

Optimizing the Health of Mothers, Infants, and Communities Through Research

See also pages 1368, 1378, and 1388

The accident of birth is a principal source of inequality in America today. American society is dividing into skilled and unskilled, and the roots of this division lie in early childhood experiences.

James J. Heckman¹

In this issue of *Mayo Clinic Proceedings*, 2 teams of researchers report their efforts to improve the health of infants by working with mothers or mothers-to-be.^{2,3} A third team describes a behavioral and social transition that may be a cause of the epidemic of overweight and obesity among young American mothers.⁴ These efforts to improve the health of mothers are important because poor maternal health creates a multigenerational problem: for example, obese mothers tend to have obese children, and obese children tend to retain their obesity and the associated morbidity into adulthood.

In their report, Oberhelman et al² describe testing 2 schedules for delivering vitamin D to nursing infants by giving vitamin supplements to their mothers. In this randomized clinical trial, the investigators gave the mothers vitamin D as either a large single dose or a series of smaller daily doses. They found, much to their surprise, that the infants' vitamin D levels increased to similar levels with both treatment schedules. Their findings are important for this small segment of the population because up to 78% of infants who are exclusively breast-fed in winter are vitamin D deficient when their mothers do not give them vitamin D supplements.⁵ As Oberhelman et al point out, mothers who do not take a daily supplement themselves or give a daily supplement to their infants could receive a single large supplement during a well child visit. Alternatively, community health workers could administer a monthly supplement to the mothers during periodic home visits.

This trial is an excellent example of optimizing practice through research.⁶ The team identified a problem that threatened the health of their patients, identified 2 potential solutions,

designed an appropriate test of their hypothesis, and documented the efficacy of both approaches. In these scenarios, we have preferred the term *optimizing practice through research* over *translating research into practice* simply because it defines the task as improving practice—and hence, patient outcomes—rather than searching for a way to incorporate the results of research into clinical practice. However, we now recognize that even this phrase restricts where solutions are sought. Clinical services determine only about 20% of the health of populations.⁷ Therefore, limiting the search for improved health to clinical practice excludes up to 80% of potential solutions. If health is to be optimized, the task must be conceptualized as “optimizing health through research.”

The 2 other reports in this issue of the *Proceedings* focus on threats to optimal infant health that arise from maternal obesity. The first is a randomized trial by Ruiz et al³ to prevent excessive weight gain by expectant mothers. With an intervention of 3 hours of supervised physical activity per week, the investigators were able to reduce the odds of excessive weight gain in pregnant women. Although women in the intervention group were nearly 40% less likely to gain more weight than the Institute of Medicine recommends, the difference in weight gain between the intervention and reference groups was only 1 kg (2.2 lb). This suggests to us that the intervention may have been effective not so much because it increased the calories burned during exercise but because it made women more aware of, concerned with, and accountable for meeting their weight gain target. Unfortunately, when the indirect costs of travel time and 3 h/wk in a gym are considered, we suspect that the intervention would not be accessible to most pregnant women who already have children and to pregnant women who are the earners for their families. Are there more accessible interventions that help pregnant women maintain their target weight? Would a virtual group of mothers-to-be linked by social media to a health coach be able to

accomplish the same goals? Would empowering mothers-to-be to self-organize into action groups be more effective? Would environmental interventions that allowed entire communities to be more active be more effective? We do not know, but it would be interesting to investigate these hypotheses.

In the United States, the mean body weight of women in their 20s increased 13.1 kg (28.8 lb) between 1960-1962 and 1999-2002.⁸ For women in their 30s, mean body weight increased 11.1 kg (24.2 lb) over the same time span. The third report in this issue of *Mayo Clinic Proceedings* asks the community to look beyond health care for the solution to this health problem. Archer et al⁴ analyzed the home activity diaries of mothers with children younger than 18 years that were collected over a 45-year period as part of the American Heritage Time Use Study. They found a 30-35% decline in physically active behaviors (the aggregate time spent in meal preparation and cleanup, general cleaning, clothing maintenance, general child care and playing with children, and leisure time physical activity). They also found that sedentary time (time spent watching television, working at a home computer, or sitting in a vehicle) increased by up to 40%. The energy imbalance associated with this shift in the way young mothers spend their time more than accounts for the weight gain that has been observed.

Both randomized and quasi-experimental trials have found that a nurturing and stimulating environment from infancy can boost babies into the skilled occupational track with the concomitant greater potential for earnings when they would have otherwise been expected to live a life of unemployment and poverty.⁹⁻¹² The corollary to these observations is that optimal health and well-being cannot be achieved simply by eliminating infectious diseases, nutritional deficiencies, and toxins; to thrive, every infant needs a health-promoting environment. In addition to being healthy herself, the mother must be engaged and empowered to positively influence the behavior and habits of the child.

Although the United States spends enormous amounts of money on health care, it is falling behind other countries in life expectancy and other measures of health.¹³ Is the country's failure to keep pace due to its focus

on more health care (and hence the management of existing disease) as the solution to its health problems? Should it instead be focusing more on creating health-promoting environments, beginning with the health issues of mothers that trickle down to subsequently burden their children?

The United Nations International Children's Emergency Fund (UNICEF) has collected evidence that the general level of education, particularly that of girls, is among the most powerful determinants of the overall health and development potential of any country.¹⁴ This is because general educational level is a powerful predictor of maternal health.¹⁵ Giving women the knowledge to raise healthy children, the ability to want the children they have, and the opportunity to space births is associated with healthier children and mothers.¹⁶

A particularly successful example of the positive impact of empowering women is an intervention to prevent stunting of young children in Bangladesh.^{17,18} The results, twice as good as expected, were so good that the chief executive officer of the community development organization, CARE, was skeptical at first. After analyzing the data herself, however, she was convinced that the results were legitimate and that they were due to the "rights-based livelihoods approach" the trial used to address malnutrition. Translated, this means that, in addition to providing food to poor families, the intervention promoted the empowerment of women so that they could participate in the decisions that were made for their children, their households, and their community. Although many may find it hard to imagine that the United States has anything to learn from Bangladeshi women, they may also be surprised that subpopulations in metropolitan centers like Minneapolis-St Paul, Minnesota, have life expectancies that are no longer than those in Bangladesh.¹⁹

None of this is to say that fathers, other family members, and community members at large do not need to accept responsibility for their own children and other children in their communities. This is also not to say that the needs of boys should be neglected. As a UNICEF report put it, "Making schools and education systems more gender-sensitive and girl-friendly does not render them any less attractive or comfortable for boys."¹⁴ UNICEF

makes a powerful argument that improving education is good for both girls and boys:

All this suggests that boys' disaffection with education may be closely connected with their traditional socialization as males. It underlines the importance of fathers being involved with their children from birth, participating in their care and development during early childhood, and supporting their education.

In addition to improving cognitive skills, schools can also teach social skills.

The accident of where one is born affects not only future skills, as observed by Heckman,¹ but future health. Infant mortality rates in the United States are higher than those in Greece, Guam, Cuba, Portugal, and 44 other countries.²⁰ Clearly, the United States has a problem. However, international experience has revealed that there are many opportunities to optimize the health of mothers, infants, and communities that lie beyond health care. If US communities are to take full advantage of their human capital potential, children cannot have their lots cast for a lifetime by the zip code or ethnicity of their mothers. In order to take full advantage of its human capital potential, the country needs initiatives that reach far beyond mother-specific, clinic-based interventions.

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