DHS Analytical Studies 4

The Contraception–Fertility Link in Sub-Saharan Africa and in Other Developing Countries

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Preface

One of the most significant contributions of the MEASURE *DHS+* program is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries. The *DHS Analytical Studies* series and the *DHS Comparative Reports* series examine these data, focusing on specific topics. The principal objectives of both series are: to provide information for policy formulation at the international level, and to examine individual country results in an international context. Whereas *Comparative Reports* are primarily descriptive, *Analytical Studies* take a more analytical approach.

The *Analytical Studies* series comprises in-depth, focused studies on a variety of substantive topics. The studies are based on a variable number of data sets, depending on the topic under study. A range of methodologies is used, including multivariate statistical techniques. The topics covered are selected by MEASURE *DHS+* staff in conjunction with the MEASURE *DHS+* Scientific Advisory Committee and USAID.

It is anticipated that the *Analytical Studies* will enhance the understanding of significant issues in the fields of international population and health for analysts and policymakers.

Martin Vaessen
Project Director

Acknowledgments

Executive Summary

Research has shown repeatedly a strong negative association between the proportion of women using contraception and the fertility rate of the population. However, the high correlation has not been evident in sub-Saharan Africa. Various hypotheses have been advanced to account for this anomaly: the fact that African women use more traditional methods with higher failure rates; that they use contraception more for spacing than for limiting births which means more discontinuation; that the total fertility rate may be insensitive to more recent rapid increases in contraceptive prevalence; that the number of observations based on countries may be too small to yield reliable correlations; and other explanations. The focus of this analysis is to evaluate such hypotheses and try to explain why the correlation between contraceptive prevalence and the fertility rate has been so much lower in sub-Saharan Africa than in other parts of the developing world.

Rather than conventionally limiting the analysis to the country as the unit of observation, we have disaggregated the data from 59 DHS surveys into 451 regions of these countries—200 from sub-Saharan Africa and 251 from other countries. This approach not only increases the potential for statistical analysis but also increases the social and cultural homogeneity of the populations.

The results of the regional analyses are quite consistent with those at the national level; both approaches clearly show a much lower association between the level of contraceptive practice and the total fertility rate in sub-Saharan Africa.

A variety of explanations were statistically evaluated. Confining the comparisons of the correlations in the two parts of the world to the use of modern methods reduces the difference but by no means erases it. None of the other explanations seem to shed any light. Substituting more current measures of fertility did not change the picture. Confining the analysis to marital fertility contributed nothing. Taking into account postpartum insusceptibility that is so much longer in Africa did not alter the picture. Comparing the associations after separating contraceptive use into spacing and limiting made only a modest contribution to shrinking the difference in the correlation. And, finally, substituting the total demand for family planning (adding unmet need and intention to use) for the standard contraceptive prevalence measure did nothing to reduce the difference.

The most important consideration appears to be the fact that the populations in sub-Saharan Africa were clearly at the beginning of their fertility transition and were being compared with Asian and Latin American populations at much more advanced stages of the transition. By comparing the correlation for the same regions that were surveyed more than once, we are able to discern a clear trend in sub-Saharan Africa toward a higher correlation over time. The implication of this trend is that the association will eventually be the same in sub-Saharan Africa as elsewhere. At the beginning of the transition, there is little variation in fertility or contraceptive prevalence and thus limited association between the two variables. As the transition develops, the variation of both measures and their covariance increases leading to higher correlations. Support for this interpretation comes from the low correlation between fertility and contraceptive prevalence in the subset of regions of countries in Asia and Latin America still in the early stage of their transition.

1   Introduction

As one of the major proximate determinants of fertility, contraceptive prevalence is expected to be strongly negatively associated with fertility. The central question motivating this study is, why has the correlation between contraceptive prevalence and fertility been considerably lower in sub-Saharan Africa than in Asia and Latin America. A review of this anomaly (Brown, 1996) estimated a correlation of -0.49 for 24 countries in sub-Saharan Africa in contrast to estimates of -0.92 for 83 nations worldwide (Frank and Bongaarts, 1991). A compilation of later country data (Blanc and Poukouta, 1997) showed similar correlations. This puzzling difference has given rise to a variety of hypotheses. Such speculations include the redundancy of contraceptive practice with postpartum insusceptibility in sub-Saharan Africa (Adamchak and Mbizvo, 1990; Curtis and Diamond, 1995; Kennedy, 1991), the greater use of contraception for spacing births in contrast to its more common use for limiting births in other populations (Greene, 1998), differences in the proportion of the population using modern rather than traditional methods with accompanying higher failure rates, the insensitivity of the total fertility rate to rapid changes in contraceptive prevalence (Freedman and Blanc, 1991), and the level of aggregation and the small number of observations with countries as the units of analysis. The following analysis evaluates these hypotheses and tracks the trend of the correlation over recent decades.

2   Regional Level of Aggregation

The data used for this study are derived from the Demographic and Health Surveys (DHS) conducted in 59 developing countries between 1985 and 1998. Twenty-five of these countries have had at least two surveys, thereby providing an opportunity to study trends in the association between the contraceptive prevalence rate (CPR) and the total fertility rate (TFR). Since the CPR and the fertility indices are aggregate measures, the units of analysis are not individuals but populations. Prior studies of this subject have used countries as the units of analysis with the results that the number of observations are limited and the estimates of the correlations are potentially unstable. To evaluate the reliability of the correlations as well as to increase the social and cultural homogeneity of the population units, we disaggregated the 59 countries into a total of 451 regions—200 regions in sub-Saharan Africa and 251 regions in Asia and Latin America (the "Other" regions). Although these regions are delineated by governments for administrative reasons, they are certainly more ethnically homogeneous than nation-states because of the settlement histories of tribes and peoples sharing common languages. There are varying numbers of regions for the different countries.

The increase in the homogeneity at the regional level is reflected in the regional variations of the TFR and CPR. In Kenya, for example, the CPR ranges from 20 percent in Coast Province to 56 percent in Central Province. The TFR ranges from 3.4 in Nairobi to 6.4 in Western Province. Such differences are blurred in national averages.

The TFR is the primary measure of fertility used in this study. In addition, three other measures of fertility are considered—the proportion of women who had a birth in the preceding 12 months, the proportion of women who are currently pregnant, and the total marital fertility rate. The indices of contraceptive use examined are the CPR, the proportion of women using only modern methods, the proportion using only traditional methods, the proportions using contraception for spacing or for limiting births, and two measures of the potential demand for family planning.

3   Results

The first question is whether the generalization about the lower correlation in sub-Saharan Africa applies when the analysis is expanded to regions. The same pattern is as clearly evident for regions as for countries (Table 1 and Figure 1) when the difference in the correlation in sub-Saharan Africa is compared with that in the Other populations (there is no difference between Asia and Latin America). All of the differences in the magnitude of the correlations are statistically significant.

Table 1 Correlation between the CPR and the TFR in sub-Saharan Africa and in other developing populations for countries and for subnational regions

	Sub-Saharan Africa		Other populations	
	R	N	R	N
Countries	-0.345	28	-0.849	31
Regions	-0.368	200	-0.807	251

The idea that the use of regions rather than countries as the units of observation might alter the difference in the correlations thus is not supported. On the other hand, the substantial increase in the number of populations greatly improves the potential for statistical analyses of other hypotheses derived from international comparisons.

4   Use of Modern Methods

Since traditional methods of contraception are more likely to be used in sub-Saharan Africa than in the Other regions, the fertility rates in the former populations may be affected by higher failure rates, thus reducing the magnitude of the correlation. This proposition can be tested by classifying the regions by the proportions using traditional or modern methods and comparing the different correlations. The results (Table 2) indicate that the difference between the correlations in sub-Saharan Africa and the Other regions persists but is not as great as

Table 2 Correlations with the TFR of the proportions using modern versus traditional methods in the regions of sub-Saharan Africa and in Other regions

Contraceptive method	Sub-Saharan Africa		Other regions	
	R	N	R	N
Modern methods	-0.480	28	-0.744	251
Traditional methods	-0.074	200	-0.230	251

with all methods combined (Table 1). The main reason for the modest shrinking of the difference is the increase in the correlation of the TFR with the use of modern methods in sub-Saharan Africa from -0.37 to -0.48. The level of the correlations with fertility is clearly higher for modern than for traditional methods in both population groupings.

Thus, it appears that part of the difference in the correlation is due to the compositional differences in the method mix, but it is only a small part and not the main explanation.

Figure 1 Association of TFR and CPR for regions of all countries

Panel A: Sub-Saharan Africa

Panel B: Other Regions

5 Current Status Measurement

Contraceptive use is a current status measure referring to the woman's report of her current behavior. The TFR, on the other hand, is an average of reproductive performance typically assessed over the preceding three or five years. In situations where fertility and contraceptive practice are changing rapidly, as they are in many developing countries, the correlation with fertility may be depressed by the time lag. There are two other measures of fertility—the proportion of women who had a birth in the past 12 months and the proportion currently pregnant—that are more closely synchronized in time with the CPR than the TFR is. These three different measures of fertility are intercorrelated as might be expected. The correlation of the TFR with the proportion having a recent birth is 0.87 and with the proportion pregnant is 0.74, while the correlation between the latter two measures is 0.68.

The substitution of current status measures of fertility does not change the picture (Table 3). The two other measures yield essentially the same association with the CPR as the TFR. The relationship with modern method use is stronger in sub-Saharan Africa than with use of all methods for all three measures of fertility.

6 Marital Fertility

The measures of fertility considered above are based on all women of reproductive age regardless of marital status. Since the conventional measure of the CPR, and the one used here, is based on currently married women, it is possible that a marital fertility rate might be the more appropriate measure, considering the cultural differences in premarital fertility. One such measure is the total marital fertility rate (TMFR), calculated here as the sum of marriage-duration specific fertility rates. This is a synthetic cohort measure exactly the same as the total fertility rate except that the summation is over duration of marriage categories rather than age.

Table 3   Correlations of contraceptive use with different measures of fertility in regions of sub-Saharan Africa and in Other regions

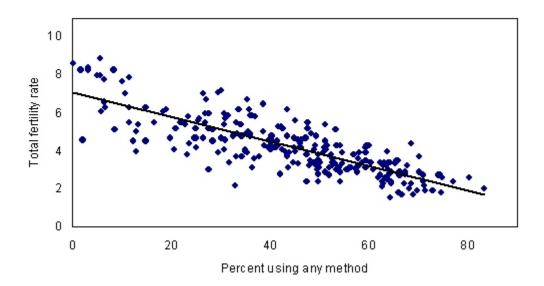| Fertility measure	All methods		Modern methods	
	Sub-Saharan Africa	Other regions	Sub-Saharan Africa	Other regions
Births in last 12 months	-0.367	-0.767	-0.457	-0.717
Proportion currently pregnant	-0.373	-0.719	-0.429	-0.662
Total fertility rate	-0.368	-0.807	-0.480	-0.744

The correlations of the TMFR with the general CPR and with the use of modern methods are lower in value than those with the TFR and, in any event, do not erase the difference in the strength of the association between sub-Saharan Africa and the Other regions (Table 4). Another approach is to examine the correlation of the TFR and the CPR with the proportions married in each regional population con-trolled. This approach produced the same result. The partial correlation for sub-Saharan Africa is -0.23, compared with -0.81 for the Other regions (the corresponding partial correlations with the proportions using modern methods are -0.34 and -0.74).

Table 4   Correlations of contraceptive use with marital fertility in regions of sub-Saharan Africa and in Other regions

	All methods	Modern methods
Sub-Saharan Africa	-0.197	-0.161
Other regions	-0.654	-0.425

It seems clear that taking into account the variability of the proportions married does not explain the difference.

7 Use for Spacing and for Limiting

Another theory is that the predominant use of contraception in sub-Saharan Africa for spacing rather than for limiting births may dilute the association between contraceptive practice and fertility, a theory for which there is some evidence (Greene, 1998). The basic idea is that when contraception is used for spacing, it is used only for short periods and perhaps with less motivation to avoid pregnancy, compared with its use for limiting. A direct test of this hypothesis is to compare the correlations distinguishing use for limiting and for spacing purposes. This does not reduce the difference, yielding correlations for the limiting component of -0.37 for sub-Saharan Africa and -0.77 for the Other regions. As expected, however, fertility is correlated more with use for limiting than with use for spacing.

Table 5   Correlation of the TFR with contraceptive use for spacing and for limiting births in regions of sub-Saharan Africa and in Other regions

	Use for spacing	Use for limiting
Sub-Saharan Africa	-0.295	-0.374
Other regions	-0.550	-0.773

Another approach is to control the variations across regions in the proportion of women who want no more children, but the differences in the partial correlations persist. In sub-Saharan Africa, the partial correlation with the CPR is -0.31, compared with -0.76 in Other regions. However, there is some shrinkage of the interregional difference with the use of modern methods, with corresponding partial correlations of -0.46 and -0.69, respectively.

8 Postpartum Insusceptibility and Contraception

The overlap or redundancy of contraceptive practice with periods of postpartum amenorrhea or abstinence would exaggerate the influence of contraception on fertility. This has been observed by others particularly in connection with Zimbabwe, where oral contraceptives were administered shortly after childbirth (Adamchak and Mbizvo, 1990). To evaluate its significance for the difference in the magnitude of the correlation that we have been examining, the partial correlation of the TFR and the CPR controlling for the average length of postpartum insusceptibility is estimated. The partial correlation for sub-Saharan Africa is -0.25 in contrast to -0.79 in the Other regions. However, once again, the difference is diminished with the substitution of modern method use with corresponding values of -0.45 and -0.74.

9 Unmet Need and Total Demand for Family Planning

To this point, the analysis has focused on the association of fertility with contraceptive prevalence—the proportion of married women currently using a method. Another perspective is to examine the potential demand for family planning that can be assessed in two ways. The first is to sum current prevalence and unmet need. Unmet need is conceived basically to designate fecund nonusers who express a desire to postpone the next birth or to have no more children at all. The second

Table 6   Correlations of the TFR and two measures of the potential demand for family planning in regions of sub-Saharan Africa and in Other regions

	CPR + Unmet need	CPR + Intention to use
Sub-Saharan Africa	-0.214	-0.235
Other regions	-0.654	-0.696

approach to measuring potential demand for family planning is to sum contraceptive prevalence and the proportion of nonusers who say that they intend to use a method. The correlations of these two measures with the TFR are shown in Table 6.

The now familiar pattern of the correlations with fertility persists with both of these measures—a much lower association in sub-Saharan Africa than in the Other regions. This is probably no surprise since the two measures of demand are highly correlated with the CPR itself.

10   Trends in the Association between Fertility and Contraception

The findings thus far have failed to uncover any dramatic explanation for the much lower correlation of fertility with the prevalence of contraceptive practice in sub-Saharan Africa. The association is stronger when modern methods alone are substituted for the standard CPR. However, none of the other variables has elucidated the basic question. The analysis has been based on the 451 regions of 59 countries using only the first surveys of countries that have had more than one survey. The focus has been on the earlier period in which the difference between sub-Saharan Africa and the Other regions has been observed by others. Since some of the countries have conducted more than one survey over the decade, there is an opportunity to trace the evolution of the pattern of association. There are 11 countries in sub-Saharan Africa[1] with 95 regions and 14 countries in the Other parts of the world[2] with 134 regions that offer data from surveys repeated over time and permit comparisons of an earlier and later period. The earlier period is approximately between 1986 and 1992 while the later period covers mainly the middle and late 1990s. The number of regions in the first and second rounds is slightly different because of a few regional redefinitions in the interim.[3]

The correlations for both periods for these subsets of regions are shown in Table 7 and in Figures 2 and 3. The first point is that the estimates of the correlations for the two parts of the world (Figure 2) at the earlier time (-0.40 in sub-Saharan Africa and -0.85 in the Other regions) are very similar to the estimates for all regions shown in Table 1 (-0.37 and -0.81, respectively), a similarity that increases confidence in the representativeness of the subset of regions with multiple surveys. The second observation is that the basic correlation in sub-Saharan Africa has increased substantially, from -0.40 to -0.68 (Table 7 and Figure 3), with the result that the difference with the correlation in the Other regions has diminished appreciably. Similar changes are evident with the proportion using modern contraception. The correlations remain lower in sub-Saharan Africa, but the gap with the magnitude of the correlation in Other regions has narrowed considerably.

Table 7   Correlations of the TFR with the CPR and the proportion using modern methods for two time periods in regions of sub-Saharan Africa and in Other regions

	CPR		Modern methods	
	First	Last	First	Last
Sub-Saharan Africa	-0.398	-0.676	-0.527	-0.689
Other regions	-0.851	-0.785	-0.778	-0.825

One further analysis was conducted to determine the correlation for the latest surveys between fertility and the use of contraception for spacing or for limiting births. As revealed in Table 8, the difference in the correlations between sub-Saharan Africa and the Other regions that was evident in the earlier surveys for limiting births has disappeared. When the focus is the correlation between the spacing of births and fertility, a difference remains, but there has been a considerable convergence.

Table 8   Correlations of fertility with contraceptive use for spacing and for limiting births for two time periods in sub-Saharan Africa and Other regions

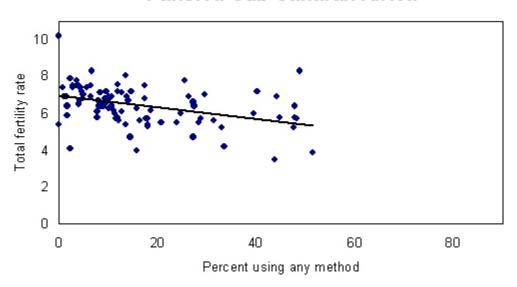|	Use for spacing		Use for limiting	
	First	Last	First	Last
Sub-Saharan Africa	-0.296	-0.573	-0.434	-0.671
Other regions	-0.716	-0.661	-0.780	-0.645

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[1] The countries are Ghana, Kenya, Madagascar, Malawi, Niger, Senegal, Togo, Tanzania, Uganda, Zambia, and Zimbabwe.
[2] These include Bangladesh, Bolivia, Brazil, Colombia, the Dominican Republic, Egypt, Guatemala, Indonesia, Jordan, Morocco, Peru, the Philippines, Turkey, and Yemen.
[3] The number of regions for sub-Saharan Africa is 91 in the second round, and the number is 150 for the Other countries.

Figure 2 Association of TFR and CPR for regions of countries with trend data: DHS-I

Panel A: Sub-Saharan Africa
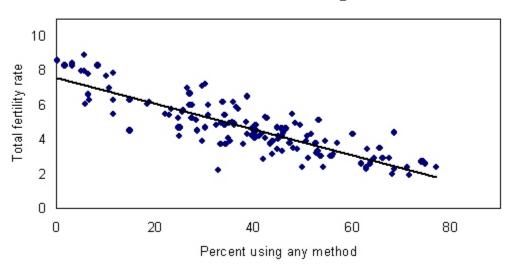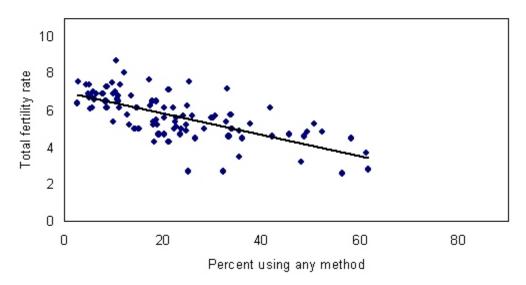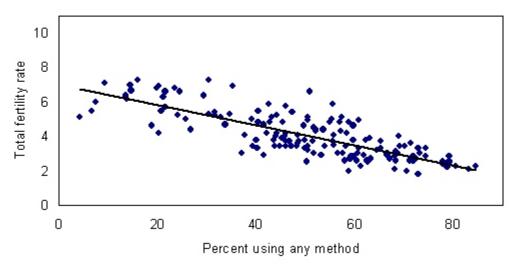

Panel B: Other Regions

Figure 3 Association of TFR and CPR for regions of countries with trend data: Most recent DHS

Panel A: Sub-Saharan Africa

Panel B: Other Regions

11   Conclusions

The basic question addressed in this study is why the correlation between contraceptive prevalence and fertility in sub-Saharan Africa observed in the beginning of the fertility transition in that part of the world was so much lower than that in other developing countries. We repeated the analysis for regions of countries as well as for the countries themselves that had been the conventional units of analysis with the same result. The main focus has been on 451 subnational units that offer greater ethnic homogeneity than nation-states and permit more detailed statistical analyses.

Most of the research described here has examined, without much substantiation, a series of hypotheses advanced in the literature on this question. The analyses included evaluations of the time synchronization of the contraceptive and fertility indicators, the substitution of marital for general fertility, the relevance of the use of modern methods, the overlap of postpartum insusceptibility and contraceptive practice, whether contraception is used for spacing or limiting births, and the potential demand for family planning as measured by prevalence plus intention to use and by prevalence plus unmet need. None of these succeeds in explaining the lower correlation in sub-Saharan Africa although the use of modern methods reduces the difference somewhat.

Whatever the explanation, the difference in the association of the CPR and the TFR between sub-Saharan Africa and Other regions has diminished over time. This observation is based on a comparison of the regions of the same countries that conducted more than one survey over an average interval of five years. Although the correlation remains lower in sub-Saharan Africa than in the Other regions, the magnitude of the difference has diminished considerably. Moreover, the difference disappears completely if the comparison is restricted to contraceptive use for limiting births.

It should be noted that the low correlation in sub-Saharan Africa is evident for the early stages of the fertility transition when the average proportion of women using contraception was only about 15 percent, the average TFR was 6.5, and the range of variation was very limited. Given that most use was for spacing purposes, that traditional methods were more commonly used, and that contraception had some overlap with postpartum insusceptibility, it seems unlikely that the TFR would be highly responsive to slight increases in the CPR. Ideally, it would be desirable to compare the association of fertility and contraceptive prevalence for countries at the same stage of the fertility transition. The countries of sub-Saharan Africa are in the early stages of that transition, perhaps as many as 30 to 40 years after the transition began in Asia and Latin America. The statistics presented here are based on comparisons of one part of the developing world in the early stage of the transition, with the other part in a more advanced stage. It is impossible to assemble comparable data for Asia and Latin America for that early period because estimates of contraceptive prevalence were not widely available prior to the large World Fertility Survey (WFS) and Demographic and Health Surveys projects. An indirect way to estimate the association is to look at regions in the Other countries where the TFR is still high. If we select from the most recent surveys the 58 regions with TFRs of 5 or higher, we find a correlation of -0.33 compared with one of -0.28 in sub-Saharan Africa. The closeness of these values supports the proposition that the correlation is low at the beginning of the transition when the range of both fertility and contraceptive prevalence is limited.[4]

With increasing prevalence, greater use of modern methods, and a shift to greater use for limiting in sub-Saharan Africa, the correlation with fertility has increased. It will undoubtedly increase further, and the difference between sub-Saharan Africa and the other countries of the world can be expected to disappear in the near future.

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[4] If all of the regions are grouped by the TFR from 2.0-2.9, 3.0-3.9, . . . 7.0-7.9, the magnitude of the correlation declines fairly regularly from -0.35 to -0.07.

References

Adamchak, D. J., and T. Mbizvo. 1990. The relationship between fertility and contraceptive prevalence in Zimbabwe. *International Family Planning Perspectives* 16:103-106.

Blanc, A.K., and P.V. Poukouta. 1997. *Components of unexpected fertility decline in sub-Saharan Africa.* DHS Analytical Report No. 5. Calverton, Maryland: Macro International Inc.

Brown, M.S. 1996. Contraceptive prevalence and fertility: A different relationship in sub-Saharan Africa? In *Population dynamics*, ed. Richard Powell, Eleuther Mwageni, and Augustine Ankomah. Institute of Population Studies, University of Exeter.

Curtis, S.L., and I. Diamond. 1995. When fertility seems too high for contraceptive prevalence: An analysis of Northeast Brazil. *International Family Planning Perspectives* 21(2):58-63.

Frank, O., and J. Bongaarts. 1991. Behavioral and biological determinants of fertility transition in sub-Saharan Africa. *Statistics in Medicine* 10:161-175.

Freedman, R., and A.K. Blanc. 1991. Fertility transition: An update. In *Proceedings of the Demographic and Health Surveys World Conference, Washington, D.C.* Vol. 1. Columbia, Maryland: IRD/Macro International Inc. 5-24.

Greene, D.L. 1998. Contraceptive use for birth spacing in sub-Saharan Africa. Ph.D. diss., Princeton University.

Kennedy, K. I. 1991. *Breastfeeding and the double protection dilemma.* Article II, Postpartum Conference, Family Health International, USA.

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