

# **Women's and Men's Social Networks and Contraceptive Use Dynamics: Longitudinal Evidence from Ghana**

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## **The Research Problem**

Most contemporary theories of the fertility transition reserve a place for social diffusion effects (Bongaarts and Watkins 1996, Mason 1997). These effects arise because individuals are themselves members of social groups and routinely encounter the attitudes and behaviors of other persons. The information that is held by other persons, the choices those persons make, and the outcomes that flow from them can all exert an influence on individuals' evaluations of the advantages and disadvantages of various reproductive behaviors. This influence is likely to be especially powerful when the behavior is innovative and hence presents risks and promises benefits that are not yet well understood. This characterization applies to the use of modern contraceptive methods in settings such as West Africa where fertility has been high and, until recently, practice of modern contraception rare. In such settings, information that individuals acquire through social interaction may have a critical bearing on their reproductive decision-making. The connections among individuals—social networks—become the pathways along which innovative demographic attitudes and behaviors can diffuse.

This is a now-familiar argument in the literature on fertility transition, first coming to prominence in research on the decline of fertility in Europe (e.g. the Princeton-based European Fertility Project). During the past decade there has been renewed interest in this argument, and this has spurred systematic empirical research in Asia (notably in Thailand by UNC-Mahidol teams) and in Africa (notably in Kenya and Malawi by members of the U Penn project). These projects have attempted to estimate the magnitude of social diffusion effects as they operate via social networks. While the story is complex, overall these analyses uncover powerful effects of social network variables, even under stringent test conditions (e.g. regression models with fixed effects).

This paper presents the culminating analysis from a multi-year project in southern Ghana which has the overarching goal of estimating social network effects on reproductive behaviors (and, thereby, assessing the validity of social diffusion theories of reproductive change). Under the auspices of this project, a panel survey collected eight rounds of data over a five-year period. The data

collection was based at the University of Cape Coast (Ghana) and received financial support from NICHD and the Rockefeller Foundation.

The paper has two major goals.

1. First, and more importantly, to evaluate the strength of social diffusion effects on contraception as they operate via social networks. The Cape Coast data also contain measurement of geographical mobility and exposure to mass media, hence these mechanisms for diffusion effects will also be considered. In a larger sense, this analysis contributes to the literature on fertility transition (and, in particular, diffusionist perspectives on fertility transition (Casterline 2001)).
2. Second, a comparison of the relative explanatory power of men's vs. women's networks in accounting for variation in contraception. Despite the large amount of empirical research on gender and reproduction during the past two decades, few pieces have brought gender differences in social interaction patterns into the picture. (One of the U Penn papers does so.) The existing literature consists largely of comparisons of men's and women's attitudes and behaviors. This is as an individualistic perspective that ignores gender differences in social interaction patterns that may well have important repercussions for contraceptive decision-making. In addressing this gap in the literature, this paper contributes to the literature on gender and reproduction.

## **Data**

The data for this analysis are drawn from eight rounds of a longitudinal household survey conducted in southern Ghana. The data collection began in late 1998 and continued until late 2003, with most respondents observed from 56-60 months. The sample universe is women aged 18 through 50, irrespective of marital status, along with the male partners of those women in formal unions, residing in six communities. These six communities, which are isolated from each other, were purposively selected to provide diversity in terms of ecological setting, economic activity, ethnicity, and kinship system. Sample retention was excellent -- about 85 percent of women and 75 percent of their male partners from Round 1 to Round 8, a solid achievement in any setting and exceptional in West Africa, where rates of residential and circular mobility are high. The full sample consists of roughly 1300 women and 750 matched male partners. The sample for the analysis of contraceptive use is restricted to women in union and their male partners, amounting to roughly 900. (Note: some of the women respondents share the same male partner.)

In each of the eight rounds, the respondents (women and men) were asked about conversational social networks, as defined by discussion of certain topics. Respondents were asked to name individuals with whom they discuss the specified topic, and then detailed information was obtained on as many as four of these network partners. In Rounds 1, 2, 4, 5, 6, and 8, respondents were asked several questions about the contraceptive attitudes and behaviors of the named network partners. It is from this information that we will construct the social network measures for this paper.

Contraceptive practice was measured in all rounds after Round 1 (Rounds 2-8) through a monthly calendar covering the period from the previous interview. Monthly calendar data was also collected for marital status, pregnancy status, and post-partum behaviors.

## Methods

Contraceptive use will be the outcome of interest. The Cape Coast panel survey data offer about five years of prospective measurement of contraceptive use, in excess of 50,000 woman-months of observation. This analysis will select those months in which women were in union and apparently at risk of conception if they did not contracept.

The equation that will be estimated can be expressed as follows. Let  $Y_{it}^*$  represent the propensity for woman  $i$  to use modern contraception in month  $t$ , where  $t$  is a month in the period from the Round 1 interview to the Round 8 interview. The structural equation in its latent-variable form can be written as:

$$Y_{it} = \mathbf{X}_{ik}\beta_k + \mathbf{W}_{if}\delta_f + \mathbf{V}_{im}\eta_m + v_i + \varepsilon_{it} \quad (1)$$

- where
- $\mathbf{X}_k$  are sets of conventional demographic and socioeconomic explanatory variables
  - $\mathbf{W}_f$  are indicators of behavior or information exchange in the woman's social network
  - $\mathbf{V}_m$  are indicators of behavior or information exchange in the man's social network
  - $\beta_k$  are vectors of parameters to be estimated
  - $\delta_f$
  - $\eta_m$
  - $t$  denotes the month, 1,2, ..., 60
  - $i$  denotes the woman
  - $v_i$  is a couple-specific component of the variance
  - $\varepsilon_{it}$  is the random disturbance assumed to be independent

of  $X_k$ ,  $W_r$  and  $V_m$

(Some of the  $X_k$  are time-varying, but for simplicity we do not subscript in  $t$ .) The observed counterpart to the latent variable,  $Y_{it}$ , takes the value of 1 if woman  $i$  used modern contraception in month  $t$ , and equals 0 otherwise. The regression model will be probit or logit. Our principal interest are the coefficients  $\delta_r$  and  $\eta_m$  i.e. the effects on contraceptive use of the woman's and man's social network measures.

A very important feature of equation (1) is the term  $v_i$ , the couple-specific effect. This represents unmeasured factors specific to each couple (woman, her male partner, or both) that bear on their decision to use contraception.  $v_i$  is an essential term in the equation that governs the analysis, for the following reason. The social network variables  $W_r$  and  $V_m$  include indicators of exposure to contraceptive attitudes and behaviors via network partners. Consider a couple who, for reasons not fully explained by the  $X_k$  covariates, have been highly motivated to consider contraceptive use. They might have been engaged for some time in a search for information about the implications of such use, or, after having experimented with contraception at an earlier date, might subsequently have felt free to discuss their experiences with social network partners (woman's or man's). Likewise, a woman and man who have long lacked interest in contraception might never have opened the subject in conversations with their respective network partners. When such motivations are imperfectly measured and persist over time, their influence will be partly expressed in either  $W_r$  and  $V_m$ , the social network variables. A correlation between the unmeasured elements of motivation and the  $W_r$  and  $V_m$  network variables can make it appear as though the network variables exert a causal influence when they are, at least arguably, the product of the couple's own durable preferences or circumstances. A potential exists for estimation bias and mistaken inference.

It is the longitudinal design that permits the inclusion of  $v_i$  in the equation.  $v_i$  may be treated as a random effect or a fixed effect; we shall consider both approaches. A random-effect specification requires that the  $v_j$  be independent of the explanatory variables  $X_k$ ,  $W_r$  and  $V_m$ , and we may conclude that this is not a tenable assumption. A fixed-effect specification can be regarded as a more stringent test of the effects of principal interest in this research ( $\delta_r$  and  $\eta_m$ ), but in so doing is more demanding of the data and, in effect, results in the discarding of a considerable amount of information, i.e. all factors that do not vary over the observation period.

## **Short Abstract**

This paper examines the effects of social network experience on contraceptive use dynamics in six communities in southern Ghana. The data permit assessment of the explanatory power of both women's and men's social network experience. Men's social networks have been largely neglected in research on social interaction and reproduction in developing countries, despite the fact that in most of these societies men have a decisive voice in reproductive decision-making. Panel survey data for roughly 900 women and their male partners covering five years of observation are analyzed. The monthly probability of use of modern contraception is modeled as a function of conventional demographic and socioeconomic variables and separate sets of social network variables specific to the woman and to her male partner. The regression equations include a couple-specific term, treated as random or fixed, as a strategy for dealing with unobservables that might bias the estimation of network effects.