

# Reassessing the Level of Unintended Pregnancy and Its Correlates in Vietnam

Linh Cu Le, Robert Magnani, Janet Rice, Ilene Speizer, and William Bertrand

*Despite rapidly increasing contraceptive use and rapidly declining fertility, unintended pregnancy and induced abortion remain common in Vietnam. This study reassesses the level of unintended pregnancy in Vietnam and its correlates, drawing on retrospective calendar data gathered for the Vietnam Demographic and Health Survey II. Data from 13,540 “segments” of outcomes and contraceptive practice were analyzed. Based on the calendar data, 40 percent of pregnancies during the 1994–97 period are estimated to have been unintended, a proportion 48 percent higher than the prevailing estimate calculated from the reported intendedness of live births. When concealment of pregnancies ending in induced abortions is taken into account, the unintended pregnancy rate in Vietnam is likely to approach levels found only in developing countries. Unintended pregnancy was found to be associated with age, early marriage, spousal age difference, number of living sons, past unintended pregnancy, geographic region, contraceptive use prior to pregnancy, and the family planning supply environment. The findings suggest that broadening the method mix at the community level, targeting high-risk and underserved groups, and expanding postabortion counseling and services are likely to have a dramatic impact on the unintended pregnancy rate in Vietnam. (STUDIES IN FAMILY PLANNING 2004; 35[1]: 15–26)*

Unintended pregnancy is an important public health issue. Studies in both developing and developed countries have pointed to associations between unintended pregnancy and adverse socioeconomic and health outcomes for mothers and children. The latter include elevated risk of poor child development, preterm delivery, and low birth weight (Brown and Eisenberg 1995; Buvinić 1998; Kost et al. 1998; Zabin and Kiragu 1998; Joyce et al. 2000; Daulaire 2002). Although some studies report that the association between unintended pregnancy and adverse outcomes is muted when socioeconomic factors and family background are taken into account (Buvinić 1998; Zabin and Kiragu 1998; Santelli et al. 2003), at least one health risk associated with unintended pregnancy is un-

contested: the subsequent higher incidence of induced abortion. The Alan Guttmacher Institute (1999) estimates that 56 percent of unintended pregnancies occurring to women in developing countries end in induced abortion. Because abortions in these settings are often performed under unsafe conditions, sizable numbers of women are at risk. Indeed, abortion is thought to be a major contributor to the unacceptably high levels of maternal mortality in many such settings (WHO 1997). Beyond health risks, high rates of unintended pregnancy indicate people's inability to achieve their reproductive intentions, in itself a matter of concern.

This study examines levels and determinants of unintended pregnancy in Vietnam. With a population of 76.4 million, Vietnam is the world's fourteenth most populous country (PRB 1999). In the last 75 years, the population of Vietnam has almost quintupled, in contrast with the global population's threefold increase. The country's population structure is very young; 35 percent of Vietnamese are younger than 15 (as compared with 43 percent of Africans, 26 percent of Chinese, 18 percent of Europeans, 15 percent of Japanese, and 21 percent of the population of the United States) (PRB 1999). Demographic indicators have improved in recent years, reflecting government policy and program efforts and international support. The total fertility rate (TFR) for

---

Linh Cu Le is Head, Department of Demography, Hanoi School of Public Health, 138 Giang Vo Street, Hanoi, Vietnam. E-mail: lcl@hsph.edu.vn. Robert Magnani is Chair, and Ilene Speizer is Lecturer, Department of International Health and Development; Janet Rice is Lecturer, Department of Biostatistics; and William Bertrand is Director, Payson Center for International Development and Technology Transfer, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA.

Vietnam estimated in the 1999 census was 2.3 children per woman of reproductive age (GSO 2001). This rate represents a continuation of the rapid fertility decline indicated by previous demographic surveys: a TFR of 4.0 for 1987 (Vietnam Demographic and Health Survey 1989 [VNDHS I]), 3.3 for the period 1989–93 (Intercensal Demographic Survey 1994 [ICDS]), and 2.5 for the period 1996–97 (Vietnam Demographic and Health Survey 1999a [VNDHS II]). Life expectancy has improved from 63 years for males and 67.5 years for females in 1994 to 64.9 years and 69.9 years, respectively, in 1999. The infant mortality rate (IMR) is estimated to have declined to approximately 32 deaths per 1,000 live births as of 2002 (NCPFP 1999b).

The rapid fertility decline in Vietnam reflects significant growth in contraceptive use. VNDHS II data indicate that the all-method contraceptive prevalence rate (CPR) reached 75 percent by 1997 and the modern-method rate, 56 percent (NCPFP 1999a). Despite the increased rates of contraceptive prevalence, rates of unintended pregnancy and abortion in Vietnam remain high. Overall, 27 percent of the births that respondents reported in the VNDHS II as having occurred during the 1994–97 period they classified as having been unintended (15 percent as mistimed and 12 percent as unwanted) (NCPFP 1999a). This proportion places Vietnam at the upper end of the range of unintended birth rates (12 percent to 34 percent) among the 34 developing countries considered by Tsui et al. (1997) in a comparative study based upon DHS data.

As striking as these survey data on intendedness are, they understate the actual level of unintended pregnancy in Vietnam because they are drawn from reports of intentions with regard to live births only. In a country such as Vietnam where abortion is legal and widely practiced, the basis for the estimate captures only part of the picture. The data also exclude never-married women.

The present study has two purposes. The first is to reassess the level of unintended pregnancy in Vietnam taking into account pregnancies not ending in a live birth, possible because calendar data were collected for the VNDHS II. In the calendar section of the questionnaire, information was gathered about all pregnancies occurring in the three years prior to the survey interview, not just those resulting in live births. Although these data are not free from reporting error (for example, resulting from concealment of pregnancies ending in abortion), because abortion is legal and widely practiced in Vietnam, higher levels of reporting of such events are likely than is the case in other settings where abortion is illegal or strongly stigmatized. Even if some underreporting occurs, estimates of the level of unintended pregnancy from such data will, nevertheless, be more

accurate than those based solely upon the number of pregnancies resulting in live births. For this study, the characteristics of women experiencing unintended pregnancies are also assessed, because policymakers and program designers need to have an accurate gauge of the prevalence of unintended pregnancy, and also to understand its causes.

## Data and Methods

The VNDHS II used a two-stage cluster sample design, based on the sample of the 1996 Vietnam Multi-round Survey (VNMRS), conducted biannually by the General Statistical Office of Vietnam. The sample was also stratified by 15 “project” provinces and other “nonproject” provinces because it was used as the baseline for the Population and Family Health project in Vietnam. For project provinces, at the first stage of sample selection, 70 primary sampling units (PSUs)—or “clusters,” corresponding to communes in rural areas and resident blocks in urban areas—were selected. For the nonproject provinces, one more step was added to reduce the field costs as follows: PSUs in 20 provinces were selected with probability proportional to estimated size, and 135 secondary sampling units (clusters) were selected. The two groups of provinces were also stratified by urban–rural setting. The urban areas were oversampled, which resulted in the need for a weighting strategy during the analysis. The final sample included 205 clusters with a total of 7,150 households. Of these, 7,001 (98 percent) were successfully interviewed. A total of 5,704 eligible female respondents (that is, ever-married women) were identified in the household interviews, of which 5,664 (99 percent) were successfully interviewed. Survey fieldwork took place from July to October 1997. The survey included a household questionnaire, a woman’s questionnaire, and a community health facility questionnaire. Many questions on current pregnancy status and contraceptive practice were skipped during the interviews with formerly married women, who numbered 324 among survey respondents. Thus, the study analysis was restricted to responses from 5,340 currently married women.

The study takes advantage of calendar data gathered in conjunction with the individual questionnaire in which female survey respondents were asked to report retrospectively their pregnancy status, pregnancy outcomes, and contraceptive use (as well as reasons for discontinuation) on a month-by-month basis for a period covering 67 to 69 months from January 1992 to whatever month the interview took place in 1997. Information on pregnancy intentions, essential to the present

study, was available only for the pregnancy events that occurred in or after January 1994, however. Thus, the events analyzed in the study were reported to have occurred during the 43-to-45-month period prior to the survey interview in 1997.

The intendedness of pregnancies was measured in the VNDHS II by asking respondents to recall how they felt each time they became pregnant. If a woman reported one or more births since January 1994, the interviewer asked, "At the time you became pregnant with [child's name], did you want to become pregnant then, did you want to wait until later, or did you want no (more) children at all?" If a woman was pregnant at the time of the survey, she was asked, "At the time you became pregnant, did you want to become pregnant then, did you want to wait until later, or did you not want to become pregnant at all?" Similarly, if any of the respondent's past pregnancies had ended in an induced abortion or menstrual regulation, the interviewer asked, "At the time you became pregnant with the pregnancy that ended in your [last/next-to-last induced abortion/menstrual regulation], did you want to become pregnant then, did you want to wait until later, or did you want no (more) children at all?" Pregnancies for which a respondent reported having wanted to wait until later were classified as mistimed, whereas those reported as having not been wanted at all were classified as unwanted. These two categories combined constitute unintended pregnancies.

In order to take maximum advantage of the calendar data, the unit of analysis for the study was not the woman, but rather pregnancy and contraceptive use segments. A "segment" is defined as a month or a continuous set of months in the reproductive calendar of a woman that satisfies one and only one of the following conditions: (1) multiple months coded as "pregnancy," followed by a "terminated-pregnancy" month (the month in which the pregnancy was terminated is considered the last month of the pregnancy segment); (2) multiple months coded as "pregnancy" followed by a "live-birth" month (the live-birth month is considered to be the last month of the pregnancy segment); and (3) months that have the same code (except for "live births" and "pregnancy"), regardless of length. The segments in the third category consist primarily of intervals of successful contraceptive use (defined as those ending either in method discontinuation or in switching to another method while not pregnant) and intervals of nonuse of a contraceptive that did not result in a pregnancy. Segments that were truncated at the interview were classified as censored pregnancy, contraceptive use, or nonuse segments, respectively. The algorithm used to classify segments is documented in Appendix A.

A separate record was created for each segment category in a new dataset in which the characteristics of the segment were variables. Characteristics of survey respondents measured in other sections of the VNDHS II questionnaire were attached to these records as additional variables so that possible statistical associations could be assessed. This restructured dataset permitted survey respondents to contribute more than one event to the analysis, reflecting Vietnamese women's contribution of differing numbers of events to the country's demographic history during the 1994–97 period. Although listed in the descriptive analysis, miscarriages and stillbirths were excluded from the analyses about intendedness of pregnancies because no question about intention was asked for those segments in the survey.

### *Analytic Procedures*

Because respondents to the VNDHS II were chosen with differing probabilities of selection, the data had to be weighted to obtain unbiased estimates of the parameters of interest in the study. Accordingly, all data were weighted by the inverse of the overall probability of selection. Standard errors of population estimates and regression parameters were corrected for the use of cluster sampling in the VNDHS II using the "survey" command in the STATA software package.

The unintended pregnancy rate was estimated as the proportion of pregnancies reported in the calendar section of the survey as having been unintended, divided by the total number of pregnancies reported, with both numerator and denominator including pregnancies censored by the survey interview. Table 1 presents the operational definition of the factors considered in the analyses of correlates of unintended pregnancy. Statistical associations were assessed using standard bivariate and multivariate statistical methods. In the multivariate analyses, sequential binary logistic regressions were estimated predicting the odds that pregnancy segments were unintended (versus intended) for each of the independent variables considered in the analysis, net of the effects of the other factors considered.

Using segments as the unit of analysis introduces the problem of statistical dependency because women can and do contribute more than one segment of events, and the observations for a given woman may be correlated. The danger of this dependency is a downward bias in the estimated standard errors of odds ratios in the logistic regressions; that is, if this bias were to be present, the statistical significance of the estimated odds ratios would be overstated.<sup>1</sup> Because compensating for the unequal probabilities of selection and the use of cluster sam-

**Table 1** Definitions and coding values of the correlates considered in the analysis of levels of unintended pregnancy in Vietnam

Variable label and explanation	Coding value
Socioeconomic status index: Household characteristics and amenities	
Socioeconomic status (low: fewer than four assets; middle: four to eight assets; high: more than eight assets). The 12 assets are: piped water, flush toilet, electricity, radio, television, refrigerator, bicycle, motorcycle, car, clean (not dirt) floor, concrete roof, telephone.	0 = low 1 = middle 2 = high
Demographic characteristics of women	
Region	1 = Northern Uplands 2 = Red River Delta 3 = North Central 4 = Central Coast 5 = Central Highlands 6 = Southeast 7 = Mekong River Delta
Project province	0 = No 1 = Yes
Age when first married (years)	0 = ≤ 20 1 = 20+
Occupation	0 = Agriculture/ unemployed 1 = Nonagriculture
Background characteristics and influence of husbands	
Educational level	0 = Primary or none 1 = Secondary+
Spousal age difference (husband's age minus wife's age)	0 = Husband younger 1 = 0–3 years 2 = 4+ years
Which partner decides how to spend household money	0 = Wife and husband 1 = Wife 2 = Husband 3 = Other/jointly
Past pregnancy issues	
Number of sons at the beginning of segment	(Numeric variable)
Past unintended birth	0 = No 1 = Yes
Past unintended pregnancy that was terminated	0 = No 1 = Yes
Special variables on the segments of the calendar	
Age of woman at the beginning of segment (years)	0 = <20 1 = 20–29 2 = 30–39 3 = 40+
Intendedness of pregnancy	0 = Intended 1 = Unintended
Used contraceptive method in previous segment	0 = No 1 = Used traditional method 2 = Used modern method
Supply environment for contraceptive methods	
Community level Three sources of supply mentioned in the DHS: Community-based method and service availability, with two methods included in the questionnaire (the pill and condom, represented by two variables); family planning worker visits village, providing the pill, condom, and counseling (represented by three variables); and mobile family planning team service availability, providing the pill, IUD, female sterilization, male sterilization, and injectable (represented by five variables). Community level of supply based on these ten variables, whether or not the method or service was available at the time the segment started. Each method or service available is given a score of one (zero if not available), with a possible total of ten for each supply environment.	
Local health facility 1 (commune health station within 30 kilometers)	
The pill available at the beginning of segment	0 = No 1 = Yes
IUD available at the beginning of segment	0 = No 1 = Yes
Supply environment scored similarly to that of community level. A five-score scale was constructed, based on the reported availability of five contraceptive methods (according to the survey). Methods included: the pill, IUD, injectable, foam, and other.	
Local health facility 2 (district health center within 30 kilometers)	
The pill available at the beginning of segment (district)	0 = No 1 = Yes
IUD available at the beginning of segment (district)	0 = No 1 = Yes
Supply environment scored similarly to that of the commune health station. A five-variable scale was constructed, based on the reported availability of five contraceptive methods (according to the survey). Methods included: the pill, IUD, injectable, foam, and other.	

pling were considered essential, STATA was used to analyze the segment-based data, and no adjustment for dependency was made. However, a sensitivity analysis was undertaken to assess the potential magnitude of bias resulting from an inability to address all of these statistical issues simultaneously. In the sensitivity analysis, logistic regression models using the most recent pregnancy event of individual women as the unit of analysis were compared with the results of regressions in which women were permitted to contribute multiple segments to the analysis. The findings of this sensitivity analysis are presented below.

Several other limitations of the study should be noted. Some of these concern the concept of the intendedness of pregnancies. Recall bias may occur in responses to retrospective survey questions about intendedness; specifically, pregnancies that were, in fact, unintended may be reported as having been wanted. Recall bias may also be an issue with regard to other measurements in the survey (for example, misreporting of the timing or sequence of events). Moreover, questions have been raised about whether the complex nature of pregnancy intentions, which involves emotional and psychological factors and ambivalence for many women, can be captured adequately by questions such as those used in the DHS (Bacharach and Newcomer 1999; Sable 1999; Klerman 2000; Santelli et al. 2003). Neither is the role husbands may play in how a woman perceives her pregnancy intentions captured by the survey questions. How to obtain survey responses that adequately reflect such nuances is a high priority for future research.

Another limitation of the study concerns the cross-sectional nature of the data, which limits researchers' ability to establish causality, although the retrospective calendar data available in the VNDHS II improves their ability to establish the sequence of events to some degree. The available data permit the establishment of statistical associations, but not necessarily of causal relationships.

The variables used in this study are limited by the design of the VNDHS II, which omitted a number of questions typically included in Demographic and Health Surveys. Among these, for example, were questions about the onset of sexual relationships, about sexual behaviors of women and their partners, about men's perceptions of desire for children and of contraceptive practice, and about respondents' reasons for not using contraceptives before each pregnancy with known intention. The survey also excluded responses from never-married women.

Finally, several limitations of the measurement of the family planning supply environment should also be noted. As the supply environment is measured at the community or, more precisely, the sample-cluster level, all wom-

en living in the same sampling cluster are assumed to have been exposed to the same community environment and characteristics, including the same commune health station, district health center, and the same family planning personnel. This assumption is an oversimplification; women may go outside their home village for family planning services. Village women commonly visit provincial polyclinics to seek menstrual regulation/abortion services, and urban women may obtain family planning methods near their workplace rather than at pharmacies close to their homes. Ideally, service availability should be measured for each respondent. Moreover, the supply environment measured in each sample cluster in 1997 was assumed to characterize the average environment during the 1994–97 period. Finally, because of the limited information gathered in the service availability module, key aspects of the supply environment such as the training of service providers and the quality of services provided could not be included in the analysis.

## Results

The age distribution of all segments in the reproductive history calendar of the 5,340 women in the DHS sample is summarized in Table 2. A total of 13,540 segments for currently married women were available for analysis during the period from January 1994 to the survey date in 1997. Each woman had 2.5 segments, on average. The length of segments ranged from 1 to 45 months, with a mean of 17.5 months (standard deviation = 15.5).

Of the 13,540 segments in the reproductive calendar, 622 segments of pregnancy (5 percent) did not result in a live birth, 2,123 were live-birth segments (16 percent), and 296 were currently pregnant segments (2 percent) at the time of the survey. Live-birth segments were most common among younger women; 36 percent of the live-birth segments were experienced by women aged 20–24. Pregnancies that did not result in a live birth were more likely to occur among older women; 24 percent of these segments were experienced by women aged 25–29 and another 24 percent by those aged 30–34. Successful contraception segments comprise the largest proportion (5,171 segments, or 38 percent of all segments), followed by segments in which no method was used and intention was not reported (22 percent).

Table 3 shows the pregnancy/nonpregnancy distribution of all segments. Seventy-eight percent of the segments were nonpregnant, and occurred primarily among women aged 20–24 and 25–29. Miscarriages and stillbirths constitute only 1.2 percent and 0.2 percent, respectively, of all segments. Menstrual regulation occurred

**Table 2** Percentage distribution of currently married women, by age group (at the beginning of segment), according to segment category for DHS calendar data, Vietnam

Age	Type of segment									All types
	Pregnancy not resulting in a live birth	Pregnancy resulting in a live birth	Current pregnancy	Contraceptive failure	Contraceptive success	Contraceptive method used, unclear intention	No method used, pregnancy intended	No method used, pregnancy unintended	No method used, intention not reported	
12–19	5.5	14.4	15.5	4.8	2.2	2.3	29.8	12.0	9.5	9.5
20–24	19.6	36.0	37.8	19.2	17.6	27.3	32.2	29.7	28.4	25.5
25–29	23.5	24.8	25.0	29.0	24.5	27.3	22.0	23.4	23.6	24.1
30–34	23.5	16.3	11.8	24.0	25.2	18.2	11.3	18.4	16.9	19.8
35–39	19.0	6.3	8.1	18.9	18.4	15.9	4.0	12.5	11.4	13.0
40–44	7.2	2.1	1.0	3.9	10.7	9.1	0.8	3.3	7.3	6.7
45–49	1.8	0.2	0.7	0.3	1.5	—	—	0.7	3.0	1.4
Percentage distribution	4.6	15.7	2.2	2.5	38.2	0.3	10.1	4.4	22.0	100.0
(N)	(622)	(2,123)	(296)	(334)	(5,171)	(44)	(1,366)	(602)	(2,982)	(13,540)

— = Not applicable. DHS = Demographic and Health Survey.

Source: NCPFP (1999a).

in 290 segments (2 percent) and numerically was almost two times more common than induced abortion (153 segments). The total number of pregnancy segments in Table 3 is smaller than that shown in Table 2 because, as mentioned above, intendedness information was not available for cases of miscarriage and stillbirth, so that those segments are excluded from Table 3.

Data on the intendedness of all pregnancy segments are presented in Table 4 (induced abortion and menstrual regulation were combined in one category). The intendedness of the live-birth segments that started earlier than or exactly in January 1994 were missing in the original DHS dataset. These 386 segments also are excluded from analysis, leaving the total number of pregnancy segments with known intentions at 2,476. Of these segments, 40 percent (N = 982) were reported as having been unintended, of which 16 percent were mistimed and 24 percent were not wanted at any time. The unintended proportion was 27 percent among live births (15 percent

mistimed and 12 percent unwanted at any time), 96 percent among abortions (16 percent mistimed, 80 percent unwanted), and 27 percent among currently pregnant segments (15 percent mistimed, 12 percent unwanted). The estimate of unintendedness based upon the total number of pregnancies reported in the calendar section of the VNDHS II questionnaire is, therefore, 48 percent higher than that based upon live births.

### *Correlates of Unintended Pregnancy*

To assess the correlates of unintended pregnancy among Vietnamese women, sequential logistic regression analyses were undertaken with intendedness status as the outcome measure and the following sets of predictors: women's background and sociodemographic characteristics; husband's characteristics; and measures of the family planning supply environment calculated in terms of contraceptive methods and services available at the commu-

**Table 3** Percentage distribution of segments, by age group (at the beginning of segment), according to segment category for DHS calendar data, Vietnam

Age	Live birth	Induced abortion	Menstrual regulation	Miscarriage	Stillbirth	Currently pregnant	Not pregnant	Total
12–19	14.4	2.6	1.7	13.5	17.4	15.5	8.5	9.5
20–24	36.0	13.1	18.6	25.0	39.1	37.8	23.3	25.5
25–29	24.8	17.6	25.5	26.3	17.4	25.0	24.0	24.1
30–34	16.3	28.8	25.9	14.7	17.4	11.8	20.5	19.8
35–39	6.3	22.9	20.3	14.1	8.7	8.1	14.2	13.0
40–44	2.1	13.7	5.2	5.8	—	1.0	7.8	6.7
45–49	0.2	1.3	2.8	0.6	—	0.7	1.6	1.4
Percentage distribution	15.7	1.1	2.1	1.2	0.2	2.2	77.5	100.0
(N)	(2,123)	(153)	(290)	(156)	(23)	(296)	(10,499)	(13,540)

— = Not applicable.

Source: NCPFP (1999a).

**Table 4** Percentage distribution of pregnancies reported by respondents to the VNDHS II (1997), by intendedness category, according to outcome

Intendedness	Live birth	Abortion	Currently pregnant	Total
Wanted then	72.7 (1,262)	3.4 (15)	73.3 (217)	60.3 (1,494)
Wanted later	15.5 (270)	16.3 (72)	15.2 (45)	15.6 (387)
Not wanted	11.8 (205)	80.4 (356)	11.5 (34)	24.0 (595)
Percentage distribution (N)	70.2 (1,737)	17.9 (443)	12.0 (296)	100.0 (2,476)

**Note:** Miscarriage, stillbirth, and live-birth segments lacking intendedness information were excluded from the analysis.

nity, commune health station, and district levels. The unit of analysis was the segments of pregnancy in which the intention can be identified explicitly. All segments with missing values for any of the predictor variables considered were excluded, yielding a total of 1,504 segments for analysis.

Table 5 displays the odds ratios, standard errors, t-statistics, and p-values for each of the predictors in the final model (that is, variables that retained a p-value of less than 0.05 after other variables were included). Among the independent variables considered, eight variables pertaining to the respondent's and her husband's characteristics and one variable pertaining to the family planning supply environment emerged as significant.<sup>2</sup>

Geographic region emerged as a strong predictor of unintended pregnancy. Using the Mekong River Delta (in the south of Vietnam) as the reference category, all four regions in the north and north-central region of Vietnam show a higher risk of unintended pregnancy outcomes. Pregnancy segments based on responses from women of the Central Coast Region had a risk of having been categorized as unintended 3.4 times higher than those based on responses of women from the Mekong River Delta region. The other three regions also showing high risk were Northern Uplands (OR = 3.1), Red River Delta (OR = 2.5), and North Central (OR = 2.4).

As women age and have fewer pregnancies, it is more likely that their pregnancies will be unintended. Compared with the reference group (women younger than 20), the risk for women aged 20–29 is 2.7; for women aged 30–39, it is 4.3; and for women older than 40, it is 5.7. Women who were not currently married were excluded from the VNDHS II sample, so that the elevated levels of risk observed among older women might reflect the circumstance that a sizable number of unintended pregnancies among young women were missed by the survey as a result of this restriction.

The likelihood of unintended pregnancy was also associated with age at first marriage. Compared with the

**Table 5** Odds ratios for predictors in logistic regression model of pregnancy intendedness (comparing intended pregnancies with unintended pregnancies), Vietnam

Predictor	Odds ratio	Standard error	t-statistic	p-value
<b>Region</b>				
Central Coast	3.44	1.21	3.53	0.001
Mekong River Delta (r)	1.00	—	—	—
North Central	2.36	0.77	2.64	0.009
Northern Uplands	3.10	0.89	3.94	0.000
Red River Delta	2.54	0.75	3.16	0.002
Southeast	1.30	0.49	0.71	0.481
<b>Woman's age (years)</b>				
≤ 20 (r)	1.00	—	—	—
20–29	2.75	0.79	3.51	0.001
30–39	4.30	1.31	4.81	0.000
40+	5.68	3.36	2.93	0.004
<b>Age when first married (years)</b>				
≤ 20 (r)	1.00	—	—	—
20+	0.66	0.10	-2.72	0.007
<b>Number of living sons</b>				
Had previous unintended birth	6.08	4.02	2.74	0.007
<b>Had previous unintended pregnancy that ended in abortion</b>				
8.00	3.99	4.17	0.000	
<b>Used contraceptive method in previous segment</b>				
No (r)	1.00	—	—	—
Used traditional method	4.66	1.50	4.79	0.000
Used modern method	4.80	1.61	4.68	0.000
<b>Spousal age difference</b>				
No difference (r)	1.00	—	—	—
≤ 3 years	1.69	0.36	2.47	0.015
4+ years	1.72	0.39	2.37	0.019
<b>Supply environment at district health center</b>				
0.71	0.09	-2.73	0.007	

Segments: N = 1,504. (r) = Reference category. — = Not applicable. Model fit: F statistic = 11.32; p < 0.001.

segments based on responses of women who were married before the age of 20, the risk of those who married after 20 was reduced by approximately one-third. In other words, women who married before age 20 had a risk of unintended pregnancy 1.5 times greater than did those who married later.

The number of living sons was also a highly significant predictor of risk in the model. Having at least one living son at the time the segment occurred increased a woman's risk of unintended pregnancy about 2.8 times. This finding undoubtedly reflects the strong preference for male children found throughout Asia.

A past history of having had an unintended pregnancy emerged as a powerful predictor of the likelihood that a given pregnancy would be reported as unintended. In preliminary bivariate analyses, an odds ratio of 14 was obtained. After controlling for other factors, however, the odds that a woman with a previous unintended birth

will have another was reduced to six. Pregnancies preceded by an unintended pregnancy that ended in menstrual regulation or abortion were almost eight times more likely than others to have been unintended.

Using a contraceptive method in the period prior to a given pregnancy was also associated with unintended pregnancy status. Compared with segments in which no preceding use of a contraceptive was reported, those in which traditional methods and modern methods were used were 4.7 and 4.8 times more likely to have been classified as unintended, respectively. Among the unintended pregnancy segments, 66 percent used no contraceptive method prior to the pregnancy, 11 percent practiced withdrawal, 9 percent used an IUD, 6 percent practiced periodic abstinence, 5 percent used a condom, and 3 percent used an oral contraceptive (not shown). Compared with the number of women who reported successful contraceptive-use segments, the proportion of those using contraceptive methods (especially the more efficient methods like the IUD) prior to unintended pregnancy segments is extremely low. Among 5,171 successful use segments, 50 percent were using the IUD, 8 percent the condom, 7 percent the pill, 7 percent had undergone female sterilization, 17 percent practiced withdrawal, and abstinence accounted for 10 percent (not shown).

Among the husband's variables considered, only spousal age difference emerged as significant. Compared with the pregnancies of women who had younger husbands, the pregnancies of those whose husbands were older were about 1.7 times more likely to be declared unintended.

Finally, when controlled for other variables, a favorable family planning method-supply environment at the district level (as measured by the five-item scale described above) was associated with a significantly lower likelihood of reporting a pregnancy as unintended. This variable represents the contraceptive methods available at the district health center at the time the segment in question began. Specifically, the findings indicate that the availability of an additional family planning method at the center is associated with a reduction of about one-third in the proportion of pregnancies classified as unintended.

### Sensitivity Analysis Results

As indicated above, a sensitivity analysis was undertaken in order to validate the segment-based analysis because of the possibility of bias resulting from statistical dependency on multiple observations for the same women. In the sensitivity analysis, the regression results presented

above were compared with those from a similar logistic regression based solely on the most recent pregnancy event (with known intention status) for each survey respondent. The sensitivity analysis is, therefore, based on a smaller sample, 1,265 pregnancy events.

The results for this model (see Table 6) show that not only is the pattern of statistical associations the same but also the level of significance for each predictor is similar to that observed in the segment-based model. None of the independent variables changed its level of statistical significance (that is, from not significant to significant or vice versa) or direction of association (from positive to negative or vice versa). These results suggest that any statistical dependency present is unlikely to be of sufficient magnitude to invalidate the segment-based analyses undertaken in the study.

**Table 6** Odds ratios for predictors in a logistic regression model of pregnancy intendedness comparing intended pregnancies with unintended pregnancies reported by respondents to the Vietnam Demographic and Health Survey II, 1997

Predictor	Odds ratio	Standard error	t-statistic	p-value
<b>Region</b>				
Central Coast	4.30	1.43	4.38	0.000
Mekong River Delta (r)	1.00	—	—	—
North Central	2.92	0.95	3.30	0.001
Northern Uplands	3.81	1.00	5.11	0.000
Red River Delta	2.90	0.88	3.49	0.001
Southeast	1.90	0.79	1.54	0.125
<b>Woman's age (years)</b>				
< 20 (r)	1.00	—	—	—
20–29	2.72	0.95	2.88	0.005
30–39	4.21	1.57	3.86	0.000
40+	8.97	5.83	3.38	0.001
<b>Age when first married (years)</b>				
< 20 (r)	1.00	—	—	—
20+	0.63	0.11	-2.68	0.008
<b>Number of living sons</b>				
Had previous unintended birth	6.38	4.44	2.66	0.009
<b>Had previous unintended pregnancy that ended in abortion</b>				
Had previous unintended pregnancy that ended in abortion	6.56	3.35	3.68	0.000
<b>Used contraceptive method in previous segment</b>				
No (r)	1.00	—	—	—
Used traditional method	4.14	1.37	4.28	0.000
Used modern method	4.24	1.47	4.16	0.000
<b>Spousal age difference</b>				
No difference (r)	1.00	—	—	—
≤ 3 years	1.81	0.43	2.48	0.014
4+ years	1.69	0.45	1.99	0.049
<b>Supply environment at district health center</b>				
Supply environment at district health center	0.74	0.10	-2.24	0.027

(r) = Reference category. — = Not applicable.  
Most recent pregnancy event: N = 1,265. Model fit: F statistic = 13.65; p < 0.001.

## Discussion

This study presents evidence of an extremely high level of unintended pregnancy among married women in Vietnam during the 1994–97 period. The proportion of pregnancies that were unintended, estimated from VNDHS II calendar data, was 40 percent, that is, 48 percent higher than the official estimate of 27 percent obtained by the National Committee for Population and Family Planning from VNDHS II data calculated from reported intendedness of pregnancies ending in live births. More than 60 percent of unintended pregnancies reportedly were unwanted at any time rather than simply mistimed. Because pregnancies terminated by induced abortion may have been underreported, even this revised estimate may understate the true level of unintended pregnancy in Vietnam. Quantifying the level of underreporting is difficult, but even rough estimates are instructive. For example, an estimated 35 percent of abortions performed in the four-year period prior to the 1988 U.S. National Survey of Family Growth were reported in the survey, a proportion that, if it is accurate, would indicate that the number of abortions that were, in fact, performed in the United States was almost three times higher than the reported number (Jones and Forrest 1992).

Researchers often adjust for the underreporting of abortions by assuming that 100 percent of underreported abortions were unintended pregnancies (Henshaw 1998). The total abortion rate in 1997 based on the VNDHS II data was estimated to be twice what it was in 1994 (for example, 1.4 abortions per woman during her reproductive life in 1997, compared with 0.6 abortions per woman in 1994), an estimate based on data from several surveys (NCPFP 1999b). Other estimates calculated from government statistics suggest, however, that the level of induced abortion was very high in the early 1990s, at a rate of 2.5 lifetime abortions per woman (Goodkind 1994). The analyses undertaken for the present study may be based on an underreported number of abortions as presented in the VNDHS II. Although no reliable method of adjustment has been developed, the NCPFP estimated that the volume of menstrual regulations and abortions was probably 2.3 times higher than that which was shown in the VNDHS II data (NCPFP 1999b). If this adjustment is accepted, the level of unintended pregnancy would be calculated to be as high as 50 percent of all pregnancy events for the period 1994–97, and would suggest that about 30 percent of pregnancies during this period resulted in menstrual regulation and abortion. Compared with the estimate that 36 percent of the 182 million pregnancies occurring every year in developing countries are unplanned (AGI 1999), the conservative estimate of

40 percent for Vietnam (based on this study) is higher than average. If the adjustment proposed by the NCPFP is made, the level of unintended pregnancy in Vietnam would surpass that of any of the developing countries included in the comparative study by Tsui et al. (1997) and would approximate the levels found in the more developed countries (Kost and Forrest 1995; Williams et al. 1997; Henshaw 1998).

When allowance is made for the underreporting of induced abortion, the proportion of pregnancies occurring during this period that were unintended likely approaches 50 percent, a level usually found only in developed countries where demand for children is lower. As documented by Marston and Cleland (2003), concurrently high and rising levels of contraception and abortion are sometimes found in transitional societies where increased contraceptive use alone is insufficient to meet the growing need for fertility regulation that results from a rapidly falling demand for children. Vietnam in the 1990s appears to be a case in point.

Unintended pregnancy was found to be associated with several factors: older age of respondent, early age at marriage, husbands who were the same age or older, number of living sons, past history of unintended pregnancy, residence in the north and the central regions of the country, contraceptive use before the pregnancy, and a less favorable environment of contraceptive method supply at the district level. A number of these factors have clear programmatic implications.

The stark regional differentials in levels of contraceptive prevalence, unintended pregnancy, and abortion, as well as the finding that approximately two-thirds of unintended pregnancies resulted from nonuse of a contraceptive (compared with 34 percent resulting from ineffective use), clearly indicate a need for expansion of the national family planning program. In addition to addressing regional disparities in the contraceptive supply environment, service availability and accessibility remain issues for ethnic minorities, people of low socioeconomic status, and disadvantaged women in the north, especially in the Northern Uplands region. Targeting these areas and population subgroups with expanded program efforts has the potential to result in substantial and rapid declines in the incidence of unintended pregnancy and subsequent recourse to abortion. Contextually, the desire for a large family may also be a factor contributing to the intendedness of pregnancy. The segment-based analysis did not allow for the link between intendedness of pregnancy segments and the variable of desired family size. The descriptive analysis based on the woman as the unit of analysis indicated, however, that the ideal number of children reported by respondents dif-

fers among geographic regions. The average ideal number of children is lowest in the regions with higher proportions of unintended pregnancy and higher levels of abortion. Specifically, the mean ideal number of children was 2.9 in Central Coast, 4.4 in Central Highlands, 3.7 in Mekong River Delta, 2.6 in North Central, 2.2 in Northern Uplands, 2.1 in Red River Delta, and 3.3 in Southeast. These numbers constitute a clear message to family planning program policymakers for consideration and action.

In addition to expanded program reach, the finding that a third of unintended pregnancies resulted from the ineffective use of a contraceptive suggests a need for improved counseling and follow-up for women who adopt a method. With a modern-method contraceptive prevalence rate of 56 percent in 1997, family planning program efforts in Vietnam are approaching the stage at which program impact will be determined as much by improvements in method-continuation and use-effectiveness rates as they will be by increases in program reach. Therefore, an emphasis on improving the quality of existing services should be a high priority.

Although the IUD is widely available, other modern and nonpermanent methods are still not widely accepted and obtainable. Thus, the expansion and improvement of the modern contraceptive method supply environment should focus on making a variety of such methods available. Among women who reported unintended pregnancies, 9 percent were using the IUD, 5 percent used the condom, and only 3 percent used an oral contraceptive, compared with 11 percent who practiced withdrawal and more than 66 percent who did not use a contraceptive. Excluding the nonuse segments, withdrawal accounted for 34 percent of reported contraceptive failure, and use of the IUD accounted for the second-largest such proportion (25 percent). Seventeen percent of those who reported method failure said they practiced periodic abstinence, 15 percent used a condom, and only 9 percent used the pill. Among those who practiced contraception successfully, a high proportion (more than 50 percent) used the IUD, but other modern methods accounted for a fairly small proportion of these women (8 percent used the condom, 7 percent used the pill, and less than 7 percent were sterilized); 17 percent practiced withdrawal, and 10 percent practiced abstinence.

Finally, the significant proportion of Vietnamese women for whom unintended pregnancies and induced abortions reported during the 1994–97 period had been preceded by earlier unintended pregnancies and induced abortions is alarming. In addition to improving family planning service quality and follow-up to increase method-continuation and use-effectiveness rates, post-

abortion counseling and follow-up efforts should be made a program priority.

## Appendix A

### Algorithm for Classifying Segments

The following algorithm was used to categorize segments in the VNDHS II calendar data.

*Pregnancy not resulting in a live birth:* This segment consists of the continuous set of months reported as “pregnant” in the calendar, ending in or after January 1994, with the last month of the segment reported as “terminated.” If the pregnancy was terminated within the first month of being pregnant, then the segment lasted for only one month in the calendar and was coded as “terminated” without any previous month coded “pregnant.”

*Pregnancy resulting in a live birth:* This segment consists of the continuous set of months reported as “pregnant” in the calendar with the last month of the segment coded as “birth,” ending in or after January 1994. This type of segment, therefore, lasts for nine months, with the first eight months coded as “pregnant” and the last one coded as “birth” in the calendar.

*Current pregnancy:* This segment consists of one month or a continuous set of months reported as “pregnant” in the calendar with the last month of the segment being the last month in the calendar (the month of the survey). Thus, this type of segment is censored at the end of the calendar.

*Contraceptive failure:* This segment consists of one month or a continuous set of months in which use of any kind of contraceptive was reported, ending in or after January 1994 and exactly prior to a nonlive-birth pregnancy segment or a live-birth pregnancy segment or current-pregnancy segment classified as unintended (see definition above), with the reason for discontinuation being “became pregnant while using.”

*Contraceptive success:* This segment consists of one month or a continuous set of months in which use of any kind of contraceptive was reported, ending in or after January 1994 and not followed by a nonlive-birth pregnancy segment or a live-birth pregnancy segment or current-pregnancy segment classified as unintended.

*Contraceptive method used, unclear intention:* This segment consists of one month or a continuous set of months in which use of any kind of contraceptive was reported, ending in or after January 1994 and followed either by a nonlive-birth pregnancy segment or a live-birth pregnancy segment or current-pregnancy segment classified

as unintended, but where the reason for discontinuation is *not* “became pregnant while using”; or by a nonlive-birth pregnancy segment representing a miscarriage or stillbirth (because questions concerning intention were not asked if the woman reported the outcome as a miscarriage or a stillbirth).

*No method used, pregnancy intended:* In this study, a woman who did not use any contraceptive method for a period of time and for whom the subsequent segment is classified as a live-birth pregnancy segment or a current-pregnancy segment or as a nonlive-birth pregnancy segment (miscarriage or stillbirth) is assumed to have had an intended pregnancy, and the segment is classified as “no method used, pregnancy intended.”

*No method used, pregnancy unintended:* This segment consists of one month or a continuous set of months in which no contraceptive method was used, ending in or after January 1994 and exactly prior to a nonlive-birth pregnancy segment or a live-birth pregnancy segment or a current-pregnancy segment classified as unintended (see definition above).

*No method used, intention not reported:* This segment consists of one month or a continuous set of months in which no method was used, ending in or after January 1994 and not prior to any pregnancy-event segment. This type of segment may occur in the following situations: between two contraceptive-practice segments regardless of the reason for discontinuation of the preceding segment (this type of segment is likely to occur if a woman is ambivalent about becoming pregnant; she might want to stop using a method in anticipation of a pregnancy at some point but soon change her mind and continue to use a method), or prior to a contraceptive-use segment and after a segment with no or missing information, or immediately after a live-birth pregnancy segment and before a nonpregnant segment.

## Notes

1 Such data are most appropriately analyzed using statistical methods such as Generalized Estimating Equations. Unfortunately, no commercially available computer software that we are aware of permits simultaneous adjustment for unequal probabilities of selection, the use of cluster sampling, and potentially correlated observations. SPSS cannot accommodate samples with unequal probabilities of selection; it does not allow for the adjustment correction of standard errors for the use of the multistage cluster sample design used in the VNDHS II, nor does it handle potentially correlated observations for the same subject. STATA and SAS both accommodate samples with unequal probabilities of selection and complex sample designs, but neither permits simultaneous adjustment for potentially correlated observations when respondents contribute multiple observations.

2 Variables that did not retain significance were: location (urban-rural); educational level of the woman; educational level of the husband; socioeconomic status; woman’s occupation; who in the family makes household spending decisions; whether respondent lives in a project province; supply environment at the community level and at the commune health station; and availability of the pill and the IUD at the district and commune health facilities.

## References

- Alan Guttmacher Institute (AGI). 1999. *Sharing Responsibility: Women, Society and Abortion Worldwide*. New York: AGI.
- Bacharach, Christine A. and Susan Newcomer. 1999. “Intended pregnancies and unintended pregnancies: Distinct categories or opposite ends of a continuum?” *Family Planning Perspectives* 31(5): 251–252.
- Brown, S. and I. Eisenberg. 1995. *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families*. Washington, DC: National Academy Press.
- Buvinić, Mayra. 1998. “The costs of adolescent childbearing: Evidence from Chile, Barbados, Guatemala, and Mexico.” *Studies in Family Planning* 29(2): 201–209.
- Daulaire, N. 2002. *The Toll of Unintended Pregnancies on Women’s Lives in the Developing World*. Washington, DC: Global Health Council.
- General Statistical Office (GSO). 2001. *1999 Population and Housing Census—Census Monograph on Marriage, Fertility and Mortality in Vietnam: Level, Trends, and Differentials*. Hanoi: Statistical Publishing House.
- Goodkind, Daniel. 1994. “Abortion in Vietnam: Measurements, puzzles, and concerns.” *Studies in Family Planning* 25(6, Part 1): 342–352.
- Henshaw, Stanley K. 1998. “Unintended pregnancy in the United States.” *Family Planning Perspectives* 30(1): 24–29, 46.
- Jones, E. and Jacqueline Darroch Forrest. 1992. “Underreporting of abortion in surveys of US women: 1976–1988.” *Demography* 29: 113–126.
- Joyce, T.J., Robert Kaestner, and Sanders Korenman. 2000. “The effect of pregnancy intention on child development.” *Demography* 37(1): 83–94.
- Klerman, L.V. 2000. “The intendedness of pregnancy: A concept in transition.” *Maternal and Child Health Journal* 4(3): 155–162.
- Kost, Kathryn and Jacqueline Darroch Forrest. 1995. “Intention status of U.S. births in 1988: Differences by mothers’ socioeconomic and demographic characteristics.” *Family Planning Perspectives* 27(1): 11–17.
- Kost, Kathryn, David J. Landry, and Jacqueline E. Darroch. 1998. “The effects of pregnancy planning status on birth outcomes and infant care.” *Family Planning Perspectives* 30(5): 223–230.
- Marston, C. and John Cleland. 2003. “Relationships between contraception and abortion: A review of the evidence.” *International Family Planning Perspectives* 29(1): 6–13.
- National Committee for Population and Family Planning of Vietnam (NCPFP). 1989. *Demographic and Health Survey 1988*. Hanoi: NCPFP.
- . 1999a. *Demographic and Health Survey 1997*. Hanoi: NCPFP.

- . 1999b. *Demographic and Health Survey 1997—In-depth Analysis*. Hanoi: NCPFP.
- Population Reference Bureau (PRB). 1999. *World Population Data Sheet 1999*. Washington, DC: PRB.
- Sable, M.R. 1999. "Pregnancy intentions may not be a useful measure for research on maternal and child health outcomes." *Family Planning Perspectives* 31(5): 249–250.
- Santelli, J.R., K. Rochat, C. Gilbert Hatfield-Timajchy et al. 2003. "The measurement and meaning of unintended pregnancy." *Perspectives on Sexual and Reproductive Health* 35(2): 94–101.
- Tsui, Amy Ong, Judith N. Wasserheit, and John G. Haaga. 1997. *Reproductive Health in Developing Countries*. Washington, DC: National Academy Press.
- Williams, S.P., M.L. Frank, A. Ilegbodun, H. Sangi-Haghpeykar, J.E. Corboy, and A.N. Poindexter. 1997. "Factors associated with unintended pregnancy." *Advances in Contraception* 13(4): 429–438.
- World Health Organization (WHO). 1997. *Unsafe Abortion: Global and Regional Estimates of Incidence of Mortality Due to Unsafe Abortion*. Geneva: WHO. Document number WHO/RHT/MSM/97.17.
- Zabin, Laurie Schwab and Karungari Kiragu. 1998. "The health consequences of adolescent sexuality and fertility behavior in sub-Saharan Africa." *Studies in Family Planning* 29(2): 210–232.

## Acknowledgments

This study was part of the first author's doctoral research and was supported by the Rockefeller Foundation. The authors would like to thank the National Committee for Population and Family Planning of Vietnam for permission to use data from the Vietnamese Demographic and Health Survey, and Macro International for help in acquiring the dataset.