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A New Look at the Determinants of Nonnumeric Response to Desired Family Size: The Case of Costa Rica*

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High levels of nonresponse or inappropriate response to items are a persistent concern in survey research because those who do not answer may not be representative of the study population. Thus nonresponse introduces potential bias in the point estimates as well as in multivariate analyses, which use the responses in question as either an independent or a dependent variable. Researchers often have little recourse but to form a "don't know" or "not available" category from the failure to respond (or to be responsive). They must either omit these cases, treat them as a separate category, or impute a value on the basis of other characteristics of the respondent (Croft 1991; Kalton and Kasprzyk 1986).

The characteristics of those in the "don't know" category are rarely analyzed (in relation to those responding), and the content of the inappropriate responses is seldom examined. Questions on desired family size (DFS) and family planning surveys are somewhat of an exception to this pattern, however. The questions generally take the form used in the Demographic and Health Surveys (DHS): "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" (Westoff 1991).

Nonresponse to DFS questions is of special interest because childbearing preferences figure prominently in fertility and family planning research. DFS helps to explain present trends in fertility behavior and to predict what may happen in years to come. Moreover, it is used widely to measure unmet needs for family planning services and unwanted fertility, and to project future fertility in cohorts that have not completed their childbearing years.

DFS questions also are distinctive in that most of the "nonresponses" are literally cases

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of nonresponsiveness. That is, the interviewer is seeking a quantitative answer, while the respondent often presents a qualitative answer in the form "up to God," "the number that comes," or the like. Such responses often are termed "fatalistic" and sometimes are treated as indicating the desire for a large number of children (or at least not opposing a large number).

Although research on nonnumeric responses to DFS questions is not extensive, two different objectives may be identified. In one, nonnumeric response generally is viewed as a methodological problem; most research focuses on the technical aspects of how to use—or how not to use—such responses in data analysis. One of the most common treatments of nonnumeric response is to categorize responses as an ordinal scale and to include nonnumeric responses in the highest preference group. Other strategies include treating nonnumeric responses as missing data and excluding such responses from the analysis. Jensen (1985) argues that the empirical evidence is insufficient to show that the true preferences of nonnumeric responders are different from those of women who give numeric responses. He demonstrates the extent of bias that might result from grouping nonnumeric responses in the highest preference category. Another methodologically oriented approach has been to experiment with alternative wording of the DFS survey to study the effect on the level of nonnumeric response as well as on the expressed number of children desired among numeric responders (Goldman, Moreno, and Westoff 1989).

The second, more substantive approach examines the characteristics of those who respond nonnumerically in relation to those who give a specific number. A study of Nigerian women in the town of Ilorin (McCarthy and Oni 1987) is illustrative. The authors' theoretical stance is that women who give a nonnumeric response may indeed have no preference about family size. Accordingly they propose a two-step procedure in which the determinants of nonnumeric response are examined in Step 1, and only the numeric responders are analyzed in Step 2. This approach may make sense in their setting, where more than 50% of respondents give nonnumeric answers, but Nigeria is aberrant in its high level of nonnumeric response to fertility preference questions. In the 1990 DHS, 60.8% of all Nigerian women of reproductive age failed to give a numeric DFS; most of the women replied that the number of children they would have is up to God. This proportion is more than twice as high as in any other country in Africa (DHS 1990). While cultural factors such as a higher degree of fatalism may play a role, it is unlikely that they explain such a large difference between Nigeria and neighboring West African countries.

Technical factors related to execution of the survey also may be important. Training of interviewers was dispersed to local jurisdictions to a greater degree in Nigeria than in other countries, and instructions on probing may not have conformed completely to DHS guidelines. One outcome may have been that "up to God" and other nonnumeric responses were recorded on the first pass and no further probing may have occurred. Although the DHS avoided the aggressive probing techniques used in the World Fertility Survey, nonnumeric responses generally were followed with a second question such as "If you could ask God to send the number you wanted . . . ?" (Rutstein 1992). Thus, failure to probe may contribute to the high rate of nonnumeric response in this country.

Although McCarthy and Oni seem to argue that nonnumeric responses indicate a certain degree of fatalism regarding fertility, at least for the total number of children, they do not test directly whether persons who give a nonnumeric response may signal a preference in other ways. They note, however, that most respondents expressed numerical preferences for lengths of birth interval and other aspects of reproduction, and they confine their conclusions to the issue of desired family size. The authors find that lower education and lower socioeconomic status were associated with a higher likelihood of a nonnumeric response and that a larger number of surviving children was associated with a higher probability of a numeric response. The range of characteristics examined is rather narrow,

however, and the analysis of this special population is not guided by an explicit conceptual framework of the factors producing nonnumeric responses.

In this analysis we focus on the factors associated with nonnumeric response but we show in passing that many of the "nonnumerics" in fact indicate preference in other ways. In the next section we propose a conceptual framework for studying the level of nonnumeric response to DFS, and we illustrate how several of these factors come into play by studying variation over time and place. This discussion is followed by a more detailed examination of a specific instance—Costa Rica in 1981—which enables us to probe other factors implicated in the model.

CONCEPTUAL FRAMEWORK AND AGGREGATE ANALYSIS

Three types of factors may be conceptualized a priori as affecting the degree of nonnumeric responses to DFS questions: factors stemming from characteristics of the population, from the individual characteristics of respondents, and from the mode of eliciting information. Table 1 shows specific elements within each category that are likely to come into play.

Table 1. Factors Related to Frequency of Nonnumeric Response to DFS Questions

Population or Major Subgroup Factors	Individual Characteristics	Survey Procedure Factors
A. Degree to which family limitation is within the calculus of choice 1. Contraceptive prevalence 2. Overall level of fertility	A. Cognitive skills: ability to understand and respond to hypothetical questions 1. Level of education 2. Wantedness of last birth	A. Form of the DFS question: Specific wording Allowance for nonnumeric response Degree of probing
B. Religious/cultural scruples concerning expression of fertility preferences	B. Reproductive control behavior 1. Current use of contraception 2. Type of Method	B. Placement of question in the survey
C. Religious-sociopolitical debates about specific methods of or contraceptive use in general	C. Reproductive experience 1. Number of living children 2. Duration of marriage 3. Age at marriage D. Community environment 1. Contact with family planning programs 2. Modernity of community	C. Interviewer's characteristics 1. Level of insistence 2. Rapport, trust, privacy 3. Age, authority, etc.

Note: Numbered items are examples of operational measures of lettered factors.

Characteristics of the Population

At the population level, the degree to which the idea of family limitation falls within the "calculus of individual choice" (Coale 1973) is clearly relevant. This idea is likely to be signaled by the level of fertility, the prevalence of contraceptive use, or the number of children desired by those who are able to respond. In addition, some cultures and religions discourage expressions that seem to give precedence to individual preference over events controlled by deity or fate. In Bangladesh, for example, it is widely believed that the number of children a woman will have is determined by God. Stated dependence on God is associated with higher fertility and with negative views of family planning (Maloney, Aziz, and Sarker 1981). In another example, the Catholic Church teaches that every act of intercourse should be open to the possibility of creating new life. The Church expressly forbids the use of abortion and contraception, with the exception of periodic abstinence (Ford, et al. 1988). Adherents to this view may be reluctant to give a number, which would suggest approval of contraception. An additional population factor may arise from religious or sociopolitical debates about the appropriateness of specific methods of family planning (e.g., sterilization and abortion) or contraceptive use in general. In these cases, persons using the method in question may be guarded about the purpose of the survey and cautious in responding to complex questions.

Individual Characteristics of Respondents

Regardless of the general characteristics of a population, individuals are likely to vary in their response. Table 1 also indicates several personal factors likely to lead to differential responses. Probably one of the most important factors is the respondent's cognitive skills, in the sense of ability to understand and respond to hypothetical questions. All DFS questions are cast as "thought experiments" in which the respondent is encouraged to relive her reproductive life without any constraints and to state the number of children she would have in this preferred, but unstated, scenario. Questions measuring DFS vary across surveys but rely mainly on a broad single question. The World Fertility Survey, for example, asks "If you could choose exactly the number of children to have in your whole life, how many would that be?" (Goldman, et al. 1989). In contrast, as stated above, the DHS asks "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" (Westoff 1991). In the 1982 Costa Rica Contraceptive Prevalence Survey (CPS), women were asked "If you were able to choose, how many children would you have?" Rather than specifying conditions, DFS questions tend to remove constraints: "if you were able to choose" removes the constraint of influence by spouse and others; "if you could go back" permits any number of scenarios beginning in early adulthood.

Therefore we expect that the level of education will be associated closely with the ability to respond to this complex, counterfactual question. This is also true of women who express an attitude about whether they wanted their most recent birth. In particular, women who say that their last birth either was unwanted or came at the wrong time signal that their opinions about the number and spacing of births are not rationalized after the birth of a child; they also demonstrate an ability to field hypothetical questions. Although this question about the last birth is less abstract than the DFS questions, it requires hypothetical thinking on the part of respondents. In effect, women are being asked to think back to the time of that birth and to decide whether they would have had that child at all, or at that time, if they had had the choice.

Also related to a woman's ability to respond to a DFS question are her reproductive

history and her experience with reproductive control. Women who are using an effective method of contraception for spacing or limiting are likely to have formed reasonably concrete ideas about their desired family size. Furthermore, use of contraception shows that the respondent views fertility as within the domain of personal control, and that she has chosen to exercise that control.

The effect of a woman's reproductive experience on the likelihood of a nonnumeric response in terms of family size, age, or duration of union, is not clear a priori. On the one hand, one might expect that women who prefer fewer children than they actually have will tend to give a nonnumeric response to the DFS question to avoid implying that any of their living children are unwanted. This tendency would lead to a positive association between number of children and the probability of giving a nonnumeric response. Also, older women with more children may feel that they are less in control of their family size, given their stage of reproduction; this feeling may translate into greater reluctance to consider the hypothetical situation in the DFS question.

On the other hand, it is possible that the longer, cumulative experience with marriage and childbearing would give these women a clearer idea of their preferences; hence they would be more willing to state a desired family size. McCarthy and Oni also hypothesize that preferences will be "more certain and realistic among older women" (1987, p. 282). This hypothesis is supported only partially by their multivariate analysis: the number of living children was associated positively with the probability of a numeric response, but age had no significant effect.

Finally, in regard to individual characteristics, we would expect the local environment—the neighborhood and the community—and the degree of contact with agents or agencies of a family planning program to affect the willingness or ability to provide a numeric response to a DFS question. Women in more modern communities and/or communities with higher contraceptive prevalence, and women in closer contact with a program, are likely to have a clearer idea about setting childbearing goals. Such goals may translate into greater responsiveness to a request about their own desired family size.

Procedures Used to Elicit Information

A third category of factors centers around the survey procedures used to elicit the DFS. In view of the subtlety of the underlying request, it is reasonable to expect that the wording of questions may affect the ability to respond. We showed above how training and questionnaire delivery may have contributed to the high proportion of nonresponse in Nigeria. Other aspects of questionnaire design also appear to be important in at least two other experiments, one in Peru and one in the Dominican Republic (Goldman et al. 1989; McCarthy and Oni 1987; Westoff, Goldman and Moreno 1990). Standard survey considerations such as placement of the question and acquiescence bias also may play a role, especially in cases of religious or political sensitivity to family planning or certain methods of contraception. Hermalin and Liu (1990) demonstrate the importance of respondents' anonymity in China: questions about DFS were answered far less often in face-to-face surveys than in returns in sealed containers.

Probably more important than these factors are the instructions and training given to the interviewers. The level of nonnumeric responses will be lower if "don't knows" are not allowed or if interviewers are instructed to probe for a number. Examples of persistent exchanges are cited by van de Walle (1992) and by Thompson, Ali, and Casterline (1982). Under circumstances of intensive probing, the characteristics of the interviewer—gender, age, degree of authority—and the rapport established between the interviewer and the respondent are likely to figure prominently in the type of response. In the Bangladesh WFS,

for example, interviewers were instructed to extract a numeric response by allowing the respondent to reinterpret the question, although they were not supposed to suggest an answer (Thompson et al. 1982). Transcripts of interviews, however, revealed that many respondents were led to give a specific response, often the number of children that they had at the time. In comparison, DHS-II interviewers were asked to record exactly what the respondent said if a numeric response was not provided (Demographic and Health Surveys 1990).

An example that bears on the data analyzed here is the difference between the 1976 WFS and the 1981 CPS in Costa Rica. This difference suggests that the proportion of nonnumeric responses to DFS increased between 1976 and 1981 and that this increase coincided with an increase in contraceptive prevalence, declining numeric DFS, and declining fertility (Hermalin, Riley, and Rosero-Bixby 1989, Table 1). In the WFS, only 3% of the women gave a nonnumeric response, whereas 12% of the respondents gave a nonnumeric response in the CPS. The difference between the two surveys is likely to be due to three factors: 1) the wording of the questions differed as noted above; 2) the WFS did not have specific categories for "don't know," "the number that comes," and so on; and 3) interviewers were instructed to probe more aggressively for numeric responses in the WFS than in the CPS (Rosero-Bixby 1981).

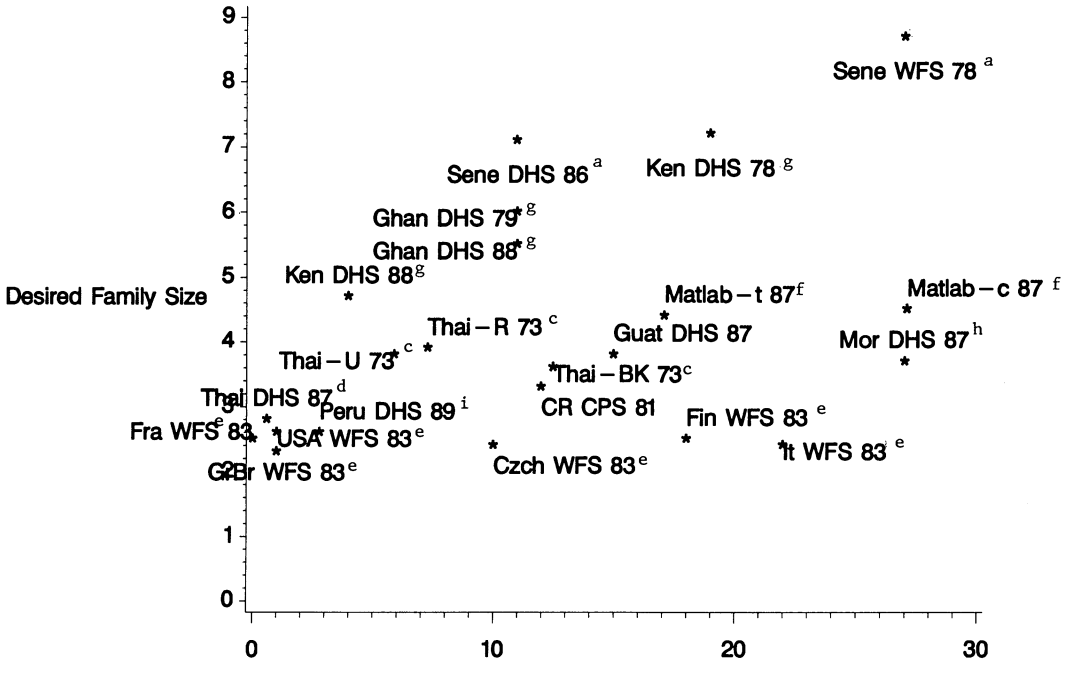
Analysis of Factors

A complex design would be required to adequately compare the relative importance of factors in all three categories shown in Table 1. To test the full gamut of factors that influence nonnumeric response to DFS would require data across many countries, and with multiple approaches to the questionnaires. At a minimum, the data base should contain surveys over time within countries as well as across countries at different levels of fertility, with information about the precise questions asked and the instructions given to the interviewer. Ideally one would prefer an experimental design in which the effects of different questions could be tested within countries, in conjunction with cross-country comparisons. It may be possible, however, to make do with existing observational studies. Data from the World Fertility Survey, the Contraceptive Prevalence Survey, and two rounds of Demographic and Health Surveys may provide such a resource in the near future.

The analysis presented here, however, follows a different strategy. First we examine differentials in DFS across a select group of countries to suggest that a number of the factors enumerated in Table 1 in fact come into play. Then, using data from a single country, we examine more formally the individual characteristics hypothesized in Table 1 to be operative.

Although it is probably premature to attempt the full analyses with available sources, published reports do provide some insights into these questions. Figure 1 shows that the relationships are not simple. The vertical axis contains values for average desired family size among numeric respondents; the horizontal axis contains the percentage of nonnumeric respondents. The figure shows a general trend whereby higher average DFS is associated with a higher proportion of nonnumeric responses (as expected, if fertility levels reflect a clearer calculus of choice), but considerable variability exists. When the proportion of nonnumeric responses is less than 10%, only in Thailand (Knodel and Prachuabmoh 1973) and in Kenya (Westoff 1991) is the average DFS more than three children. For surveys that report 20–30% nonresponse, however, DFS ranges from 2.4 in Italy (Berent 1983) to 7.2 in Senegal in 1978 (Ndaiye, Sarr, and Ayad 1988).

Variations in question format and in probing techniques may confound the relationships shown in the figure. Yet, if we examine DHS and WFS reports separately, considerable



[a] Ndiaye, Sarr, and Ayad (1988); Senegal 1978; Kenya 1988 (DHS).
[b] Ministerio de Salud Publica y Asistencia Social (1989); Guatemala 1987 (DHS).
[c] Knodel, and Prachmaubmoh (1973); Thailand: rural, urban, Bangkok.
[d] Chayovan, Kamnaunsilpa, and Knodel (1988); Thailand 1987 (WFS).
[e] Berent 1983; Italy, France, Great Britain, USA, Czechoslovakia, and Finland (WFS).
[f] Koenig, Phillips, et al. (1987); Matlab, Bangladesh treatment and control areas.
[g] Westoff (1991); Ghana 1979 (WFS), 1988 (DHS); Kenya 1978 (WFS), and 1988 (DHS).
[h] Azelmat, Ayed, and Belhachmi (1989); Morocco (DHS)
[i] Goldman, Moreno, and Westoff (1989); Peru (DHS).

Figure 1. Desired Family Size by Percent Nonumeric Response for Selected Countries

variability persists. Although interviewers' training may vary across countries, still this finding suggests that factors other than survey design and implementation are operating. Three examples where survey design and implementation factors are controlled for are evident in the Matlab, Bangladesh treatment and control areas in 1987, in the WFS 1983 reports for European countries, and three areas of Thailand in 1973.

In the Matlab example (Koenig, et al. 1987) two contiguous areas of rural Bangladesh were surveyed, and respondents were asked identical questions. The treatment area (identified as Matlab-t in Figure 1) is served by an intensive community-based maternal and child health and family planning program, wheresas the control area (identified as Matlab-c) receives government services available throughout the country. DFS is similar in the treatment and the control areas (4.4 and 4.5 children respectively), but the proportion of nonnumeric responses is much higher in the control area (27.1%) than in the treatment area (17.1%). This finding suggests that contact with the family planning program (see Table 1, Item D.2, under individual characteristics) influences the level of nonnumeric responses.

In the European countries, women were asked about the expected number of children

rather than the desired number. In all six countries presented here, the average expected family size ranges between two and three children. Even within this narrow range, however, the percentage of nonnumeric responses varies from virtually nil in France to 22% in Italy. One explanation may be that because Italy is a predominantly Catholic country the religious and sociopolitical climate (as suggested in Table 1) may be an important factor. France, however, is also a Catholic country, and it falls at the low end of the spectrum for nonnumeric response. Although it may be possible to reconcile this discrepancy on the basis of some measure of religiosity, the relatively high level of nonnumeric response in Finland (18%) remains unexplained.

The Thailand data call into question the hypothesis that modernity is associated with lower rates of nonnumeric response. In the Thailand data, women living in Bangkok have higher rates of nonnumeric response than do rural or semi-urban women, although numeric responses suggest that they desire the smallest families (Knodel and Prachuabmoh 1973).

Thus Figure 1 provides ecological evidence that some of the relationships displayed in Table 1 are operating, particularly the association between the level of nonnumeric response and the average actual family size. Several exceptions, however, contradict the expectations set forth in Table 1; the Thailand findings, for example, suggest that several other factors are operating as well.

AN ANALYSIS OF INDIVIDUAL CHARACTERISTICS IN COSTA RICA

Our focus now shifts from the aggregate to a specific country at a specific time, namely Costa Rica in 1981. As shown in Figure 1, Costa Rica has a relatively moderate DFS among the developing countries (just over three children). Excluding the developed countries, only Peru and Thailand have a lower DFS than Costa Rica; those estimates were obtained more recently, in 1989 and 1987 respectively. The percentage of nonnumeric responses in Costa Rica is intermediate at about 12%. This case study examines the four individual-level factors set forth in Table 1: cognitive skills, reproductive control behavior, reproductive experience, and contact with family planning programs and the community environment. In addition, the analysis indicates religious-sociopolitical factors also hypothesized in Table 1 as affecting nonnumeric responses to DFS questions.

Data and Methods

Data are provided by the Costa Rica Contraceptive Prevalence Survey 1981 and supplemented with a community survey of rural areas. (See Rosero-Bixby 1981 for a detailed description of sampling and data collection methods.) The sample consists of 1,224 fecund women age 15–49, who are currently married or in a consensual union and are living in a rural or semi-urban area (<20,000 inhabitants).

Women who wanted no more children, women who were sterilized, and women who were unsure whether they wanted another child were asked a variant of the WFS question: "If you were able to choose, how many children would you have?" The analysis is restricted to these 692 respondents. The dependent variable is based on whether the respondent gave a numeric or nonnumeric response to this question (1 = nonnumeric; 0 = numeric). Nonsterilized women who wanted more children were asked how many additional children they desired; total DFS was tabulated from the number of living children and the number of additional children desired. This question is clearly different from the

more hypothetical WFS-style question described above; therefore these (532) women are excluded from further analysis. Among the women who said they wanted more children, however, only 30 (5.4%) could not say specifically how many additional births they desired.

Operational measures of explanatory variables are described below. Measures of cognitive skills in this analysis are education and whether the last birth was wanted. Education is a categorical variable structured as three dummy variables: less than primary school, primary school completed (six years), and more than primary school. All parous women were asked whether they had wanted their last birth, at the time of that birth, and also whether they had not wanted the birth at all or if the birth had come at the wrong time. This provides an important distinction between failures in timing and failures in number of births. We formulate two dichotomous variables: number failure is coded as 1 if the respondent reported the last birth as unwanted, and 0 otherwise; timing failure is coded as 1 if the respondent reported that the last birth came at the wrong time, and 0 otherwise. The omitted category is that the last birth was wanted at that time. Positive responses to the questions about timing and number failure indicate the respondent's ability to deal with hypothetical questions.

Current use of contraception measures reproductive control behavior. Two dichotomous variables are employed: use of all temporary methods, and use of sterilization. We distinguish between sterilization and other methods of fertility control for two reasons. First, sterilization may add another layer of thinking to a question that is considerably complex from the outset. Sterilized women cannot increase their current family size: thus, responding to the DFS question may include rethinking the decision to be sterilized. As a result, sterilization status may capture some aspects of cognitive skills as well as reproductive control behavior.

Second, religious-sociopolitical factors also may affect sterilized women's responses because of the climate of opinion concerning sterilization in Costa Rica in the late 1970s and early 1980s. Religious authorities, as well as some politicians and intellectuals, expressed concern about the rapidly growing rate of sterilization; accordingly, in the late 1970s, sterilization technically was made available only for health reasons. In the 1976 CPS, 77.5% of sterilized women said they had been sterilized for contraceptive reasons, compared to only 22.5% in the 1981 CPS (Barrantes, McCarthy, and Yinger 1983). Among rural and semi-urban women in the 1981 survey, 70% of sterilized women said they had been sterilized for health reasons, 10% for contraceptive reasons, and 19% for a mixture of the two. In this environment, some sterilized women may have been reluctant to state a desired family size less than or equal to their current number of children, lest it be taken as an indication that they had employed sterilization for contraception.

Operational measures of reproductive experience are age at first union, time since first union (duration), and the number of living children, all treated as interval scales. In addition, whether a respondent had a birth in the last five years is coded as 1 for yes and 0 for no. This variable was included because women who have borne children more recently may have clearer ideas about family size targets than other women.

Community factors are captured in a modernity scale based on the number of schools, electrification, piped water, and other amenities; this scale ranges from 0 to 15. In addition, the analysis includes two crude measures of contact with the government family planning program. The first variable measures whether the respondent is covered by National Social Security Insurance (CCSS). CCSS is provided automatically for all wage workers and can be purchased by anyone. The second variable measures whether the respondent was contacted by a Ministry of Health rural health outreach worker in the last 12 months. This program targets more remote rural areas of the country and is separate from the CCSS, although both are operated by the Costa Rican government. Neither measure is a pure

measure of exposure because both programs provide a wide array of primary health and other clinical services in addition to family planning. Therefore contact with the program does not necessarily mean that family planning services were provided or discussed.

RESULTS

Table 2 displays differentials in the variables considered in this analysis between women who gave a nonnumeric DFS and those who gave a numeric response: reproductive experience, measures of cognitive skills, current use of reproductive control, characteristics of the community, and contact or coverage by the family planning program. We found important differences and similarities between numeric and nonnumeric respondents. One of the most notable differences is that nonnumeric respondents were more likely to be sterilized (52.5%) than were numeric respondents (33.9%). Although a higher proportion of numeric respondents than of nonnumeric respondents were using other means of fertility regulation, more than one quarter of nonnumeric respondents were using a method of contraception other than sterilization. When sterilization is included, nearly 80% of nonnumeric respondents were using some form of birth control. This high level of reproductive control among nonnumeric respondents does not support the hypothesis that these women are fatalistic about the number of children they have.

More women in the numeric response group than in the nonnumeric response group had a birth within the last five years, most likely because fewer of these women were

Table 2. Differentials in Key Variables for Numeric and Nonnumeric Respondents

Variable	Numeric	Nonnumeric
Desired Family Size	4.3 (2.8)[a]	—
Reproductive Experience		
% with birth within last 5 years	51.1	36.7
Mean number of living children	4.7 (2.6)	5.9 (2.9)
Mean age at first union	19.2 (4.2)	19.5 (4.3)
Mean duration of union	15.3 (7.6)	17.7 (7.6)
Cognitive Abilities		
Education: < Primary school (%)	56.9	85.0
Primary (%)	26.4	12.5
> Primary (%)	16.6	2.5
Wantedness of most recent birth		
% number failure	29.9	30.0
% failure in timing of last birth	19.9	12.5
Use of Reproductive Control		
% sterilized	33.9	52.5
% using contraception[b]	50.7	27.5
Community Factors		
Mean modernity score	6.9 (4.2)	6.9 (3.9)
Contact with Family Planing Program/Workers		
% Social Security Insurance	81.3	75.8
% Rural Health Outreach	61.2	62.5
N	572	120

[a] Standard errors in parentheses.
[b] Excluding sterilization.

sterilized. Women who gave a non-numeric response had 1.2 more living children, on average, than did women who gave a numeric response. Women who gave a nonnumeric response also had somewhat longer durations of marriage than numeric respondents but the mean age at marriage is virtually the same for the two groups. Taken together, these differentials suggest that those who gave nonnumeric responses are, on average, somewhat older women who bore children at a more rapid rate early in their reproductive careers and have sharply curtailed their recent childbearing.

As expected, women who gave a nonnumeric DFS response had less education than the other women. The most notable difference is in the proportion of women who achieved higher than primary school education.

The proportion of women who reported their last birth as being altogether unwanted is virtually the same for numeric and for nonnumeric respondents. A slightly higher proportion of numeric respondents, however, reported that their last birth came at the wrong time. The substantial proportion of nonnumeric respondents who stated that the last birth was unwanted in some sense provides further evidence that nonnumeric respondents are not fatalistic about their reproductive patterns.

In this bivariate context, community modernity did not differ greatly for the two groups. Differences in program factors also were small; numeric respondents were more likely than nonnumeric respondents to be covered under the national social security program (CCSS) but we found no difference in coverage by the rural health outreach program.

To understand the relative importance of these factors in a multivariate context, we estimated a series of logistic regressions (Table 3). We introduced variables from each of the four factors sequentially to observe changes in individual coefficients, in their standard errors, and in the overall fit ("-2 log-likelihood ratio"), though we will focus on the full

Table 3. Logistic Regression Results for Nonnumeric DFS

	1		2		3		4	
Variable	β	χ^2	β	χ^2	β	χ^2	β	χ^2
Intercept	−2.58**	(12.91)	−1.44	(3.59)	−1.36	(2.63)	−1.28	(2.21)
Reproductive History								
Age at first union	0.03	(1.27)	0.03	(1.12)	0.03	(1.17)	0.03	(0.85)
Duration of union	0.01	(0.06)	−0.02	(0.86)	−0.03	(1.28)	−0.03	(1.61)
Birth in last 5 years	−0.49*	(3.78)	−0.48	(3.66)	−0.35	(1.74)	−0.36	(1.87)
Actual family size	0.14**	(8.54)	0.11*	(4.30)	0.10*	(3.83)	0.11*	(4.47)
Measures of Cognitive Skills								
Education: Primary			−1.06**	(11.68)	−1.04**	(10.95)	−1.08**	(11.46)
Secondary+			−1.09**	(12.66)	−1.09**	(12.44)	−1.14**	(13.21)
Last birth: Timing failure			−0.69*	(4.66)	−0.69*	(4.55)	−0.67*	(4.29)
Number failure			−0.72**	(5.43)	−0.54*	(4.69)	−0.53*	(4.41)
Reproductive Control								
Sterilized					0.86**	(12.04)	0.85**	(11.32)
Use of contraception					−0.55	(3.10)	−0.53	(2.85)
Community Factors								
Modernity							0.04	(1.63)
Program Factors								
Rural Health Outreach							0.00	(0.00)
Social Security Insurance							−0.29	(1.25)
-2 Log Likelihood Ratio	624.42		595.75		568.55		565.76	

N = 691. One observation had missing data for age at first union. Outcome coded 1 for nonnumeric response, 0 otherwise.

* ≤.05 ** p≤.01.

specification that contains variables from each domain of theoretical interest. In each column (1–4) the coefficients represent the log-odds of giving a nonnumeric response for women in the 1 category for that specific variable relative to women in the 0 category for dichotomous variables, and of each successive increment for continuous variables (e.g., one additional year of union). The outcome is coded 1 for a nonnumeric response and 0 for a numeric response. Thus positive coefficients indicate an increased probability of a nonnumeric response.

When the full model is viewed in Column 4, we see that most measures of reproductive experience had no statistically significant effect on the probability of a nonnumeric response. Only actual family size had a significant effect when the other levels of observation were controlled. Women with larger numbers of living children were more likely to give nonnumeric responses than women with smaller families. The relative odds of a nonnumeric response were 1.1 for each additional child, calculated by $e^{0.11}$.

In the multivariate models, measures of cognitive skills had a significant effect on the probability of a nonnumeric response. Both completion of primary school and achievement of a higher-than-primary education had a highly significant negative association with nonnumeric response. The odds of a nonnumeric response for "completed primary school" and for "greater than primary school" were 0.34 and 0.32, relative to the odds for "less than primary school." Furthermore, whether the last birth was wanted had a significant effect; those who reported their last birth as a failure in timing or in number were less likely to give a nonnumeric response.

Among the measures of reproductive control, sterilization status had a highly significant positive effect. The odds of giving a nonnumeric response for sterilized women, compared to those for nonsterilized women, were 2.3. By contrast, the effect of using other contraceptive methods was clearly negative, although of borderline significance in the final equation. This finding is as expected if reproductive control behavior is associated with explicit fertility goals. The difference in direction between these two components of contraception highlights the importance of identifying special circumstances associated with specific methods, as discussed further below. Community and program factors, as measured in this analysis, had no statistically significant effect on the probability of nonnumeric response when other factors were controlled.

Most coefficients remained fairly stable across models. We found only one exception: the coefficient for having a birth in the last five years was diminished by the addition of reproductive control measures. The effect of education was strong and stable even when reproductive control and community and program variables were added to the model. In this analysis we tested several multiplicative interactions between sterilization, education, and actual family size, but none produced significant results.

DISCUSSION

In this paper we have approached nonnumeric response to DFS from a conceptual framework that views such responses as a function of macro-level factors, such as the aggregate level of fertility, of micro-level factors, such as individual cognitive skills and reproductive experience, and of circumstances of data collection. The analysis presents evidence from two different levels of observation. At the macro level, we compare country-level data on the proportion of nonnumeric responses and the number of children desired among numeric respondents in a variety of countries. At the micro level, we examine the 1981 CPS survey in Costa Rica.

Data for the macro-level analysis were compiled from published reports of the WFS, DHS-I, DHS-II, and a few independent surveys. The analysis confirmed the expectation

that countries with high desired family size in general would have higher proportions of nonnumeric response. We also present some examples that emphasize the effect of community context and perhaps some influence of questionnaire design as well. The analysis also illustrates that considerable variability in the level of nonnumeric response persists in some countries that show similar levels of numeric preferences and that received the same questionnaire. The major focus of the paper, however, is the individual analysis of the Costa Rican data. At the outset we noted two interrelated substantive questions that relate to nonnumeric response: 1) do those who give nonnumeric responses to DFS indicate preferences relevant to family size or pace of childbearing in other ways? and 2) what factors are associated most closely with the probability of a nonnumeric response?

On the first score we pointed out several ways in which women who gave a nonnumeric response indicated clear preferences regarding past or future fertility in their attitude either about prior births or about current fertility regulation. More than half of the nonnumeric respondents were sterilized, and nearly 28% were currently using another method of contraception. Among nonnumeric respondents who were not sterilized ($n = 57$), 65% wanted no more births. Furthermore, 43% of all nonnumeric respondents reported that their last birth was either a timing failure or was altogether unwanted at that time. The combined evidence of fertility-regulating behavior and attitudes about the desirability of past and future births suggests that most nonnumeric respondents to DFS have fertility preferences related to their ultimate family size or to the pace of childbearing. Thus, the findings from Costa Rica do not support the hypothesis that women who fail to give a numeric DFS are indifferent to their fertility, or that they believe fertility regulation is under the control of the supernatural.

On the second point, findings reveal several factors among the four categories of individual variables which influence the probability that a woman will give a nonnumeric response. Our analysis demonstrates that measures of cognitive skill and of reproductive control are important determinants of nonnumeric response. Measures of reproductive history were less important; community and program factors had no statistically significant effects.

Among the reproductive history variables, only the number of living children had a statistically significant effect on the probability of a nonnumeric response. This finding suggests that women with large numbers of children may have exceeded a target number and may be reluctant to state a desired family size lower than the actual size. Alternatively, the absence of a target may have contributed to the larger family size, and the nonnumeric response simply may reflect this lack of a specific preference.

Findings confirm our hypothesis that the respondent's cognitive abilities and ability to handle hypotheticals figure prominently in the probability of eliciting a nonnumeric response to DFS questions. The tendency for women with more education to give numeric responses supports the expectation that education improves a respondent's ability to deal with abstract concepts and ambiguity. Education also may act as a proxy for other variables, such as aspects of socioeconomic status not measured in this analysis.[1] The effect of wantedness of the previous birth was less great than that of education, but appears to be a significant indicator of the respondent's ability to field hypothetical questions.

Measures of reproductive control behavior, particularly sterilization, also were important determinants of the probability of a nonnumeric response. Women who were sterilized were about 2.5 times as likely to give a nonnumeric response as were nonsterilized women. This finding conflicts with the hypothesis that contraceptive use indicates target-oriented fertility behavior. Although the effect of other contraceptive use is statistically insignificant, it is in the expected direction: negative.

Two factors may explain why use of sterilization is associated with higher rates of nonnumeric response. First, as mentioned earlier, being sterilized may add a layer of

thinking to a question that is considerably complex from the outset. Sterilized women no longer can increase their family size, whereas women who say they want no more children can change their mind at any time. This question may make them rethink whether they would choose to be sterilized if they had the choice.[2] In a related line of thought, sterilized women may not have thought about their fertility preferences for a long time because the decision to use sterilization could be well in the past.

The second factor concerns the political and religious context of Costa Rica. Although we did not address this variable directly in our individual-level analysis of Costa Rica, it was discussed in Table 1 in the broader context. We believe it also may be relevant in explaining this finding. As stated earlier, sterilization for contraceptive purposes has been technically illegal in Costa Rica since the mid-1970s because of pressure from the Catholic Church and other organizations. Since that time the procedure has been performed for health reasons only, although in practice, many women continue to be sterilized to limit childbearing. Few women reported in the survey that they were sterilized for contraceptive purposes; they may have suspected that the DFS question was a veiled attempt to trick them into admitting that this was the motive for their sterilization. The ordering of questions in the 1981 CPS may have exacerbated this situation because the question about DFS immediately followed the section on sterilization status. That section included questions about where, why, and how long ago the respondent had undergone the procedure. Although it is doubtful that respondents in Costa Rica would fear repercussions, acquiescence bias in surveys is a common phenomenon (Schuman and Presser 1981). Also, it is reasonable to believe that women might provide the most socially acceptable response in this situation—that is, a response that would not indicate sterilization for contraceptive purposes. If sterilization were found to be associated strongly with nonnumeric response in other countries, where sterilization was considered appropriate for contraception, it would indicate that the first factor--the woman's individual situation in coping with the hypothetical question—was a major influence. If no such association were noted, it would suggest that the specific climate of opinion in Costa Rica was strongly influencing the results reported.

Finally, our measures of the community environment did not significantly affect the probability of a nonnumeric response. We hypothesized that modernity and exposure to the family planning program might make women more familiar with numeracy in general, and with the concept of reproductive targets. Failure to find an effect of contact with a family planning program may be a function of widespread exposure to family planning through private sources and the media as well as through the government programs.

On the basis of these findings we make several recommendations for future research on fertility preferences. We advise other investigators to ensure that questions are consistent across subgroups of the sample population. Problems of comparability in the analysis are created by asking one group of respondents how many additional children they want and another group about how many they would have if they alone could decide. These are two very different questions and should be treated as such. The former is a specific question that allows no deviation from the respondent's past experiences, whereas the latter leaves open a wide range of possible changes in life course events.

We suggest that two types of questions be asked of all respondents. First, women should be asked about their desire for more children, regardless of sterilization status or other conditions that may prohibit future births. It would be preferable, however, to ask a question with three distinct categories such as the following: "Is the number of children you have right now 1) equal to the number you would like to have when you have completed your family, 2) smaller than the number you would like to have, or 3) larger than the number you would like to have?" Separate categories for "don't know" "up to God" and so on should be provided on the questionnaire to be marked by the interviewer. Women who

want more should then be asked how many additional children they would prefer to have; similarly, women who want fewer children should be asked how many fewer they would like to have.

Presumably this sequence would elicit the respondent's current preference for number of children, incorporating present circumstances, past experience, and future outlook. In recognition that some respondents may be reluctant to admit having more children than they currently prefer, it also might be useful to ask all respondents a more generalized question about ideal family size, such as "If you alone could decide . . ." or "If you could start over again . . ." to all respondents.

Our analysis of the Costa Rican data shows that the exact choice and sequence of questions on preference require careful attention, and that it may be necessary to take into account the specific cultural and political context surrounding issues of fertility control.

NOTES

[1] In analyses not shown, other measures of individual and community socioeconomic status such as partner's occupation, and distance to major city were not statistically significant.

[2] We tested an interaction term between sterilization and education to see whether education was a more important factor for women who had to overcome this additional layer of complexity, but there we found statistically significant effect.

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