WHY ARE INFANT, CHILD, AND MATERNAL MORTALITY RATES LOWER IN THE MCH-FP AREA OF MATLAB, BANGLADESH? IS THE DIFFERENCE DUE TO DIFFERENCES IN REPRODUCTIVE PATTERNS?

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Infant, child, and maternal mortality rates are significantly lower in the MCH-FP Area of Matlab, Bangladesh, than in the Comparison Area. The two areas are similar in terms of the socioeconomic and demographic characteristics of their populations, but the MCH-FP Area has better family planning services than the Comparison Area and, as a result, has different reproductive patterns, including lower fertility rates, longer intervals between pregnancies, and fewer unwanted pregnancies. In this paper we use data from the Matlab Demographic Surveillance System on nearly 146,000 pregnancies that occurred between 1982 and 2002 to investigate the extent to which the different reproductive patterns in the MCH-FP Area explain the lower infant, child, and maternal mortality rates there.

The Matlab data are particularly well suited for understanding the effect of an MCH-FP intervention on infant, child, and maternal morality because they

> are high-quality data from a demographic surveillance system. (Exact dates of events are recorded through regular household visitations [every two weeks or every month] by well-trained, experienced, trusted community health workers.)
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> provide large sample sizes of pregnancies (nearly 146,000) and births (nearly 126,000), infant and child deaths (over 12,000), and maternal deaths (363 from pregnancy or delivery causes).
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> not only provide data from which the durations of interpregnancy intervals can be accurately calculated but also provide information on other aspects of reproductive patterns (e.g., maternal age, parity, whether the pregnancy was intended) as well as other possibly confounding variables including the duration of pregnancy (i.e., prematurity), education, breastfeeding, contraceptive use, sibling survival, and social and economic characteristics.
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> are longitudinal data that cover a period of over 20 years (1982-2002), during which there were remarkable demographic changes.
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> are for an experimental setting (two populations that differ in their accessibility and quality of health and family planning services, but are otherwise the same).

The green line (with the triangles) in the figure below shows the relative risks of infant and child mortality for four subperiods of infancy and childhood for the MCH-FP Area vs. the Comparison Area of Matlab. (These are based on hazard models in which an

indicator for MCH-FP Area is the only explanatory variable.) We can see that the relative risks of infant and child mortality are lower in the MCH-FP Area than in the Comparison Area of Matlab in each subperiod that we consider. During the first week of life, living in the MCH-FP Area reduces the relative risk of mortality by 16 percent ($p<.001$), and during weeks 2-4 the risk of mortality is 37 percent lower ($p<.001$) in the MCH-FP area. During the remainder of the first year of life and years 1 through 5, the reductions in mortality associated with MCH-FP Area residence are 20 percent ($p<.001$) and 37 percent ($p<.001$), respectively.

We then add controls for the following aspects of reproductive patterns to the hazard model: maternal age, parity, the duration of the interval between the preceding pregnancy and the pregnancy under consideration (the "inter-outcome interval"), the type of outcome of the previous pregnancy (i.e., whether a live birth, miscarriage, induced abortion, or stillbirth), whether the pregnancy was intended, duration of gestation of the index pregnancy, and calendar year. Each of these variables differs between the two areas.

We illustrate this in the table below for inter-outcome intervals by showing how the distribution of inter-outcome intervals differs between the MCH-FP Area and the Comparison Area. We see in the table that pregnancies in the Comparison Area are more likely to follow shorter inter-outcome intervals (less than 36 months) than pregnancies in the MCH-FP Area, while longer intervals, of 36 months or more, are likely to occur among women living in the MCH-FP Area. A t-test reveals that the difference between the two percentages is statistically significant different ($p<.001$) for all interval-length categories shown. Since shorter intervals are associated with significantly higher risks of infant and child morality,[1] the difference in the distributions of interval length helps explain the difference in infant and child morality rates between the two areas that we just saw in the green line (with the triangles). In the full paper, we will show the differences between the two areas for all of the reproductive-pattern variables that we consider and will test for the statistical significances of these differences.

The relative risks of mortality associated with living in the MCH-FP Area compared to the Comparison Area when we control for all of the reproductive variables mentioned above are shown in the red line (with the squares) in the figure below. Once these controls are added, we cannot reject the null hypothesis at $p<.05$ that the relative risk of mortality associated with living the MCH-FP Area is the same as the relative risk of mortality associated with living in the Comparison Area. This holds true for all four subperiods of infancy and childhood that we investigate. This suggests that the protective effect on infant and child mortality of living in the MCH-FP Area works through altering the reproductive behaviors of the women living in these regions.[2] In the full paper, we

[1] In J.DaVanzo, A. Razzaque, M. Rahman, and L. Hale et al., *The Effects of Birthspacing on Infant and Child Mortality, Pregnancy Outcomes, and Maternal Morbidity and Mortality in Matlab, Bangladesh*, draft, 2004, we find that inter-outcome intervals of less than 36 months duration are associated with much higher risks of infant and child mortality than are longer intervals.

[2] In DaVanzo et al., op cit., we show that each of the reproductive variables we consider here (e.g., maternal age, parity, whether the pregnancy was intended) significantly affects the risk of infant and/or child mortality.

will explore adding each set of reproductive-pattern variables alone so that we can see which ones contribute the most to explaining the difference between the areas that we see before the reproductive-pattern variables are controlled.

In addition, in the full paper we will also consider maternal mortality. In DaVanzo et al. (op cit., 2004) we show that the probability a pregnancy or delivery will lead to a maternal death is 28% lower in the MCH-FP Area than in the Comparison Area. We also show that the probability of maternal death varies significantly with maternal age, gravidity and the number of prior pregnancy losses and that it is higher following the longest interpregnancy intervals.

Figure 1. The Effect of Living in the MCH-FP Area on Mortality Across Four Subperiods of Infancy and Childhood, with and without Controls for Reproductive-Pattern Variables

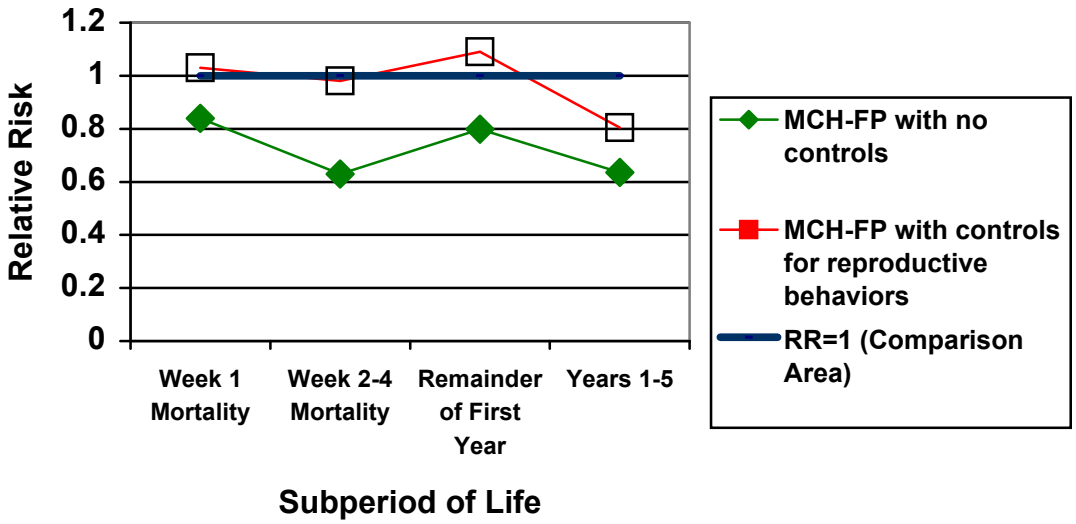

Table 1. Distribution of inter-outcome intervals preceding live births, by whether the women lived in the Comparison or the MCH-FP Area

Duration of the inter-outcome interval	Comparison Area (n=67,165)	MCH-FP Area (n=58,555)
<15 months	0.07	0.05***
15-17 months	0.03	0.02***
18-23 months	0.08	0.05***
24-35 months	0.23	0.14***
36-59 months	0.17	0.20***
60-83 months	0.04	0.08***
84 or more months	0.02	0.03***

*** Difference is statistically significant at p<.001