representative, was interviewed in Nepali by a trained interviewer of the same

sex. All interviews, except the monthly family planning updates, were conducted in 1996. Since 1996 each woman in the sample was subsequently followed monthly for updates in her contraceptive use and pregnancy status using the Family Planning Data Sheet. Even women who subsequently moved out of the study area were kept in the study and were followed up monthly where possible. Interviewers recorded all responses to the baseline questionnaires and monthly contraceptive use updates on paper and pencil. The data from these paper and pencil surveys were then entered into a database separately, by two different analysts. Discrepancies were reconciled before the data file was considered complete.

## **Measurement**

For the purposes of this study, contraceptive adoption was defined as a transition from a state of nonuse to a state of use of a contraceptive method. The monthly risk of contraceptive adoption among nonusers was examined separately by method and for the adoption of any method, the adoption of non-permanent and permanent methods, and the adoption of supply and non-supply methods, as sample size allowed. When examining contraceptive adoption by method, all adoptions of other methods were treated as censored. Episodes of nonuse were constructed from 1996 onwards and left-censored episodes were excluded from the analysis. Episodes containing missing contraceptive information were also excluded from the analysis. Women who were sterilized exited the analysis and never reentered since they were no longer at risk for

adoption. Women were also excluded from the analysis during pregnancy and reentered the analysis immediately upon the end of pregnancy.

Contraceptive discontinuation was defined as the transition from a state of use of any method to a state of nonuse of any method for any reason (including pregnancy). Voluntary discontinuation refers to discontinuation for any reason other than method failure. A method failure was considered to occur when discontinuation resulted from pregnancy. The monthly risk of users of temporary methods discontinuing the use of contraception is examined in this study. Interruptions in use of 1 month or greater was considered to be a discontinuation. In addition to all method discontinuation rates, discontinuation was also disaggregated by most recent method used prior to the abandonment of contraceptive use. Episodes of use were constructed from 1996 onwards and missing and left-censored episodes were dropped.

A measure of natural resource responsibility was also constructed as a part of this dissertation research. Natural resource responsibility has two dimensions. The first of these is participation in agriculture, and the second is engagement in the collection of natural resources such as fuelwood, water, and fodder. A complete definition of natural resource responsibilities can be found in Table 4-1.

Women's status is a general term meant to signify the personal respect and authority that women enjoy as compared to men. This construct is multidimensional, including measures of economic independence, education, travel, and participation in outside social activities. Overall measures of women's

status can be useful in studies of reproductive health behavior and outcomes. There are, however, many challenges to their use. The first challenge is to define status and to clearly identify domains within status, choosing meaningful, well-measured indicators that fit these domains while minimizing overlap. In this instance I have chosen to examine the effects of economic power as measured by employment status and the possession of a bank account. Travel (or mobility) is measured as ever having traveled to Kathmandu or outside of Nepal. Participation in outside (of the family) social activities is measured by participation in voluntary organizations such as youth clubs, women's groups, and other types of groups. Domains of women's autonomy and status which we have not considered in this analysis include economic decision-making, freedom from threat, and power within relationships (26).

Care should be taken in combining elements of these different dimensions into a single measure of women's status. Although this aggregation has been performed in the past, more recent studies have shown that the different domains of women's autonomy can have differential effects on reproductive health outcomes (55, 64). Furthermore, women in a particular setting can be empowered in some domains of autonomy and subjugated in others. For this reason no single women's status index was created for this research.

For the purposes of this research, accessibility of services was defined according to the Bertrand et al. framework (27) which defines 5 aspects of access: physical, economic, administrative, cognitive, and psychosocial. This framework has been used in conceptualizing many studies of the impact of

health services on contraceptive use, including contraceptive adoption and discontinuation (37, 51, 65-68). Separate constructs for all five of these accessibility domains were developed for this study. These include physical access, measured as travel time to clinic, economic access, measured by method costs, cognitive accessibility, measured by individual's perceptions of the availability of methods, and psychosocial access, measured by the perceived social acceptability of using contraceptives. Administrative access was measured using the number of providers and exam rooms available, availability of methods, and clinic hours.

In the Western Chitwan Valley of Nepal, as in many other rural agrarian settings, one of the best indicators of socioeconomic status (SES) is land ownership. This is because, with almost 95% of Nepal's labor force engaged in agriculture, land is an important measure of production, and thus, wealth. Land ownership in the Western Chitwan Valley was measured as a series of three dichotomous variables representing the ownership of any of three types of land. The first is the ownership of any khet, or wet, land. This type of land is low-lying and the most valuable for production because it can support 2 rice crops per year without irrigation. The second type of land is bari, or dry uplands. This type of land requires irrigation in order to support a rice crop and often supports other crops, such as millet and maize. The third type of land is house plots. These small land parcels cannot support a large crop but can be used for small kitchen and truck gardens or to support a small business. The ownership of these three types of land correlate well with more traditional consumption based indicators of

SES (such as consumer durables, electricity and toilet facilities) in the Western Chitwan Valley. Land ownership has furthermore been found to provide a more direct wealth measurement than consumption measures such as asset indices, which in rural settings tend to be less reliable (15).

### **Statistical Approach**

Data were analyzed using STATA 8.0 S.E. statistical computing software. All models were estimated using multilevel discrete time hazard models. Hazard models, also called survival or duration models, or event history analyses, are appropriate for use in this context because both contraceptive adoption and contraceptive discontinuation represent transitions in state (2, 34, 69). Because there are women who did not change state during the length of data collection, observations are censored, making traditional regression analyses biased and inefficient. Because information on contraceptive use is collected at discrete time intervals (monthly) rather than continuously, discrete time hazard models are appropriate. Multilevel models were estimated because the data structure is inherently multilevel, with the unit of analysis being an episode of use or nonuse of contraception, experienced by an individual woman living in a given neighborhood, making it necessary to account for random error at these multiple levels. In STATA, models were fitted using the SVYLOGIT command, modeling the hazard as a logit function. Time was included in the model as both a period effect (month 1-72 of data collection) as well as representing the length of a single continuous episode of contraceptive use or nonuse in months. Adjusting

for episode length is important since it allows us to account for changes in the hazard over the interval. For example, most studies find that the hazard of discontinuing contraception decreases the longer a woman uses family planning (35-38)

This study examined the effect of service accessibility, natural resource responsibility, and women's status on contraceptive adoption and discontinuation. All service accessibility variables are examined independently and selected model variables were examined as interaction terms. Interactions to be evaluated were selected on the basis of theory and to test specific hypotheses among significant service factors and sociodemographic variables. For example, time spent collecting natural resources, if significant, is likely to affect contraceptive use via time constraints. If this were true, travel time to clinics, and clinic hours could possibly offset this effect of time spent collecting natural resources on likelihood of adopting contraception. However if natural resource responsibility is merely a manifestation of lower SES, it might be expected that method cost offsets more of the effect than physical and administrative accessibility. Predicted probabilities were used to determine the degree to which interaction terms modify the main effect of women's status and natural resource responsibility on contraceptive adoption and discontinuation. Because true statistical significance of interaction terms is difficult to assess in a logistic model (used to fit the hazard model), interaction terms in this study were evaluated through a Wald test for joint significance with the individual variables that make up the interaction. Other independent variables were included in the model as

controls. Control variables include age, education, parity, SES/land ownership, household structure (having ever lived with in-laws), and caste/ethnic group. For a complete description of model variables see Table 4-1.

## **Results**

In the 72 months of the study period, there were 1,379 eligible episodes of nonuse contributed by 1,355 women, and 618 eligible episodes of temporary method use contributed by 427 individual women. In order to be at risk for adoption in this sample, one must have discontinued contraceptive use or been pregnant during the study period (first time adopters who have never been pregnant would have a left censored episode of nonuse and be dropped from the sample). In order to be at risk for discontinuation a woman must have adopted a method other than sterilization during the 72-month period. Women who continuously used contraception through the 72-month period would have had a single left-censored episode and would have been dropped. Women who never used contraception and those who were sterilized were also considered to be not at risk of discontinuing and were therefore excluded from the analysis. All told, in the study period there were 561 eligible adoptions and 422 eligible discontinuations. Adoptions in this period were predominantly of Depo Provera (44% of all adoptions) followed by oral contraceptive pills (22%), sterilization (17%), and condoms (17%). Similarly, discontinuations were predominantly of Depo Provera (49%), followed by the pill (26%), and condoms (22%).

As has been documented in other study settings, both adoption and

discontinuation were more likely for an individual woman early in an episode, with the percent adopting and discontinuing dropping off sharply and leveling off at a low percentage, although cumulatively adoptions increased over time. A look at discontinuation rates during the study shows a similar pattern for all method discontinuation. The 12-month voluntary discontinuation rate averages at 73.7% for all modern methods (see Table 4-2). These rates are high when compared to similar rates calculated using demographic and health survey calendar methods, which range from 19 to 65% (36). The all-method failure rate in this study, at 3.3%, was comparable to that found in other countries including, Bangladesh, Indonesia, and Zimbabwe (39). The all-method adoption rate in this study was fairly high at 51.5% at 12 months (see Table 4-3).

## **Adoption**

Results from the event history analysis of contraceptive adoption by method are summarized in Table 4-4. Overall few accessibility measures were significantly related to the likelihood of adopting a contraceptive method. Method choice, however, was a significant predictor, with the likelihood of adopting condoms, increasing with increased number of methods available at the nearest clinic. Perceived method choice is a related measure to method choice. An increase in the number of methods a woman perceives to be available at the nearest clinic is significantly positively associated with the likelihood of adopting oral contraceptive pills.

Natural resource responsibility also showed weak effects on the likelihood

of adopting contraception. Women who spent greater amounts of time collecting fuelwood, fodder, and water were significantly or marginally ( $p < 0.10$ ) less likely than others to have adopted the pill, although only those who spent moderate amounts of time collecting water were less likely to adopt a method, overall. Women's status showed a similar picture with women who have ever belonged to a youth group being more likely to have adopted contraception, particularly condoms. Women who had ever had their own bank account were more likely to have adopted the pill but women who had ever worked for a wage were less likely to have adopted the pill. A much stronger relationship was found between the likelihood of sterilization and having ever lived with a mother-in-law. The presence of a mother-in-law is often associated with women's status, although considered a control variable for household structure in this model.

Perhaps unsurprising, given the generally weak relationships described above, there were few significant interactions between service accessibility and natural resource responsibility or women's status. The results indicated, however, that there was a small, significant relationship between increased method choice and spending 5 or more minutes, on average per woman in the household, collecting water. While overall increased method choice had an insignificant and slightly negative effect on the likelihood of adopting the pill, women who spent more time collecting water showed a significantly more negative impact of increased method choice on the likelihood of pill adoption than that experienced by other women (see Figure 4-2a). This decrease in likelihood of pill adoption with increased method choice is countered by the positive effect

of perceived method choice on the likelihood of pill adoption. There was also a small interaction such that women who agreed with the statement that family planning is wrong and who had ever lived with their mothers-in-law were even more likely to have adopted sterilization than those who agreed with the statement but had never lived with a mother-in-law (see Figure 4-2b).

Much stronger than any of the effects of service accessibility, women's status, and natural resource responsibility, were the relationships between likelihood of contraceptive adoption and some of the sociodemographic factors included as controls in these models. These factors included age, parity, education, household SES (land ownership) and ethnicity, as well as household structure as discussed above. As expected, the likelihood of adopting any method, and particularly depo, pills, and sterilization, increased with middling parity but was less common at parity extremes (one child or less, or more than five children). Increased age (from teens to twenties) also had a positive association with the adoption of any method, although women in their thirties or forties were not particularly likely to adopt. Ethnicity also had a significant relationship with the likelihood of adoption, particularly on method choice. For example, low caste Hindus were more likely than higher caste Hindus to adopt overall, and pills and Depo Provera in particular, while Hill Tibetan Burmese were equally likely as higher class Hindus to adopt any method but significantly more likely to adopt the pill.

Not all control factors included in the model were significant associates with contraceptive adoption, however. Somewhat surprising, was the fact that

education had no strong association with the likelihood of adopting contraception. This was true even in a bivariate analysis (data not shown). Socioeconomic status, as measured by land ownership, also failed to show a particularly significant relationship with the likelihood of contraceptive adoption, although those who owned a houseplot (the lowest degree of SES in this model) were significantly less likely to have adopted any method, and sterilization in particular.

### **Discontinuation**

The results of event history models of the likelihood of contraceptive discontinuation are presented in Table 4-5. Method choice was not a significant associate with method discontinuation, as it was for adoption. Instead travel time to clinic and the number of days a week a clinic was open were more important predictors of the likelihood of discontinuing a method once it was adopted. Women who had to travel thirty or more minutes by foot to reach the nearest clinic were significantly more likely to have discontinued, while women who lived nearest to a clinic open more days per week than others were less likely to discontinue.

Natural resource responsibility and women's status showed even less of an association with method discontinuation than with method adoption. Women who spent a moderate amount of time on average collecting fuelwood were less likely to discontinue while women who had ever worked at a salaried job were more likely to discontinue. No other factors related to natural resource responsibility or women's status showed any significance when associated with

the likelihood of contraceptive discontinuation. Furthermore, there was no evidence of significant interactions between natural resource responsibility or women's status and service accessibility.

As far as the sociodemographic controls included in the model, we found no significant associations between landownership (SES), household structure (having ever lived with in-laws), ethnicity, or age with the likelihood of discontinuing contraception. Education showed a slight effect, such that women with some secondary education were more likely to discontinue using contraception than women with no education, while women with a school leaving certificate or higher were less likely than those with no education to discontinue. The most significant control variables were that of parity and most recent method used prior to discontinuation. Women were more likely to discontinue at higher parities. Women who last used the pill were equally likely as those who last used Depo Provera to discontinue using contraception, while women who last used condoms were much more likely to discontinue use.

## **Discussion**

This study attempts to answer the question of whether measurements of women's status and household responsibilities explain the probability of adopting and discontinuing the use of contraception, and whether family planning service accessibility interacts with these factors in any way.

Overall, there was little evidence that natural resource responsibility or

women's status played a large role in explaining either contraceptive adoption or discontinuation in this study setting, either alone or interacted with service accessibility measures. While, there was some evidence that women with increased natural resource responsibility were less likely to adopt contraception, and particularly the pill, than others, these effects were fairly modest and no real effect was found regarding the likelihood of discontinuation. Women's status showed very weak and inconsistent effects on the likelihood of adoption and virtually none at all on the likelihood of method discontinuation. While there were a couple of significant interactions between women's status or natural resource responsibility and service accessibility, these effects were small and contributed little to the overall likelihood of adoption or discontinuation. One unexpected finding of this study was that having lived with in-laws (a control variable often associated with women's status) was a positive predictor of adoption of sterilization. Further investigation into this finding may help to delineate a communication strategy that might be used to increase contraceptive adoption in the Chitwan Valley where extended households are common.

As far as contraceptive services are concerned, this research highlights the importance of physical accessibility of services relative to other family planning service factors in decreasing contraceptive discontinuation, and identifies method choice as increasing the likelihood of contraceptive adoption. These results are similar to findings from an earlier study of contraceptive use dynamics in Morocco (39). However, results also showed that the belief that family planning is wrong (a psychosocial accessibility measure) was significant

when considering the probability of adopting nonsupply methods including Depo Provera and sterilization. Further, an increase in the number of days a week a nearby clinic was open improved the likelihood of continuing the use of temporary method. This demonstrates the utility in using an expanded definition of “accessible” family planning services, the importance of considering method-specific contraceptive behavior, and the general complexity involved in the consideration of how family planning services might affect contraceptive behaviors.

Like all studies, this research has limitations, especially in its measurement of certain variables. The measurement of service accessibility is circumscribed by the limited data collected in the facility surveys and there is no way to link a woman to the characteristics of the facility she uses. It is therefore assumed that an individual woman is affected only by the characteristics of the nearest facility. There are also difficulties in measuring household natural resource responsibility. This measurement was at a household level and fails to capture how women divide tasks up among themselves within a household. The difficulties inherent in any study of women’s status have already been discussed in some detail earlier. These difficulties in this study, including multidimensionality and culturally appropriate domains, are compounded by the fact that the individual questionnaires were not designed explicitly for the measurement of gender norms and overall women's status. Finally, there was no direct measure of wealth or poverty included in these models. Instead, land ownership proxied wealth, which, despite being a good and consistent measure

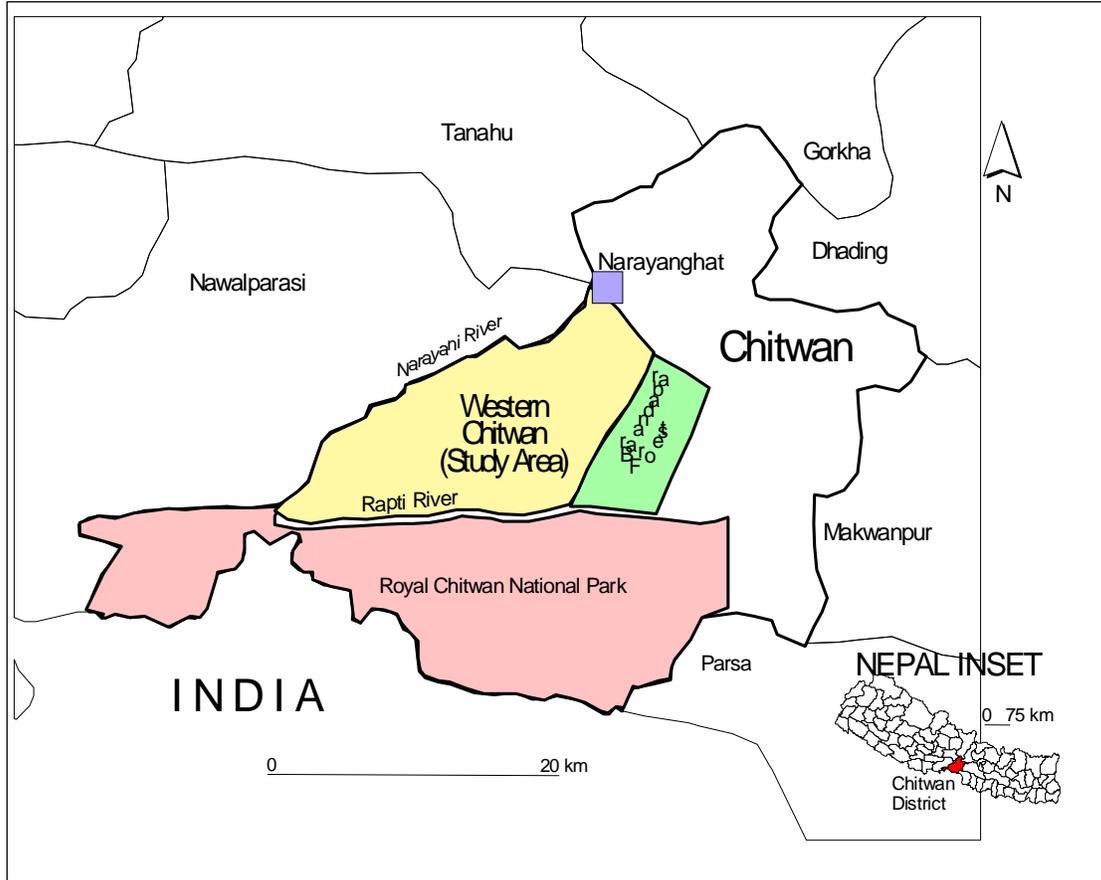
in other studies, could be argued to be potentially endogenous since other independent variables in the model, such as education and employment, could also be possible predictors of land ownership.

Despite these limitations, this study represents a stride forward in the study of contraceptive behavior by examining factors other than service accessibility that might explain contraceptive use dynamics, namely household responsibility and women's status. It also examined possible interactions between service factors and culturally relevant sociodemographic factors that have never before been explored. Another major strength of this study is the availability of longitudinal data that is wide enough in scope to allow the service accessibility and contraceptive behavior among these unique groups of women to be studied over time.

This study reemphasizes that method choice and physical accessibility are major service factors influencing contraceptive adoption and discontinuation, respectively, and that efforts to increase contraceptive use by increasing adoption and reducing discontinuation should focus on increasing physical accessibility and widening method choice. Also, since women who spent large amounts of time gathering fuelwood, fodder, and water were less likely to adopt the pill (or, in the case of those spending more time collecting water, any method), than those who spend less time on these tasks, it seems possible that household responsibility may be a factor influencing likelihood and method choice among potential contraceptive adopters. Further studies with more detailed measurement of natural resource responsibility would be better suited to

further evaluation of this relationship. Finally, the results of this research indicated that, although the effects were small, service accessibility can interact with sociodemographic factors to jointly influence contraceptive behaviors, a possibility which should be considered by future studies seeking to explain contraceptive behavior and by family planning programs seeking to more fully evaluate their impact.

Figure 4-1. Map of Study Area



**Table 4-1.** Model variable descriptions

<b>Variable</b>	<b>Description</b>
<b>Service Accessibility</b>	
<b>Physical Accessibility</b>	
Travel time to nearest clinic	Travel time on foot to nearest clinic (classified as <15 min, 15-30 min, 30+ min)
<b>Economic Accesssibility</b>	
Avg method cost	Average cost of available fp method (rupees)
<b>Administrative Accessibility</b>	
Days per week	Number of days per week the nearest clinic is open
Method choice	Number of methods available at nearest clinic
Number of staff	Number of regular staff members at nearest clinic (classified as 10 or more or < 10 staff members)
<b>Cognitive Accessibility</b>	
Perceived method choice	Number of methods an individual believes to be available at the nearest clinic
<b>Psychosocial Accessibility</b>	
Everyone should use fp	Agrees that everyone should use family planning
vasectomy and God	Agrees that "a vasectomized man cannot be blessed by God"
fp wrong	Agrees that using family planning is wrong
<b>Natural Resource Responsibility</b>	
Farming	Household engages in agriculture
Fodder	Time spent by all women in the household collecting fodder for livestock in hours and divided by total number of women (15 years and older) in the household (categorized as less than 1 hr, 1 to 2 hrs, 2+hrs)
Water	Time spent by all women in the household collecting water in minutes and divided by total number of women in household (categorized as less than water onsite, 1-5 min, 5+min)
Firewood	Time spent by all women in the household collecting fuelwood in hours and divided by the total number of women in the household(categorized as less than 2 hrs, 2 to 4 hrs, 4+hrs)
<b>Women's Status</b>	
Youth club	Woman has ever belonged to a youth group
Other social group	Woman has ever belonged to any other voluntary organization
Bank account	Woman has ever had a bank account
Work ever	Woman has ever worked for a wage or a salaried job
Traveled outside Nepal	Woman has ever traveled outside Nepal

Traveled to Kathmandu	Woman has ever traveled to Kathmandu
<b>Other Explanatory Variables</b>	
<b>Demographic Characteristics</b>	
age (time varying covariate)	Age of a woman (classified as under 20, 20-29, 30-39, or 40-49)
education	Highest educational level obtained by a woman (classified as none, some primary, some secondary, or S.L.C. or higher)
number of living children (time varying covariate)	The number of living children to whom a woman has given birth
caste/ethnic group	Caste or ethnicity of a woman (classified as low class hindu, high class hindu, hill tibetan burmese, terai tibetan, and newars)
<b>Household Structure</b>	
Live In-laws ever	Whether a woman has ever lived with her in-laws
<b>Land Ownership (SES)</b>	
own khet land	A household owns khet (wet) farmland
own bari land	A household owns bari (dry) farmland
own houseplot	A household owns their own houseplot
<b>Last Method Used (for Discontinuation only)</b>	
Pills	Last method used before discontinuation was pill
Condoms	Last method used before discontinuation was condoms
Depo Provera	Last method used before discontinuation was Depo Provera

**Table 4-2.** 12-month life table modern method discontinuation, failure, and voluntary discontinuation rates by method

<i>Rates</i>	<i>%</i>
Total Discontinuation rate	76.9
Failure rates	
All methods	3.3
Condom	2.9
Depo Provera	5.1
Oral contraceptive pill	2.5
Voluntary Discontinuation rates	
All methods	73.7
Condom	78.6
Oral contraceptive pill	69.8
Depo Provera	72.7

**Table 4-3.** 3- 6- and 12-month life table modern method adoption rates by method

<i>Rates</i>	<i>3 months</i>	<i>6 months</i>	<i>12 months</i>
All methods	6.6	19.9	51.5
Pills	1.5	3.6	10.8
Depo Provera	2.2	8.4	21.9
Condoms	1.7	4.6	11.1
Sterilization	1.3	3.3	7.8

**Table 4-4.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive adoption

<i>Variable</i>	<i>Pills</i>		<i>Condoms</i>		<i>Depo Provera</i>		<i>Sterilization</i>		<i>Any Method</i>	
Physical Accessibility										
Clinic 0-14 minutes by foot (ref)										
Clinic 15-29 minutes by foot	0.49	(0.29)	-0.32	(0.44)	-0.06	(0.19)	0.37	(0.33)	-0.04	(0.12)
Clinic 30 or more minutes by foot	-0.21	(0.51)	-0.36	(0.46)	0.54	(0.29)	0.31	(0.33)	-0.23	(0.16)
Economic Accesssibility										
Avg method cost	-0.13	(0.10)	0.07	(0.10)	0.04	(0.05)	0.22	(0.14)	-0.03	(0.04)
Administrative Accessibility										
days open per week	-0.04	(0.12)	0.33	(0.26)	0.11*	(0.05)	0.87	(0.66)	0.02	(0.05)
Method choice	-0.04	(0.25)	0.50*	(0.31)	0.05	(0.13)	-0.08	(0.19)	0.06	(0.07)
<10 staff members	0.62	(0.45)	-0.28	(0.52)	0.18	(0.22)	0.15	(0.56)	0.19	(0.17)
Cognitive Accessibility										
Perceived method choice	0.12*	(0.06)	-0.00	(0.30)	-0.03	(0.12)	0.01	(0.08)	0.04	(0.03)
Psychosocial Accessibility										
Everyone should use fp vasectomy and God	0.57	(0.43)	0.20	(0.45)	-0.19	(0.19)	-0.29	(0.29)	0.19	(0.13)
fp wrong	-0.17	(0.22)	0.03	(0.37)	0.08	(0.17)	-0.09	(0.24)	0.03	(0.10)
Natural Resource Responsibility	-0.14	(0.20)	-0.00	(0.30)	-0.08	(0.15)	0.45	(0.40)	-0.10	(0.10)
Farming	0.50	(0.46)	0.06	(0.52)	-0.08	(0.32)	0.27	(0.44)	0.26	(0.21)
Fodder <1hr (ref)										
Fodder 1-2hrs	-0.34	(0.39)	-0.20	(0.44)	0.40	(0.25)	0.24	(0.34)	-0.10	(0.19)
Fodder 2 plus hrs	-0.19	(0.54)	-1.94**	(0.75)	-0.36	(0.60)	0.47	(0.57)	-0.36	(0.28)
Fuelwood <1 hr (ref)										
Fuelwood 1-4 hrs	-0.36	(0.29)	-0.28	(0.42)	0.18	(0.21)	0.24	(0.40)	-0.02	(0.12)
Fuelwood 4plus hrs	-0.68	(0.43)	-0.23	(0.75)	0.32	(0.26)	0.10	(0.40)	-0.12	(0.16)
Water onsite (0 minutes) (ref)										
Water 1-4 minutes	-0.11	(0.32)	-0.06	(0.33)	-0.36	(0.22)	0.24	(0.24)	-0.23*	(0.12)
Water 5 or more minutes	-3.32*	(1.72)	-0.10	(0.63)	0.11	(0.21)	-0.65	(0.40)	-0.12	(0.16)

Women's Status										
Youth club	0.48	(0.63)	1.74***	(0.44)	0.30	(0.30)	-0.78	(0.91)	0.51**	(0.20)
Other social group	-0.16	(0.40)	0.04	(0.43)	-0.43	(0.31)	0.46	(0.45)	0.26	(0.17)
Bank account	0.91**	(0.32)	-1.00	(0.84)	-0.16	(0.41)	-0.88	(0.57)	-0.15	(0.20)
Salary work ever	-0.01	(0.38)	0.84	(0.50)	-0.37	(0.34)	0.22	(0.46)	-0.15	(0.22)
Wage work ever	-0.61*	(0.36)	0.12	(0.36)	0.25	(0.16)	0.28	(0.27)	-0.05	(0.09)
Traveled outside Nepal	-0.35	(0.39)	0.34	(0.55)	0.03	(0.37)	-0.06	(0.60)	0.15	(0.22)
Traveled to Kathmandu	-0.10	(0.27)	0.35	(0.38)	0.13	(0.17)	-0.05	(0.25)	0.13	(0.10)
Other Explanatory Variables										
Demographic Characteristics										
Under 20 years old (ref)										
20-29 years	-0.05	(0.25)	0.54	(0.81)	0.71*	(0.33)	0.79	(0.78)	0.59**	(0.21)
30-39 years	0.25	(0.65)	1.03	(0.91)	0.72	(0.39)	0.07	(0.95)	0.61*	(0.31)
40-49 years	0.64	(0.71)	0.78	(1.20)	-0.54	(0.65)	-1.21	(1.46)	-0.14	(0.39)
No education (ref)										
Some or completed Primary	-0.10	(0.38)	-0.27	(0.56)	-0.28	(0.24)	-0.19	(0.38)	-0.26*	(0.13)
Some or completed Secondary	0.48	(0.38)	-0.15	(0.54)	-0.05	(0.21)	-0.03	(0.40)	-0.05	(0.14)
S.L. C. or Higher	-0.12	(0.43)	0.66	(0.43)	0.07	(0.28)	-0.35	(0.42)	0.11	(0.21)
No living children (ref)										
1 child	0.36	(0.45)	0.06	(0.38)	0.10	(0.19)	0.56	(0.48)	0.07	(0.16)
2-5 children	1.15**	(0.39)	0.03	(0.33)	0.07	(0.23)	1.25**	(0.42)	0.44**	(0.16)
5 or more children	0.33	(0.87)	0.23	(0.71)	0.17	(0.36)	1.35	(0.75)	0.27	(0.24)
High caste hindu										
Low caste hindu	1.51***	(0.37)	-1.82**	(0.73)	0.59*	(0.25)	-0.37	(0.44)	0.38*	(0.16)
Hill tibetan burmese	1.06**	(0.31)	-1.55*	(0.69)	0.08	(0.24)	-0.73	(0.42)	0.00	(0.14)
Terai tibetan	-0.15	(0.39)	-0.65	(0.59)	-0.23	(0.25)	-0.22	(0.41)	-0.29	(0.17)
Newar	0.09	(0.45)	-2.36	(0.90)	-0.17	(0.28)	-0.10	(0.73)	-0.27	(0.20)
Household Structure										
Live In-laws ever	-0.05	(0.26)	0.47	(0.37)	0.25	(0.13)	0.78**	(0.40)	0.02	(0.11)
Land Ownership (SES)										
own khet land	-0.13	(0.25)	0.35	(0.42)	-0.31	(0.18)	0.24	(0.38)	-0.11	(0.12)
own bari land	-0.27	(0.32)	0.19	(0.42)	-0.28	(0.17)	-0.04	(0.35)	-0.13	(0.12)
own houseplot	-0.07	(0.43)	-0.92	(0.52)	-0.53*	(0.25)	-0.53	(0.36)	-0.55**	(0.15)
Constant	-7.50**	(1.72)	-7.96**	(2.66)	3.82***	(0.94)	-11.71*	(4.29)	-4.43***	(0.66)

Study Month (1-72)	0.03	(0.03)	0.01	(0.02)	0.01	(0.02)	0.00	(0.02)	0.04	(0.01)
Study Month squared (1-72)	-0.00	(0.00)	-0.00	(0.00)	-0.00	(0.00)	0.00	(0.00)	-0.00	(0.00)
Duration	-0.01*	(0.01)	-0.03	(0.01)	-0.02***	(0.00)	0.02*	(0.01)	-0.01**	(0.00)
Duration squared	-0.00*	(0.00)	-0.00	(0.00)	0.00***	(0.00)	-0.00**	(0.00)	-0.00***	(0.00)

(ref) reference category

--not applicable

\* Significant at  $p < 0.05$

\*\* Significant at  $p < 0.01$

**Table 4-5.** Parameter estimates (with standard errors) from the discrete-time event history analysis of contraceptive discontinuation

<i>Variable</i>		
<b>Physical Accessibility</b>		
Clinic 0-14 minutes by foot (ref)		
Clinic 15-29 minutes by foot	0.15	(0.15)
Clinic 30 or more minutes by foot	0.58**	(0.19)
<b>Economic Accesssibility</b>		
Avg method cost	0.02	(0.04)
<b>Administrative Accessibility</b>		
days open per week	-0.09*	(0.04)
Method choice	-0.03	(0.07)
<10 staff members	-0.07	(0.16)
<b>Cognitive Accessibility</b>		
Perceived method choice	-0.02	(0.03)
<b>Psychosocial Accessibility</b>		
Everyone should use fp	0.03	(0.16)
vasectomy and God	-0.09	(0.10)
fp wrong	-0.12	(0.10)
<b>Natural Resource Responsibility</b>		
<b>Farming</b>		
Fodder <1hr (ref)		
Fodder 1-2hrs	0.13	(0.23)
Fodder 2 plus hrs	0.07	(0.17)
<b>Fuelwood &lt;1 hr (ref)</b>		
Fuelwood 1-4 hrs	-0.46*	(0.18)
Fuelwood 4plus hrs	-0.25	(0.17)
<b>Water onsite (0 minutes) (ref)</b>		
Water 1-4 minutes	-0.26	(0.15)
Water 5 or more minutes	-0.06	(0.14)
<b>Women's Status</b>		
Youth club	-0.04	(0.27)
Other social group	-0.18	(0.22)
Bank account	-0.06	(0.21)
Salary work ever	0.63**	(0.19)
Wage work ever	-0.12	(0.10)
Traveled outside Nepal	0.10	(0.18)
Traveled to Kathmandu	0.12	(0.13)
<b>Other Explanatory Variables</b>		
<b>Demographic Characteristics</b>		
<b>Under 20 years old (ref)</b>		
20-29 years	-0.09	(0.32)
30-39 years	-0.40	(0.36)
40-49 years	-0.77	(0.44)
<b>No education (ref)</b>		
Some or completed Primary	0.28	(0.18)
Some or completed Secondary	0.35*	(0.16)

S.L. C. or Higher	-0.56**	(0.18)
No living children (ref)		
1 child	0.14	(0.17)
2-5 children	0.31*	(0.17)
5 or more children	0.63*	(0.27)
High caste Hindu		
Low caste Hindu	0.06	(0.20)
Hill Tibeto- Burmese	-0.13	(0.15)
Terai Tibeto-Burmese	-0.03	(0.17)
Newar	0.25	(0.22)
Household Structure		
Live In-laws ever	0.19	(0.13)
Land Ownership (SES)		
own khet land	0.10	(0.12)
own bari land	0.02	(0.13)
own houseplot	-0.02	(0.14)
Last Method Used		
Depo Provera (ref)		
pills	0.19	(0.14)
condoms	0.64**	(0.13)
Constant		
Study Month (1-72)	-0.01	(0.01)
Study Month squared (1-72)	0.00	(0.00)
Duration	0.01	(0.01)
Duration squared	-0.00**	(0.00)

(ref) reference category

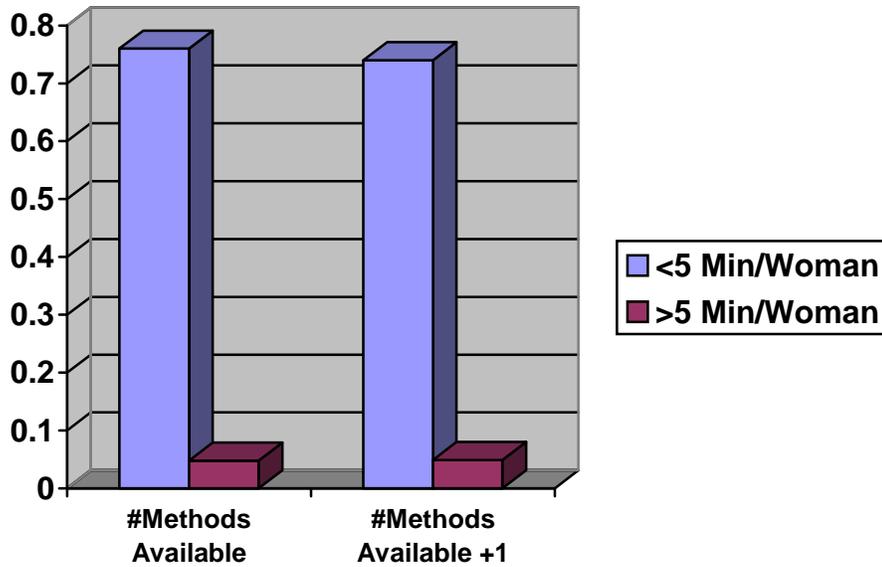
--not applicable

\* Significant at  $p < 0.05$

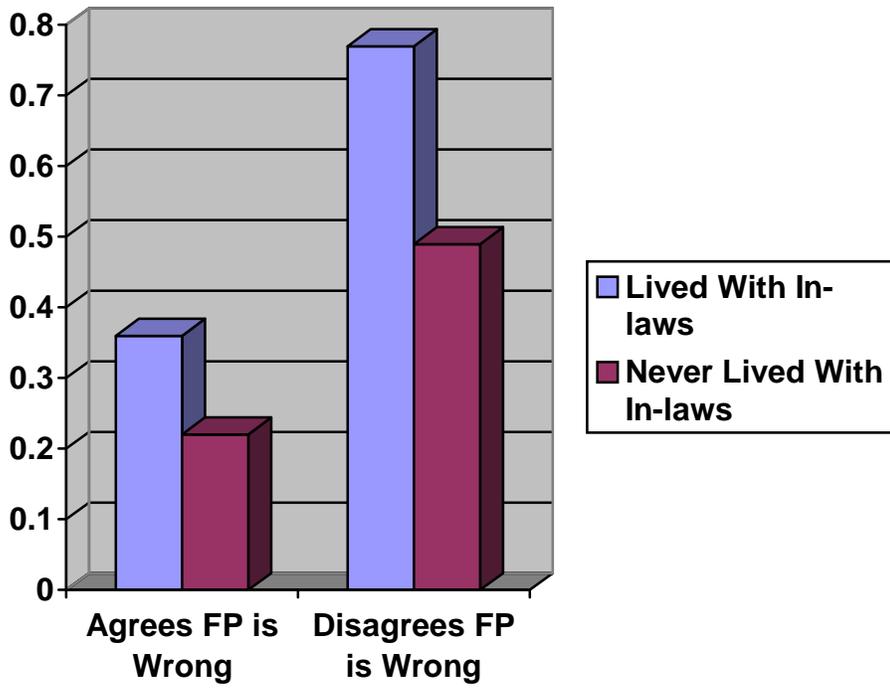
\*\* Significant at  $p < 0.01$

**Figure 4-2.** The predicted probabilities of a) adopting the pill as a function of increased method choice at the nearest clinic and the average time spent collecting water and b) of adopting sterilization as a function of belief that family planning is wrong and having ever lived with in-laws

a)



b)



## **CHAPTER 5**

### **CONCLUSION**

The intention of this dissertation was to identify how a variety of contextual factors across multiple levels act and interact to affect contraceptive use and fertility via contraceptive adoption and discontinuation. This dissertation question was formulated with the intention of identifying circumstances that put women at risk of unintended pregnancy, lower than average rates of contraceptive adoption, and higher than average rates of contraceptive discontinuation. While these analyses were performed within the cultural context of the Western Chitwan Valley of Nepal, and all public health implications must also be for this specific population, this study addresses a larger gap within the literature regarding contraceptive adoption and discontinuation.

Researchers have typically sought to understand contraceptive behavior as it relates to a specific exposure, such as individual factors known to affect fertility and within the context of specific health service environments. This dissertation takes the approach that all behaviors are embedded within the individual, social, health, and physical environments in which they occur, and these exposures might interact to affect behavior. The literature surrounding contraceptive use and fertility in Nepal was carefully assessed in order to identify contextual factors that have not previously been evaluated for an impact on contraceptive use dynamics together or separately.

Here, in the final chapter of my dissertation, I will review the individual conclusions and public health significance of each study aim and end with a discussion of overall conclusions and future research.

**Aim 1:** To determine if the experience of unmet need for contraception (being at risk of conception, wishing to limit births, but not using contraception) or past contraceptive use and discontinuation predicts future individual-level differences in contraceptive and fertility behavior among women of reproductive age.

The results of this research demonstrate how both unmet need for contraception, which reflects fertility intentions and current contraceptive use, and past contraceptive discontinuation, which reflects past use, interact to affect the future likelihood of future fertility and contraceptive adoption and discontinuation. Women with unmet need for contraception were more likely than women with met need to experience a future birth, and women with unmet need and no past history of contraceptive use are more likely to experience a future birth than those with unmet need who have used modern methods of contraceptives in the past, indicating that unmet need remains a demographically relevant concept in the Western Chitwan Valley of Nepal. However, it is important to note that a large proportion of women with unmet need for contraception have unmet need as a result of past contraceptive discontinuation. Therefore, family planning programs should address contraceptive discontinuation and effective use among method adopters as well as aiming to increase method adoption among those who have never adopted if

they wish to have an impact on unintended fertility among women with unmet need for contraception. The debate in the literature between Jain's assertion that effective and continued use of contraception is more important for fertility than unmet need status (39) and Casterline's argument that in settings with low prevalence and widespread use of effective modern methods, unmet need for contraception remains an important predictor of fertility (36) is, at least in this study setting, therefore not really appropriate. While unmet need for contraception remains relevant, unmet need status itself is a consequence of past contraceptive discontinuation and an important predictor of future contraceptive behaviors including method adoption. Addressing unmet need for contraception, then, requires a focus on effective and continued use of contraception as well as an increase in method adoption.

**Aim 2:** To explore the relationship between season and women's use of contraception (i.e. contraceptive adoption and discontinuation) and to determine if women's natural resource collection and management responsibilities (i.e. collection of fuelwood, fodder, and water, and involvement with agriculture) modify this relationship in the Western Chitwan Valley of Nepal.

Previous studies had found some evidence of a peak in sterilization (17, 18) and, to a lesser extent, use of other methods (14) during the winter in South Central Nepal. This study finds evidence to support this seasonal pattern in adoption of sterilization, and also finds that the adoption of pills was less likely in the monsoon months of June-September. However, after further investigation into the relationship

between season and contraceptive behavior, I found the discontinuation of temporary methods also showed evidence of seasonality, with discontinuation significantly more likely to occur in the monsoon months. While the interactions between natural resource responsibility and seasonal patterns of contraceptive behavior were small and weak in this study, the hypothesis that seasonal workloads influence the probability of adopting or discontinuing contraception cannot be completely dismissed and is worthy of further investigation with more refined measures. Further research that captures women's individual workloads, by season, would be more useful for understanding the relationship between seasonal contraceptive behavior and natural resource responsibilities.

It is ultimately important to understand that there is a seasonal pattern in contraceptive behavior because a season of low adoption and high discontinuation represents a seasonal barrier to the successful, effective use of family planning by women in the Western Chitwan Valley and in other areas where seasonal contraceptive behavior may not have yet been recognized. This barrier could create a window of time when a woman risks an unintended pregnancy while waiting for a more convenient time to adopt or resume contraceptive use. Better understanding why this seasonality occurs may help family planning providers to better help couples in overcoming this barrier to effective contraceptive use in rural, agrarian settings.

**Aim 3:** To investigate the relationship between access to local family planning services and contraceptive use (adoption and discontinuation) and to examine

whether women's status and/or natural resource responsibility modify this relationship.

This study reemphasizes that method choice and physical accessibility are major service factors influencing contraceptive adoption and discontinuation, respectively, although the effects are small, and that efforts to increase contraceptive use by increasing adoption and reducing discontinuation should focus on or include increasing physical accessibility and widening method choice. Also, since women who spent large amounts of time gathering fuelwood, fodder, and water were less likely to adopt the pill (or, in the case of those spending more time collecting water, any method), than those who spend less time on these tasks, it seems possible that household responsibility may be a factor influencing likelihood and method choice among potential contraceptive adopters. Further studies with more detailed measurement of natural resource responsibility would be better suited to further evaluation of this relationship. Finally, the results of this research indicated that, although the effects were small, service accessibility could interact with sociodemographic factors to jointly influence contraceptive behaviors, a possibility which should be considered by future studies seeking to explain contraceptive behavior and by family planning programs seeking to more fully evaluate their impact.

While the theoretical and methodological approach to understanding contraceptive use dynamics used in this dissertation research are advanced and

many of the factors considered as part of this analysis, such as seasonality of contraceptive behavior and the influences of natural resource responsibility, have never previously been explored, further work in this area still remains to be done. One of the biggest limitations to attempting a multilevel, contextual understanding of contraceptive behavior is the lack of data. Contraceptive calendars for a representative sample of women over time are difficult and expensive to construct. To also collect comprehensive and time varying data on the host of other individual, social, and environmental factors that may influence contraceptive behavior is a daunting task, especially given the relatively recent period in which contraceptive dynamics have been studied and the amount that is still unknown regarding the variation in contraceptive behaviors.

The data used in this analysis from the Chitwan Valley Family study are unique in that they result from a massive and long-running data collection effort that is representative of a specific population over time. However, this dissertation research was still a secondary analysis and the data were not collected specifically to address these study aims. Therefore, measurement of natural resource responsibility, fertility preferences, and women's status were limited somewhat by the data that was collected in the Chitwan Valley Family Study. Future researchers investigating these relationships would do well to design appropriate primary data instruments in order to ensure adequate measurement of natural resource responsibility, women's status, and unmet need for contraception. In order to achieve this, natural resource related activities should be measured seasonally and at the individual level. Women's status measures should reflect the successful

scales developed by Jejeebhoy and others, and fertility intentions should be periodically reassessed for change over time.

A second direction for future research is to conduct qualitative fieldwork in order to further investigate the relationships examined in this dissertation and to shed new light on other possible contextual factors affecting contraceptive behavior in the Western Chitwan Valley. Because research into the contextual factors affecting contraceptive use dynamics is so new, fieldwork interviews could help contribute to the developing body of theory and research in contraceptive behavior. Furthermore, when one is studying contextual influences on contraceptive behavior, fieldwork is perhaps the best way to get a true sense of how women themselves weight the competing influences of individual circumstance, family and social attitudes, and environmental constraints.

A third and final area in which to expand this research is through examining these processes and relationships in other study settings outside of the Western Chitwan Valley. Seasonal agriculture and migration patterns, for example, are not limited to Nepal, and might create seasonal patterns in contraceptive use in other parts of the world. Understanding where and under what circumstances various contextual factors influence behavior takes analyses such as those in this dissertation beyond case studies and into a better general understanding of contraceptive behavior.

However, overall it can be concluded from this dissertation research that contextual factors directly affect and interact to affect contraceptive behavior. This research demonstrates that multiple factors have the potential to interact both within

(such as individual unmet need and contraceptive histories) and across (such as season and natural resource responsibility) levels of contextual hierarchies to influence contraceptive use dynamics.

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