Maternal Reproduction and Child Survival

Over the past 30 years, historical demographers have reconstructed the patterns of fertility, mortality, and marriage in European and North American populations using data on births, deaths, and marriages recorded in parish registers. This work, known as family reconstitution, was pioneered by the French demographer Louis Henry and has yielded a wealth of information on the health of historic populations which is of relevance to our understanding of health conditions in developing nations today. Rarely have these demographic studies appeared in the medical literature, so the publication of the paper by Knodel and Hermalin in this issue of the Journal marks a welcome departure.

Knodel and Hermalin consider the effects of maternal reproductive patterns on the mortality of infants and children in selected German villages during the 18th and 19th centuries. There is an extensive literature on maternal fertility and the survival of progeny which suggests that the risks of infant or child death are increased among children of younger and older mothers,2-4 children with a short preceding or succeeding birth interval,5-7 and, more controversially, children of higher birth rank or larger family size.2,3,4,8 In addition, pregnancies at the extremes of age or parity are associated with higher maternal mortality and morbidity.3,4,8 This evidence provides the health rationale for family planning, since if high-risk pregnancies were prevented by birth control, aggregate infant and child mortality, and maternal complications of pregnancy might be significantly reduced. Indeed, several studies suggest that changes in the age/parity distribution of births toward more favorable low-risk groups has contributed to declines in stillbirths, and perinatal and infant mortality in industrialized countries over the past two decades.9-12

Nevertheless there is still controversy over the precise relationships between maternal reproductive patterns and child survival, largely because of problems in the analysis and interpretation of data. This area is a methodological mine field, and a few examples will suffice to illustrate the difficulties. The reproductive variables of maternal age, parity, and birth interval are highly interrelated and studies employing univariate analyses cannot disaggregate independent effects.9-11 Short birth intervals may be either a cause or a consequence of child death. For example, an early postpartum conception leading to a short succeeding birth interval may prematurely interrupt breast-feeding and increase child mortality due to malnutrition and infection; conversely, the death of a child can lead to a short interval because the cessation of lactational amenorrhea results in early resumption of fertility, or because mothers of dead children tend to replace the lost child and go on to further pregnancies. The tendency to replace lost children can introduce a bias into longitudinal or cross-sectional studies when observation is truncated before family formation is complete, since the progression to higher order births may selectively occur among women with prior adverse outcomes. Furthermore, such self-selection is particularly a problem in contracepting populations where couples voluntarily terminate reproduction after successfully achieving a desired family size. Finally, in many populations, low maternal socioeconomic status or education are independently associated with both higher fertility and mortality. This creates serious problems of confounding since an observed relationship between reproductive patterns and child survival may reflect the common influence of socioeconomic factors, rather than a direct effect of maternal fertility on child mortality.

No single study has adequately addressed these complex questions, and the
paper by Knodel and Hermalin can only in part resolve outstanding controversial issues. Nevertheless, these German data on 9,000 women and 48,000 births have three distinct advantages: the number of observations is sufficient for adjustment or stratification by subgroups of particular interest; the population did not practice birth control, so self-selection for higher birth orders should be minimal; and unlike cross-sectional or truncated longitudinal studies, these historic data are based on completed reproductive histories over a woman’s entire reproductive life. The authors confirm previous findings that extremes of maternal age or short preceding birth intervals are independently associated with an increased risk of infant death. However, they also show that larger completed families have higher mortality at each birth order, even after controlling for maternal age and the length of the preceding birth interval, whereas birth order per se is not independently associated with mortality risk. This effect is most pronounced in families with seven or more children. These findings suggest that membership of a larger family confers a higher risk of dying at all stages of family formation, and it is the characteristics of larger families that influence mortality risks via behavioral or biological mechanisms. Unfortunately, these historical data do not allow us to unravel causal mechanisms, but it is likely that breast-feeding was a critical factor since certain villages with a short duration of lactation also have shorter birth intervals, higher mortality, and a larger average completed family size.

The importance of completed family size as a determinant of mortality has implications both for research and policy. From the research perspective, it is clear that the association between higher birth order or parity and increased mortality observed in previous retrospective or cross-sectional studies is, in part, an artifact due to the inappropriate comparison of families at different stages of formation, since lower birth ranks may arise from either small or incomplete larger families, but higher birth ranks can only occur in larger families. Conversely, the declining mortality risk with higher parity reported in truncated prospective studies is also probably in part an artifact whereby women who lose children selectively progress to further pregnancies, but women without child loss selectively stop reproduction. There is, however, still need for further research to determine what specific factors associated with larger families lead to poorer child survival, and what are the mechanisms through which these factors influence mortality risk.

From the perspective of policy, it is clear that priority in the provision of family planning services should be given to those women with large families, women at the extremes of reproductive life, and women who have recently had a birth. Such policies would potentially minimize the risk of infant and child loss, and contribute to a reduction of maternal morbidity and mortality. Thus, the health rationale for family planning remains unchanged, although the quantification of the health benefits remains elusive.

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Can a Time-Honored Model Solve the Dilemma of Public Health Nursing?

Public health nursing embodies all the best in the ideals in American nursing and yet also all the failings that have plagued the field since its 19th century origins. With the publication in this issue of the Journal of Melanie Drehser’s strongly positive analysis of a historically popular form of public health nursing,1 we are given the opportunity to reflect upon these hopes and dilemmas. As historians and health policy analysts, we are pleased to see a well-argued plea for this model in which public health nurses provide both bedside and preventive care.

Generalized district nursing, as this model is labeled, has an intrinsic appeal to many: to nurses anxious to create a more “rational” division of labor than the present physician-dominated arrangement; to over-burdened families of the chronically ill; and to policy makers searching for less costly alternative systems of care. Despite complex social, medical, and economic problems that create a contemporary need for just this kind of home-based nursing care however, it remains an ideal obtainable only in the rarest circumstances. It is imperative that historical evidence be considered in