

The Measurements and Interpretation of Desired Fertility

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The idea of measuring fertility preferences has a long history. In the United States, survey questions about ideal family size have been used in family and fertility surveys since at least the 1940s. In the 1960s, data from such questions were used in a lively debate about the role of subsidized family planning in a national population policy, and the term "unwanted fertility" appears for the first time (Harkavy et al., 1969; Blake, 1969; 1972). However, the widespread collection of largely comparable cross-national data on fertility preferences in the developing world dates back to the World Fertility Survey (WFS) in the late 1970s and early 1980s (Lightbourne, 1985). That effort has been continued in the late 1980s and early 1990s by the Demographic and Health Surveys (DHS) program.

The collection of information on fertility preferences is important both for theoretical research as well as for policy planning. Since desired fertility is a key factor in demand theories of fertility transition, its measurement is essential for understanding the dynamics of fertility change. Measurement of preferences is important for policy purposes because of its two main uses: to make forecasts about medium-term changes in fertility, and to measure the prevalence of unwanted births, and thus the prevalence of an unmet need for family planning services. These two uses need somewhat different measures. Forecasts may best be based on desired fertility, that is, wanted births that did occur plus wanted births that did not, possibly for period-specific reasons. Unwanted births (and the unmet need for family planning) are those unwanted among births that actually occurred, i.e., period fertility less an adjustment for those births not wanted (then or later). Much of the recent use of fertility preference data has been in the context of the debate about the impact of family planning programs on fertility (see, for example, Pritchett 1994) and has focused

on the magnitude of unwanted fertility and the unmet need for family planning; Westoff and Ochoa (1991) measure unmet need for 25 DHS countries. In this paper, we return to measures of fertility preferences in the belief that such measures are more useful for informing longer term policy than the so-called "KAP-gap" and other measures of unmet need.

Shortcomings of Fertility Preference Measures

Early attempts to measure fertility preferences depended on simple (to write) questions about ideal family size, such as "If you could start over again, how many children would you like to have?". Such simple questions work better than one might expect, but have been criticized for a number of theoretical and empirical shortcomings. First, there is an unspoken, not usually articulated, condition implied: "other things being equal". There will be some uncertainty of interpretation on the part of most interviewees. Second, answers may be affected by the status quo: women (or couples) with a certain number of children may feel constrained to give an ideal family size at least as large as their existing family size (ex-post rationalization). Third, the effects of child mortality risks are not explicit: respondents presumably do not include child deaths in their ideal family size, though they may need to bear additional children to reach their desire. Thus, total fertility may exceed desired family size without any unwanted fertility. Fourth, some respondents will provide non-numeric answers, such as "Up to God", that cannot readily be incorporated into an average. Fifth, there may be compositional preferences, for example wanting at least one boy or at least one child of each sex, that are not explicitly family size factors, but which will affect family size. Sixth, the average desired family size may be affected by the age distribution of the female population, particularly if family size

preferences differ across cohorts. Bongaarts (1990), in an excellent review, shows that average desired family size is quite closely related to the period total fertility rate across 48 WFS and DHS surveys, exceeding total fertility in some settings and falling below it in others.

Reservations about the validity of family size preference data led to the development of methods based on the wantedness of specific children. Retrospective wanted fertility approaches use the recorded births in some time period after the deletion of those that are reported not to have been wanted (Westoff et al., 1989). Such a measure resolves some of the ambiguities of the desired family size measure, but may exacerbate others. There is no "other things being equal" problem, child mortality is allowed for, non-numeric answers will not be a problem, and compositional preferences are included. However, ex-post rationalization is likely to bias wanted fertility upwards. By definition, wanted fertility has to be equal to or smaller than actual fertility, so it does not measure fertility preferences, though the difference between actual and wanted fertility may provide a measure of the unmet need for costless contraception.

A third family of approaches uses information on the desire for additional children to measure fertility preferences. Such desires cannot be biased by ex-post rationalization, and are unlikely to be biased by any of the other errors listed. The proportion of women of a given parity who want an additional child appears at first sight to resemble a "wanted parity progression ratio", but the use of such ratios in a synthetic cohort measure of total wanted fertility results in a large underestimate, partly because some women may have multiple unwanted births (biasing down the wanted progression at all parities after the first unwanted one), but mainly because effective stopping

behavior inflates denominators at each parity, again reducing the wanted progression ratio (see Rodriguez and Trussell, 1984, and Lightbourne, 1985 for detailed discussions). Attempts to redress the multiple unwanted birth problem (by introducing the wantedness status of the last birth, for example) involve some cost in terms of ex-post rationalization. Strategies for dealing with the effects of stopping and spacing behavior depend on prior assumptions about the extent of preference implementation.

Bongaarts (1990) combines the second and third families in creating another estimate of wanted fertility that avoids the effects of ex-post rationalization. Births in some recent period are regarded as unequivocally wanted if the woman (or couple) report wanting another child at the time of the survey. "Want more" age-specific fertility rates are calculated on the basis of these births alone. These rates underestimate true wanted fertility to the extent that some births in the reference period to women (couples) who report wanting no more at the time of the survey were actually the last wanted births of those couples. Thus an adjustment factor, somewhere between 0 and 1, must be added to the initial wanted TFR to arrive at the final estimate. This adjustment factor is approximated on the basis of the proportion of women aged 40-44 who want more children. The Bongaarts measure is of wanted fertility, and although not necessarily smaller than actual total fertility, it is **certain** to be so in practice.

The measures available of fertility preferences thus fall into two categories, those that measure desired fertility, which can be either higher or lower than actual fertility, and those that measure the wanted component of actual fertility, which will always be smaller than actual fertility. Measures of

desired fertility are likely to be of more value for forecasting near future fertility levels, whereas measures of wanted fertility may be of more value for advocacy purposes, since they will be certain to show some level of "unmet need." Interpreting measures of wanted fertility as indicators of fertility preferences may give rise to seriously misleading conclusions, since wanted fertility will always be smaller than actual fertility, and since changes in age patterns of fertility can affect measured wanted fertility with no change in fertility desires. Indeed, the behavior of these measures of wanted fertility under dynamic conditions is complex, as discussed in the next section. In the remainder of the paper, we develop a measure of fertility preferences that is conceptually similar the Bongaarts' measure of wanted fertility, and illustrate its use.

Wanted Fertility Measures Under Changing Conditions

In this section, we show that Bongaarts' measure of wanted fertility gives misleading estimates in settings where preferences are changing. It is assumed that cohorts have unchanging fertility preferences, in the sense of completed family size, but that preferences can change between cohorts, and that the timing of fertility can also change. Wanted fertility will be calculated in two ways, one on the basis of the "wantedness" of a given birth, and the other on the basis of method proposed by Bongaarts. The first will be called the actual Wanted Total Fertility Rate, $WTFR$, and the second the estimated Wanted Total Fertility Rate, $WTFR_E$. Women are assumed to enter union at age 20 (the early marriage cohort) or at age 25 (the late marriage cohort), and to have exactly one birth at age 22.5 (if married), 27.5, 32.5 and 37.5. Women (or couples) are assumed to want exactly two (the low fertility preference cohort) or three (the high fertility preference cohort) children.

Tables I.1 and I.2 in annex I show what happens to TFR, WFR and WFR_E as a steady state made up entirely of one type of cohort is replaced by a steady state made up of another.

The first panel (Table I.1) shows what happens as early marrying cohorts are replaced by late marrying cohorts. After five years, the TFR has dropped from 4.0 to 3.0, the WFR has dropped from 2.0 to 1.0, and the WFR_E has also dropped from 2.0 to 1.0. Thus both the WFR and the WFR_E are only half the desired family size, but they are equal to each other. After 10 years, TFR is still 3.0, the WFR is still 1.0, but the WFR_E is now 2.0. Thus the WFR_E is now correctly measuring the desired family size, but is one child larger than the WFR, thus underestimating "unmet need". After 15 years, the change has worked its way through, and TFR is 3.0, WFR is 2.0 and WFR_E is 2.0.

The second panel (Table I.2) shows what happens as high preference cohorts are replaced by low preference cohorts. In this case, TFR does not change, and after five years, neither the WFR nor the WFR_E have changed from 3.0. After 10 years, the WFR is still 3.0, but the WFR_E has fallen to 2.0, overestimating "unmet need" as a result of changing preferences. After 15 years, the change has worked its way through, and both the WFR and the WFR_E are equal to 2.0, the desired family size of the new cohorts.

As shown above, Bongaarts' measure overestimates desired fertility in settings where there is an upward shift in the age of child bearing. The shift in the age of child bearing may be due to increase in the average age of marriage or due to increasing trend of contraceptive use for spacing.

The measure underestimates desired fertility, however, in settings with declining trend in desired family size. Therefore, if both these trends are present, the opposite effects of the distortions associated with changes may cancel each other to some extent. But theoretically, as this (highly simplified) example shows, even measures of wanted fertility, free of any ex-post rationalization problem, give a distorted picture of fertility desires, and even of the "wantedness" of births, under changing age patterns of childbearing or changing preferences. Since most of the developing world is witnessing significant changes in the fertility preferences, Bongaarts' measure is not ideal for measuring fertility preferences.

Prospective Desired Total Fertility

As Bongaarts (1990) points out, the desire for additional children appears to be the least biased basis for measuring fertility preferences. Our new measure of fertility preference is largely (though not entirely) based on the desire for additional fertility. In the DHS, fertility preference questions are put to women who are currently in union with neither partner sterilized. Women who are not pregnant or are unsure are asked "Would you like to have (a/another) child or would you prefer not to have any (more) children?". For women who are pregnant, the same question is put referring to a time after the birth of the expected child. The non-pregnant women who reply that they want (a/another) child are then asked "How long would you like to wait from now before the birth of (a/another) child?", with responses in months, or years, or non-numeric responses such as "soon/now", "says she can't get pregnant", "other" and "don't know".

The prospective desired total fertility rate, PDTFR, is based on the fertility rates that would occur in the 12 months after the survey if women had the births they say they want. The largest component of these births is the non-pregnant women who respond to the questions above that they do want (a/another) birth, and that they want it in the next 12 months. To this number must be added the wanted current pregnancies, which would result in wanted births during the next 12 months, plus some adjustment for women not yet married who will get married in the next three months and have a wanted birth within 12 months. Wanted current pregnancies are based on the preference question put to pregnant women, "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?". Using this information introduces some risk of ex-post rationalization bias, but to minimize this risk only current pregnancies for which the woman wanted to become pregnant then are used. Wanted births to currently unmarried women are approximated by the number of births reported as wanted then by women who got married in the year before the survey. Again, there is risk of ex-post rationalization bias in this measure, but the number of events is very small.

Numerators of age-specific prospective desired fertility rates are then calculated by summing the three categories of desired births in the prospective year, adjusting the ages of the women upwards by six months to approximate true age groups. Denominators are all women, regardless of marital status, as recorded at the time of the survey, again with their ages inflated by six months. The PDTFR is then obtained in the normal way from the age-specific rates.

The new measure has several desirable features. Going back to the concerns about desired

family size, there is no "other things being equal" uncertainty with the new measure. It focuses explicitly on immediate fertility preferences, given the current situation, and so is a measure of period preference that can be expected to vary with economic conditions and other factors that influence fertility in the short run. The measure can only be moderately sensitive to ex-post rationalization, since only the wanted current pregnancies and wanted births in early marriage, about one third of the total desired fertility in the examples, are susceptible to this problem. Moreover, current pregnancy may be less susceptible to rationalization than the actual births. Since the measure is based on current desires for another birth, rather than an ideal of family size, it presumably incorporates an allowance for possible child mortality, and can thus be legitimately compared to TFR. Non-numeric answers are not a serious problem except insofar as they affect the answers on desired timing of the next wanted birth; this question is explored below in greater detail. The measure incorporates compositional as well as size preferences since the questions on future desires are conditional on current family structure. Age distribution effects should be small, and prior unwanted fertility has no effect.

There are clearly data ambiguities involved in the measure, however. In order to get some idea of their potential magnitude, we have carried out a simple sensitivity analysis, calculating PDTFR's from three DHS surveys with different assumptions about what to include and what not to include. The three countries chosen all have two DHS surveys, and we have calculated PDTFR for the first, so that the measure of desired fertility in the year after the first survey can be compared with the actual fertility recorded by the second survey for that same time period.

Prospective Desired Fertility in the Dominican Republic, Egypt, and Indonesia

Table 1 shows the distribution of the respondents by the stated preference of time for their next child. The distribution shows a considerable heaping of responses at one year. Table 2 shows the components (want in next 12 months, wanted current pregnancies, wanted births to women married in the last 12 months) of prospective desired fertility by age group for the three countries studied. Table 2 also shows reported fertility for a comparable period from the next DHS held in the country. Figure 1 plots the age-specific prospective desired fertility rates and the subsequently observed ones for each of the three countries.

The PDTFR's are lower than the subsequently-observed actual TFR's for the same time period in all three countries, though the difference is very small in the case of the Dominican Republic. Preferences for future births in all three cases make up more than half the PDTFR, though the lower the PDTFR the higher the proportion that pregnant women (retrospective wantedness) make up, as would be expected. The age patterns show that in all three countries it is younger women whose actual fertility most exceeds their fertility preference; indeed, older women generally would prefer to have more children than they are having. This age pattern is in sharp contrast to the standard paradigm of older women being the most motivated to control their fertility. One explanation for this observation may be that it is only the sterile women who are left at older age with wanted fertility. Since sterile women can't have births and the overall fertility in old age groups is low, one finds wanted fertility higher than the actual fertility.

Table 3 shows PDTFR's for each country for the second DHS survey. In both the Dominican Republic and Egypt, the second PDTFR is lower than the first, suggesting continued future fertility decline in these two countries. In Indonesia, on the other hand, the PDTFR rises from 1987 to 1991, raising questions about the prospects for further short-run fertility decline.

Sensitivity Tests

The basic question on the timing of wanted future births allows for non-numeric answers (soon/now, other, don't know) or for numeric answers in either months or years. The answer "soon/now" is assumed to mean within the next 12 months, while the "other" and "don't know" answers are assumed to mean not within the next 12 months. A more serious problem is those answers of "12 months" and "one year"; there is pronounced heaping of answers on "one year". Our basic calculations have excluded these desired births, limiting ourselves exclusively to the "now/soon" and zero to eleven month categories. Table II.A in Annex II shows the PDTFR's for the three countries if half of the "12 months" and one quarter of the "one year" answers are included. The measure is quite sensitive to how these answers are treated, increasing by as much as 13% percent if half the "12 month" and a quarter of the "one year" preferences are included.

The second sensitivity test covers the adjustment for currently pregnant women. The basic calculation uses only those women who report that they wanted to get pregnant at the time they did. Table II.B in Annex II shows the PDTFR's for the case in which half the pregnancies reported as wanted later are included. The measure is very little affected by which measure of wantedness is

used.

The third sensitivity test covers the adjustment for currently unmarried women. The basic calculation includes the births to women marrying in the year before the survey and described as wanted then. Table 2 shows the PDTFR's when all the women who enter into an union in the next three months (since only these will have chance to realize their fertility intention in the current year) are assumed to desire a child within one year. The contribution of newly-married women to PDTFR is so small that the treatment of the wantedness status of the births makes no difference to the result.

Conclusion

A new measure of fertility preference, the prospective desired total fertility rate, can be computed from DHS data on the timing of wanted additional births. This measure avoids some of the shortcomings of existing methods by being based largely on reported desires for additional children rather than on the wantedness of past children or vague ideas of ideal family size. The method is not based on observed fertility, therefore, it represents fertility preferences of the population rather than the desired component of fertility. The method is sensitive to problems with reporting of the timing of future births, particularly the tendency to choose round numbers such as 12 months or one year.

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Table 1
DISTRIBUTION BY PREFERRED TIME FOR NEXT CHILD

Reported Preference for the timing of next child	Proportions		
	Indonesia	Egypt	Dominican Republic
Do not desire a child before next year	85.0%	80.6%	72.6%
Want a child in 11 months or less (or soon)	4.9%	8.5%	13.7%
Pregnant with appropriately timed pregnancy	4.9%	6.4%	5.1%
Want a child in 12 months	0.3%	0.1%	0.3%
Want a child in one year	4.2%	2.6%	4.3%
Pregnant with wanted but mistimed pregnancy	0.8%	1.9%	3.9%

Table 2
AGE SPECIFIC DESIRED FERTILITY RATES AND OBSERVED FERTILITY RATES

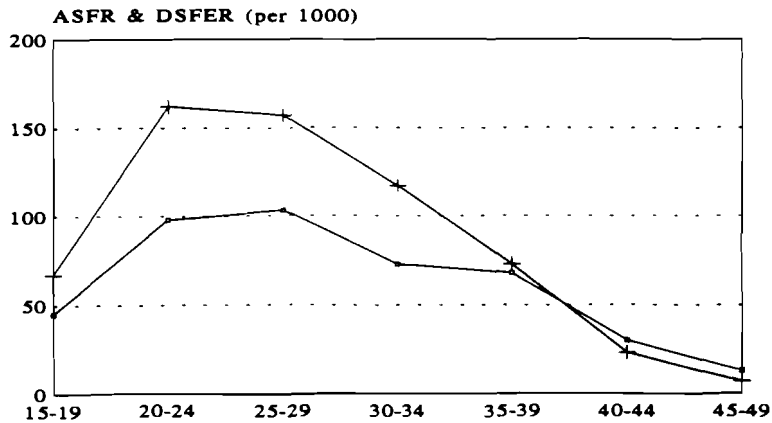
Age Groups	Indonesia					Egypt					Turkey				
	Desired Fertility Rates (per 1000) (1987-88)				Observed Fertility	Desired Fertility Rates (per 1000) (1988-89)				Observed Fertility	Desired Fertility Rates (per 1000) (1986-87)				Observed Fertility
	Pregnant	Non-Pregnant	New Unions	Total	IDHS 1988-91	Pregnant	Non-Pregnant	New Unions	Total	EDHS 1990-92	Pregnant	Non-Pregnant	New Unions	Total	DHS 1989-91
15-19	28.7	12.4	4.1	45.2	67	27.8	46.6	1.5	75.9	63	28.0	31.1	4.1	63.2	88
20-24	62.6	31.3	3.7	97.6	162	85.8	79.3	4.5	170	208	43.1	65.2	4.4	113	210
25-29	53.4	48.5	1.4	103	157	69.8	74.6	1.1	145	222	47.0	97.8	1.1	146	175
30-34	27.9	45.4	0	73.3	117	45.0	61.5	0	107	155	20.3	93.1	0	113	116
35-39	25	43.2	0	68.2	73	18.2	39.9	0.7	58.8	89	8.8	81.1	0	89.9	57
40-44	3.9	26.5	0	30.4	23	8.4	35.9	0	44.3	43	1.6	77.0	0	78.6	12
45-49	0	12.7	0	12.7	7	1.1	33.0	0	34.1	6	4.1	43.5	0	47.6	11
PDTFR /TFR	PDTFR=			2.15	TFR = 3.03	PDTFR=			3.17	TFR= 3.93	PDTFR=			3.26	TFR=3.3

Table 3

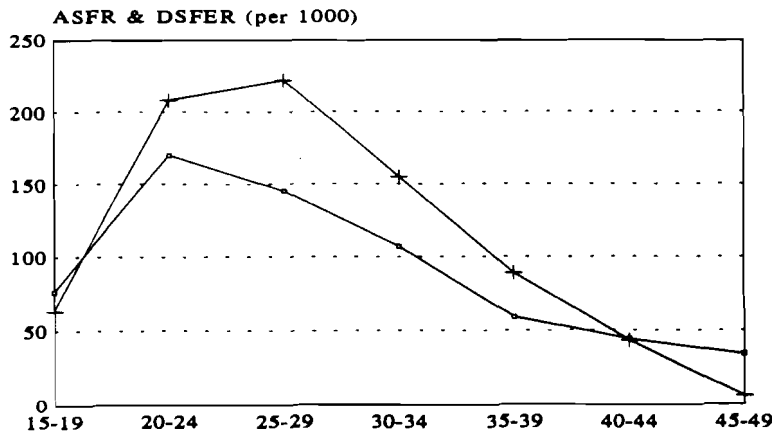
	Indonesia		Egypt		Dominican Republic	
	1987	1991	1988	1992	1986	1991
PDTFR	2.15	3.17	3.17	3.08	3.26	2.64

Figure 1 Desired and Actual Fertility

Indonesia

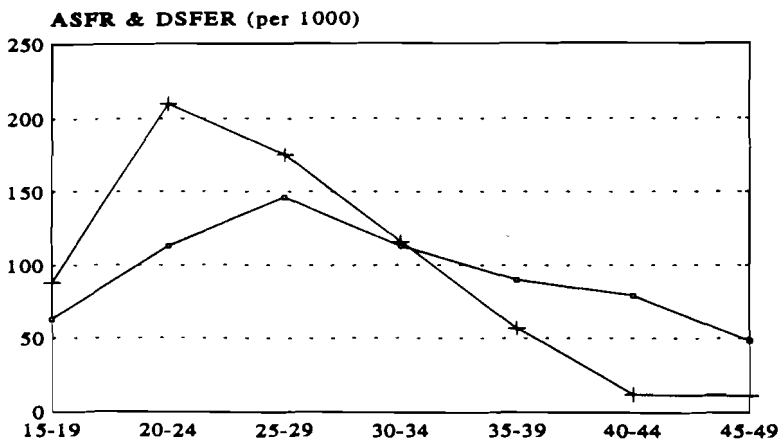


Egypt



+ Actual Fertility
o Desired Fertility

Dominican Republic



CHANGE IN TIMING OF BIRTHS (DESIRED FAMILY-SIZE UNCHANGED)

Assuming that there is a shift in the timing of first birth by five years at $t = 5$, the age specific fertility rates (ASFRs) for various cohorts will be as follows:

Table I.1

	t = 0	t = 5	t = 10	t = 15	t = 20	t = 25
20-24	<u>0.2</u> ¹	0	0	0	0	0
25-29	<u>0.2</u> ²	0.2	<u>0.2</u>	<u>0.2</u>	0.2	0.2
30-34	0.2	0.2	0.2	0.2	0.2	0.2
35-39	0.2	0.2	0.2	0.2	0.2	0.2

¹represents "want more" component of desired fertility.

²represents "want no more" component of desired fertility.

From the above table, Bongaarts' measure of desired fertility can be estimated as follows:

	Time t = 0			t = 5 years			t = 10 years			t = 15 years		
	W	NW	Want Next	W	NW	Want Next	W	NW	Want Next	W	NW	Want Next
20-24	.2	0	.2	0	0	0	0	0	0	0	0	0
25-29	.2	0	0	.2	0	0	.2	0	.2	.2	0	.2
30-34	0	.2	0	0	.2	0	0	.2	0	.2	0	0
35-39	0	.2	0	0	.2	0	0	.2	0	0	.2	0
WTFR	2	2	1 + 1 = 2	1	2	0 + 1 = 1	1	2	1 + 1 = 2	2	1	1 + 1 = 2
	WTFR=2 TFR=4 WTFR _E =2			WTFR=1 TFR=3 WTFR _E =1			WTFR=1 TFR=3 WTFR _E =2			WTFR=2 TFR=3 WTFR _E =2		

CHANGE IN DESIRED FAMILY-SIZE (TIMINGS OF BIRTHS UNCHANGED)

Assuming that there is a change in the desired family-size from 3 children to 2 children at time $t = 5$, as specific fertility rates for various cohorts will be as follows:

Table L.2

	t = 0	t = 5	t = 10	t = 15	t = 20	t = 25
20-24	<u>0.2¹</u>	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>	<u>0.2</u>
25-29	<u>0.2¹</u>	<u>0.2</u>	0.2	0.2	0.2	0.2
30-34	<u>0.2²</u>	0.2	0.2	0.2	0.2	0.2
35-39	0.2	0.2	0.2	0.2	0.2	0.2

¹represents "want more" component of desired fertility.

²represents "want no more" component of desired fertility.

From the above table, Bongaarts' measure of wanted fertility can be estimated as follows:

	Initial Situation			After 5 years			After 10 years			After 15 years		
	W	NW	Want Next	W	NW	Want Next	W	NW	Want Next	W	NW	Want Next
20-24	.2	0	.2	.2	0	.2	.2	0	.2	.2	0	.2
25-29	.2	0	0	.2	0	.2	.2	0	0	.2	0	0
30-34	.2	0	0	.2	0	0	.2	0	0	0	.2	0
35-39	0	.2	0	0	.2	0	0	.2	0	0	.2	0
WFR	3	1	2 + 1 = 3	3	1	2 + 1 = 3	3	1	1 + 1 = 2	2	1	1 + 1 = 2
	WTFR=3 TFR=4 WTFR_E=3			WTFR=3 TFR=4 WTFR_E=3			WTFR=3 TFR=4 WTFR_E=2			WTFR=2 TFR=3 WTFR_E=2		

SENSITIVITY ANALYSIS**A) Heaping at Preferred Time of One Year:****TableII.A**

	Estimates of PDTFR		
	Indonesia	Egypt	Dominican Republic
Standard Formulation	2.15	3.17	3.26
Including 1/4th of the respondents with preferred time of one year	2.43	3.31	3.48

B) Ambiguous Response about Planned Status of Current Pregnancy::**TableII.B**

	Estimates of PDTFR		
	Indonesia	Egypt	Dominican Republic
Standard Formulation	2.15	3.17	3.26
Including ½ of the respondents with reported mistimed pregnancies	2.24	3.36	3.56

C) New Entries into Union in the Current Year:**TableII.C**

	Estimates of PDTFR		
	Indonesia	Egypt	Dominican Republic
Standard Formulation	2.15	3.17	3.26
Including all women who will form union in next three months	2.24	3.31	3.30