Using Systematic Anomalous Case Analysis to Inform Theories of Fertility: A Case Study from Cebu, Philippines

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Abstract

Systematic anomalous case analysis (SACA) is a form of mixed-method research in which existing data are used to identify and conduct subsequent examination of cases that do not exhibit the expected behavior, for the purpose of refining social theories and measurement strategies. Using intergenerational longitudinal cohort data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS) in the Philippines, we use household, peer, family, and young adults' sexual attitudes, as reported in 1998, to predict the number of living children that young adults had by 2009 (ages 25-26). We then calculate residuals to identify statistical outliers (anomalous cases) from the multivariate model. In-depth interviews with a subsample of the anomalous and normative cases are conducted to identify ways in which subsequent investigations and data collection instruments may better theorize and measure fertility among young adults in this and other settings.

Introduction

Fertility preference measurements are critical to assessing the reproductive health needs of individuals and populations. At the individual level, fertility preferences reflect desires to have (or not have) children according to a specific number, pace, composition, or lifestage. Discrepancies between desired fertility and actual fertility indicate areas in which health or social programs may intervene, either to prevent undesired fertility or to facilitate desired fertility. At a population level, measures of fertility preferences inform estimates of key policy-relevant indicators, including the demand for contraceptive services. These indicators provide a metric to assess the effectiveness of national family planning programs, the achievement of demographic goals, and the degree to which individuals' or couples' fertility intentions are achieved.

An extensive empirical and theoretical literature outlines reasons for the onset and pace of fertility decline. Two key points emerge from this recent literature that serve to inform subsequent investigations: 1) the need to consider the influences of social context on individual fertility preferences and behavior (e.g.,(Axinn WG & Yabiku ST, 2001; Edmeades J, 2008; Entwisle B et al., 1996; Montgomery MR & Casterline JB, 1996)) and 2) the need for a deeper understanding of the role and influence of proximate determinants on fertility behavior (e.g., (Friedlander D et al., 1999; Seltzer et al., 2005)).

This study seeks to address these points by conducting a Systematic Anomalous Case Analysis (SACA) of extant data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS), an intergenerational, longitudinal cohort study in the Philippines. SACA is a form of mixed-method research in which existing data are used to identify and conduct subsequent examination of cases that do not exhibit the expected behavior, for the purpose of refining social theories and measurement strategies (Axinn WG & Pearce LD, 2006; Pearce LD, 2002). We use household, peer, family, and young adults' sexual attitudes, as reported in the 1998 CLHNS, to predict the number of living children born to young adults by 2009 (ages 25-26). We calculate residuals to identify statistical outliers from the multivariate model. In-depth interviews with a subsample of the

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anomalous and normative cases are conducted to identify ways in which subsequent investigations and data collection instruments may better theorize and measure fertility among young adults in this and other settings.

Systematic Anomalous Case Analysis

Axinn and Pearce (2006) identify six steps in SACA: 1) Estimating multivariate models to determine which factors predict a particular outcome, 2) Conducting regression diagnostic tests of these models to identify a list of statistical outliers, 3) Selecting informants using systematic sampling techniques, 4) Conducting follow-up, in-depth research (e.g., semi-structured interviews and/or observations) with these selected informants, 5) Reanalyzing the survey data based on the findings from the in-depth fieldwork and suggesting additional predictors in the multivariate analyses, and 6) Using insights gained from the in-depth fieldwork to improve theories, measures, and methods that can then inform subsequent survey data collection and/or analysis (Axinn WG & Pearce LD, 2006).

Quantitative Data and Analysis

The CLHNS is an ongoing longitudinal study of a cohort of Filipino mothers and their children born between May 1, 1983 and April 30, 1984 in Metro Cebu, Philippines (Adair LS & Popkin BM, 2001; Feranil AB et al., 2008). 33 communities (barangays) were selected from the Metro Cebu area using a single stage cluster sampling procedure. All women who gave birth in the selected barangays during the survey time were included in the sample. More than 3,000 women and their newborns (index children) were included in the baseline study. Follow-up surveys were conducted, with the most recent surveys conducted in 2007 and 2009.

The dependent variable in this analysis is number of living children, as reported by participating young adults who had sex by the 2009 survey (n=1,264).

The analysis examines the effects of five blocks of variables on number of living children (see Table 1). The first block of variables includes household characteristics of the index children: number of persons in the household, nuclear versus extended household, household wealth, and an urbanicity score of the household's community. The household wealth index was derived based on Vyas and Kumaranayake's index (2006). The urbanicity scale was constructed following a modified version from Dahly and Adair (2007).

The second block of variables consisted of the mother's sociodemographic characteristics, including marital status, education, age, religiosity, and number of children alive in 1998, and marital characteristics, including father's presence in the household, whether the husband turned over income to the mother, and the mother's status. The status of the mother was assessed by an interviewer-assessed measure of the degree to which mothers, children, and their households appeared to be well-kept. Age and education were measured in years; a mother was considered religious if she attended church at least once a week.

The third block of variables included the mother's educational aspirations for the index child, and reported communication and closeness between the mother and child. Mothers were coded as having high educational aspirations for the index child if they wished the child to graduate from college. For the communication variable, good communication was considered to be if mother and child separately reported they had discussed at least two of seven topics together. Similarly, if both mother and child separately reported being close to each other, the mother-child pair was rated as being close.

The fourth block of variables involved peer and family influences on the index children, including the child's perception of their friends' sexual behavior, whether the child had a sibling less than 20 years old that had a boy/girlfriend, whether the child had a family member working abroad, and a scale of the mother's reported adolescent behaviors. To gauge perception of friends' sexual behavior, each index child was asked if their close friends had engaged in any of a list of sexual behaviors. If a child reported that they thought their friends had

at least engaged in kissing, the child's perception of their friends' sexual behavior was rated as high. Mother's adolescent behaviors were determined from questions on whether she had a boyfriend when she was 14-16 years old, if she had sex before she turned 18 years old, and if she had engaged in premarital sex (range: 0-3).

The last block of variables focused on the sociodemographic characteristics and sexual attitudes and behaviors of the adolescent. Included in the sociodemographic characteristics were age, education, educational aspiration, religion, religiosity, and media exposure. Religion was measured as whether or not the child was Catholic, and a child was considered to be religious if he or she attended church at least weekly. Media exposure was determined based on how often the index child watches TV, listens to the radio, and reads magazines. The child's sexual attitudes and behaviors included an index of the child's attitudes regarding dating, sex, and marriage, whether or not the child had heard of family planning, the child's perception of their mother's attitudes about sex, whether or not the child reported engaging in any precoital behaviors by 1998, and the child's age at first sex. Since previous analysis shows that age at first sex was closely tied to marriage, we also controlled for the number of times the child had been married by 2009 and the number of months the child had been married for. The index of the child's attitudes regarding dating and marriage was created by using a factor analysis on questions regarding the appropriate ages for young people to have crushes, court, date, and become married. The factor analysis was performed separately on male and female index children to account for differences in societal standards for boys and girls. Higher index scores correspond to more conservative attitudes toward dating and marriage.

The index child's perception of their mother's attitudes about sex was determined based on three questions from the 1998 survey. Each adolescent was asked: (1) "Do you think your mother agrees that boys your age should not have sex yet?" (2) "Do you think your mother agrees that girls your age should not have sex yet?" and (3) "Do you think your mother agrees that only married couples should have sex?" If the child indicates that the mother agrees with all 3 statements, the child is coded as perceiving the mother "strongly disapproves". Finally, the child is coded as having engaged in precoital behavior if the child indicated that they have engaged in kissing, holding hands, more than kissing, petting, or "gone all the way".

We conducted the following, preliminary steps (not presented due to space). We first assessed the characteristics of participants from the 1998-2000 CLHNS survey. Significant differences between male and female participants substantiated gender-disaggregated models. Next, we conducted a multivariate logistic regression to test for significant differences between adolescents who had sex, and those who did not have sex, by the 2009 survey. We then conducted gender-disaggregated bivariate Poisson regressions to predict the number of living children, followed by multivariate analyses comprised of all predictor variables for which there were significant bivariate findings for either males or females (Table 1). Next, we calculated raw residuals to identify those participants who were considered to be outliers, i.e., those whose residual values fell outside two standard deviations from the mean of zero. Though Pearson residuals are often used with Poisson regression to correct for heteroskedasticity, raw residuals are used here because they easier to interpret and there is no need to scale the residuals for the purpose of this study. Figure 1 highlights those outliers whose residual values fall outside two standard deviations of the mean.

Qualitative Sampling, Data Collection, and Analysis

Based on the findings of these analyses predicting number of living children, as well as another analysis predicting time to first sex (Gipson JD et al., 2013) among the CLHNS young adults, we identified four groups of anomalous cases: 1) those young adults whose sexual debut occurred earlier than the model predicted, 2) young adults whose sexual debut occurred later than the model predicted, 3) young adults who had less than the predicted fertility, and 4) young adults who had more than the predicted fertility. Anomalous cases were defined as respondents whose residual values were approximately two or more standard deviations from the mean residual zero (see Figure 1). Eight respondents (four male and four female) were randomly selected from each group for in-depth interviews. For each model, we also randomly sampled eight normative respondents

(four male and four female) whose residual values were approximately zero. These normative respondents will also be interviewed in order to better understand cases in which the models were highly predictive of age at first sex and fertility.

A field guide was developed to explore components of young adults' lives to complement previous quantitative survey questions (e.g., educational aspirations, perceptions regarding religion's influence on sexual and contraceptive decision-making), as well as to explore aspects of young adult lives that were not explored previously in quantitative surveys (e.g., expectations regarding marital relationships, desired timing of childbearing and number of children, engagement in same-sex and opposite-sex behaviors, etc.). In total, we will conduct 48 in-depth interviews. Qualitative data collection is now underway with expected completion of interviews by December 2013.

All of the interviews are being audio recorded, transcribed and translated in to English. Analysis of the data will start in October 2013 and continue through the end of the year. All transcripts will be imported in to QSR NVivo software for initial analysis and coding. A coding scheme will be developed by JDG and SG, as well as the lead interviewer, based on reviews of transcripts. Initially, we will independently code a set of the same transcripts to ensure coding consistency and to make any needed changes to coding scheme. We will then complete coding of the transcripts using a constant comparative method (Glaser, 1965).

Initial review of the first set of interviews points to a few, emerging findings:

- Parents are usually more strict when raising their daughters, as compared to their sons (e.g., implement curfews, etc.)
- Compared to females, first sex among the males is usually casual sex (not in a committed/intimate relationship)
- First sex among females usually leads them to further stages of commitment (going steady, engagement, marriage), even if at a faster pace of progression through these stages for some
- First sex is done without the use of contraceptives/family planning, particularly among males.
- Most of the young adults did not get any advice from parents regarding sex. They got information on their own (e.g., reading or searching internet) or from friends.
- The terms used to refer to sex are not commonly used in normal conversations, these are mostly coined terms by certain personalities that are being used in conversations within the circle of friends (barkada) of the respondents. They are not very comfortable using such terms.
- Many young adults are just living together rather than married (in church or by a judge) due to the expense of marriage.

By PAA 2014, we will have a full set of findings and be able to discuss the findings in more detail, particularly differences between the groups (e.g., earlier sexual onset vs. later sexual onset; males vs. females).

Table 1: Unadjusted and adjusted Poisson regression models of number of living children (age ~25), by sex and household, parental, individual characteristics, Cebu, Philippines

	Unadjusted Models		Full Model	
	Males	Females	Males	Females
Household Characteristics	N=732	N=532	N=732	N=532
Urbanicity	-0.01	-3.14**	-0.01	-0.01
Extended family household				
Extended family household	-0.12	0.05	-----	-----
Multi-nuclear household	-0.13	0.11	-----	-----
Number of persons in household	-0.01	0.03†	0.02	0.01
Household wealth	-0.05*	-0.13***	-0.03	0.01
Parental Sociodemographic and Marital Characteristics				
Mothers				
Marital Status	-0.08	-0.13	-----	-----
Education (years)	-0.04***	-0.06***	0.01	0.00
Age	0.00	-0.01	-----	-----
Religiosity: Attends ≥ weekly	-0.06	-0.20**	0.01	0.04
Number of mother's children alive in 1998	0.02	0.06***	0.00	0.01
Marital Characteristics				
Presence of father in household	-0.16	-0.02	-----	-----
Husband turns over all income to wife	0.03	0.06	-----	-----
Status of mother (well-kept)	-0.02	-0.33***	-0.01	-0.12
Mother-Child Relationship				
Mother's educational aspiration for child	-0.12	-0.39***	-0.09	0.02
Closeness between mother and child	-0.08	0.19*	-0.05	0.04
Communication between mother and child	0.20	-0.21*	0.03	-0.36***
Peer and Family Influences				
Perception of friends' sexual behavior	0.31***	0.24*	0.00	0.12*
Household member <20 relationship	0.13	0.00	-----	-----
Family member working abroad	0.16	0.02	-----	-----
Scale of mother's reported adolescent behaviors	0.05†	0.19***	-0.05*	0.07*
Adolescent Characteristics				
Age	0.17*	-0.31*	-0.01	-0.09
Completed education	-0.07***	-0.15***	0.00	-0.03†
Educational aspiration	-0.15*	-0.32***	0.16*	-0.01
Religion	0.41*	0.49*	0.03	0.09
Religiosity	-0.09	-0.21*	-0.07	-0.07
Media exposure	-0.04	-0.15***	-0.03	-0.03
Sexual Attitudes and Behaviors				
Attitudes regarding dating, sex, and marriage	-0.11*	0.05	0.01	0.08*
Has heard of family planning	-0.14*	-0.36***	-0.01	-0.11†
Perception of mother's attitudes re: sex (strong disapp.)	-0.21*	-0.27	0.00	0.30*
Any reported precoital behaviors	0.48***	0.30***	0.16†	0.08
Age at first sex	-0.09***	-0.20***	0.01	-0.07***
Months married	0.02***	0.02***	0.02***	0.01***
Number of times married	0.90***	0.67***	0.55***	0.30***

***p≤0.001; ** p≤ 0.01; * p ≤ 0.05; †p≤ 0.10

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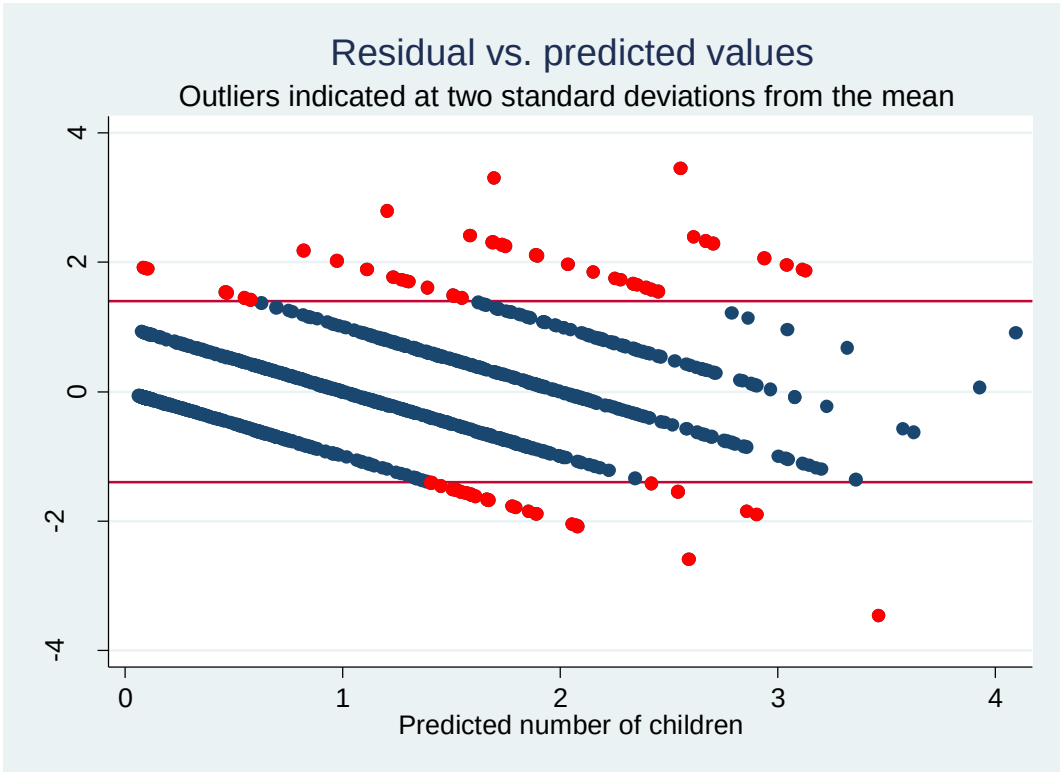
Figure 1: A plot of residuals vs. predicted values. Residuals that fall outside 2 standard deviations of the mean residual, zero, are marked in red.



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