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THE IMPACT OF MEDICAL PROGRESS ON CHILD HEALTH

Mary Ellen Avery†

I AM SOBERED AT THE THOUGHT of addressing this topic after reading Lewis Thomas' new book, *The Fragile Species*,¹ where he states that:

There is no question that our health has improved spectacularly in the past century, but there is a running argument about how this came to be. One thing seems certain: it did not happen because of medicine, or medical science, or the presence of doctors.²

Our colleagues in schools of public health have long reminded us that advances in sanitation, food processing and storing, understanding the basic principles of nutrition, family spacing, clean air, pure drinking water, fluoridation, shorter working hours and all those things that are packaged as "improved standards of living," not the least of which is education, have been largely responsible for the better health of the public.

With that caveat, I embark on some selected comments about the "impact of medical progress on child health."

One of the major social forces that has improved the outlook for mothers and children in developed countries has been a decrease in fertility rates.³ Declining fertility rates and infant mortality rates are coupled with increased standards of living.⁴ The use of technologies to prevent pregnancy and the availabil-

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1. LEWIS THOMAS, *THE FRAGILE SPECIES* (1992).

2. *Id.* at 85. Of course, he then relates some of the marvels of scientifically based modern medicine in recent times. *Id.* at 80-87.

3. See Myron E. Wegman, *Annual Summary of Vital Statistics-1991*, 90 *PEDIATRICS* 835, 836 (1992) (citing a drop in the fertility rate in the U.S. from 71.1 in 1990 to 69.6 in 1991).

4. See UNICEF, *STATE OF THE WORLD'S CHILDREN 1992*, at 21 (1992) [hereinafter UNICEF 1992].

ity of abortion and contraceptives such as RU 486⁵ facilitate the goal that every child should be wanted.⁶ When women have no choice and lack family planning, both women's health and infant mortality remain excessive⁷ — a human tragedy.

It seems pertinent to ask about the role of neonatal intensive care in the lowering of the neonatal component of infant mortality. In the U.S., the rate of preterm births has not changed dramatically, and very recently has actually increased, in part from the multiple births that so often follow *in vitro* fertilization and in part from pervasive illicit drug use and poverty.⁸ The mortality of preterm infants has decreased steadily from the 1950s to the present,⁹ in large part associated with sophisticated neonatal care, and in part from the substitution of C-section for forceps deliveries. Fortunately, the morbidities of the 1500-gram-and-over group are reduced as well, although the less than one-thousand gram infants remain at risk of the consequences of immaturity on the brain, eyes, lungs and intestines.¹⁰

The impact of wide use of ultrasonography for detection of anomalies and the availability of abortion are difficult to quantify, but clearly fewer of the major neural tube defects and other malformations are allowed to go to term.¹¹

What could happen in the next decade to lessen prematurity and infant mortality? The answer is at hand: improve the

5. See André Ulmann et al., *RU 486*, *SCI. AM.*, June 1990, at 42, 42.

6. See R. Alta Charo, *A Political History of RU 486*, in *BIOMEDICAL POLITICS* 43 (Kathi E. Hanna ed., 1991).

7. See UNICEF 1992, *supra* note 4, at 21.

8. See *id.*; John Funk, *Seeing How They Operate: Lawyers Given Close Look at Medical World*, *PLAIN DEALER*, Sept. 4, 1994, at 1B, 6B.

9. See Myron E. Wegman, *Annual Survey of Vital Statistics-1990*, 88 *PEDIATRICS* 1081, 1082 (1991) (stating that the U.S. infant death rate has decreased from 8.4 per 1000 in 1950 to 5.2 per 1000 in 1990).

10. See Marie C. McCormick et al., *The Health and Developmental Status of Very Low-Birth-Weight Children at School Age*, 267 *JAMA* 2204, 2204-05 (1992) (studying the effects of low birth weight on neurodevelopmental, sensorineural and learning abilities and on the lungs, heart and blood in infants); Marie C. McCormick, *The Contribution of Low Birth Weight to Infant Mortality and Childhood Morbidity*, 312 *NEW ENG J MED* 82, 85-87 (1985) (discussing much longer hospital stays for low-birth-weight infants).

11. See Centers for Disease Control, U.S. Dep't of Health & Human Servs., *Cases of Specified Notifiable Diseases, United States Cumulative, Week Ending June 19, 1992*, 41 *MORBIDITY & MORTALITY WKLY REP* 425 (1992); Centers for Disease Control, U.S. Dep't of Health & Human Servs., *Use of Folic Acid for Prevention of Spina Bifida and Other Neural Tube Defects, 1983-1991*, 40 *MORBIDITY & MORTALITY WKLY REP* 514-15 (1991) [hereinafter referred to as CDC, *Use of Folic Acid*].

health of women, reduce discrimination and the social stresses that ensue, improve access to family planning and effective reproductive technologies, insure safe deliveries and provide and teach optimal care of newborn infants, especially that which encourages breast feeding and six months to one-year maternity leave. Successful models exist in Scandinavia, Japan, Hong Kong, Singapore and elsewhere in the industrialized world.¹²

Other significant issues concerning prematurity and infant mortality include improved methods of *in vitro* fertilization to lessen the likelihood of multiple births. The training of birth attendants could be improved to preserve the beneficial aspects of traditional care in conjunction with the teaching of *proven* advances in modern medicine. Access to tertiary care medical centers for more of the world's children would permit correction of many otherwise lethal anomalies, such as congenital heart disease, omphaloceles or hydrocephalus from intraventricular hemorrhage.

INFECTIOUS DISEASES, IMMUNIZATION

An unequivocal success story for human betterment has been the advent of vaccines and antimicrobials in this century. Infectious diseases have clearly been devastating to civilization from time immemorial. Even a casual reading of history lets us know that native populations have been victimized by microbes introduced by explorers or conquerors. Surely one of the great historic advances of all time was made by the World Health Organization ("WHO") and the group headed by D.A. Henderson which achieved the eradication of smallpox from the globe.¹³ The eradication of measles and polio is certainly possible,¹⁴ but not without the sustained effort and will to achieve the goals. The infrastructure established to make the smallpox eradication possible still exists and has been used to virtually

12. See Wegman, *supra* note 9, at 1091.

13. See Phil Gunby, *1992 Could Be the Pivotal Year in Efforts to Improve Health of People Everywhere*, 267 JAMA 15, 17-24 (1992) (discussing the work of D.A. Henderson).

14. See James O. Mason, *From the Assistant Secretary for Health, U.S. Public Health Service*, 267 JAMA 24, 24 (1992) (detailing efforts of WHO to distribute vaccines worldwide).

eliminate polio from the western hemisphere, although not yet from Africa and Asia.¹⁵

Celebrating past success is surely appropriate. However, in 1993, we should acknowledge other illnesses. Malaria remains among the top ten disease killers in the world today,¹⁶ in the absence of a vaccine and in the presence of increasingly resistant organisms.¹⁷ At the present rate of infection, the human immunodeficiency virus ("HIV") will predictably lead to yearly deaths of the more than ten million people known to be HIV-infected, again in the persisting absence of an effective vaccine or curative antiviral drugs.¹⁸

What can vaccines do to improve the quality of human life? They can, as in the case of smallpox, eradicate disease,¹⁹ and in other instances greatly reduce the prevalence.²⁰ It is known for example, that measles and hepatitis B vaccines are both highly effective, very safe, but not universally distributed.²¹ If vaccines against HIV and malaria were available, such issues as who would get them and who would pay for them would be raised. We have the knowledge and the recent experience to achieve universal immunization, but we have not made the effort to utilize this experience and knowledge top priority.

The availability of the *Hemophilus influenza* vaccine, which was approved by FDA in December 1990,²² has dramatically decreased deaths from meningitis and other serious ill-

15. *Id.*

16. Susan Oakie, *Mortality: Heart Disease is World's Worst Scourge*, WASH. POST, April 30, 1990, at A02; see also *The Cutting Edge Vital Statistics*, WASH. POST, June 9, 1992, at Z05.

17. See Sally Squires, *Medical Panel Calls World's Malaria Control Efforts Grim*, WASH. POST, Oct. 15, 1991, at Z05.

18. Mason, *supra* note 14, at 24.

19. *Id.*

20. See William H. Foege, *Preventative Medicine and Public Health*, 268 JAMA 401, 401 (1992) (stating that in the early 1980's vaccine preventable diseases dropped to record low levels) (citing Centers for Disease Control, U.S. Dep't of Health & Human Servs., *Summaries of Notifiable Diseases in the U.S.—Summary of Reported Cases by Month, 1990*, 39 MORBIDITY & MORTALITY WKLY REP. 3, 3 (1990)).

21. Mason, *supra* note 14.

22. AMERICAN ACADEMY OF PEDIATRICS, REPORT OF THE COMMITTEE ON INFECTIOUS DISEASES 225 (1991).

nesses associated with hemophilus, so that the number of cases of *Hemophilus meningitis* has been dramatically reduced.²³

Hepatitis B vaccine has had a positive impact where it has been used for the last decade in developing countries, and is being recommended for all infants born in the U.S. in anticipation of its ability to significantly reduce chronic liver disease in young adults.²⁴ This controversial recommendation is based on knowledge of the association of chronic Hepatitis B infection and cirrhosis in young adults rather than the prevalence of infection in children at low risk.²⁵ The assumption that only newborns and infants are a *captive* population for immunization has led to the recommendation.²⁶ Issues of concern are the lack of assurance of persistent immunity without a booster shot in adolescents and the low level of acquisition of infection by horizontal spread in day-care settings. Judgment calls such as this one are increasingly evident, not because of inadequate science (as the vaccine is safe and effective), but because of the public policy implication with respect to the cost of twelve million shots per year for newborns alone in the U.S., which will almost certainly be at the expense of other components of prevention, such as anticipatory guidance.

The tragedy, of course, is that current vaccines are not universally available in even the developed countries, and there is a long way to go in the developing countries. The Children's Vaccine Initiative sponsored by UNICEF, The Rockefeller Foundation, The World Bank and WHO has as its goal the reduction in measles incidence by ninety percent by the year 2000, and elimination of the wild polio virus. Having a population fully immunized against tetanus would dramatically reduce the likelihood of that still fatal disease in developing countries.²⁷ According to D.A. Henderson, global coverage for diphtheria, pertussis, tetanus, polio, measles and tuberculosis is now at an average of eighty percent.²⁸ The maintenance of these levels of immunization could mean eradication of some of

23. Caroline Breese Hall & Neal A. Halsey, *Control of Hepatitis B: To Be or Not to Be?*, 90 PEDIATRICS 274, 275 (1992).

24. *See id.* at 274 (explaining the need to immunize all infants against Hepatitis B).

25. *Id.* at 275.

26. *Id.* at 275-76.

27. UNICEF 1992, *supra* note 4, at 14 (discussing worldwide vaccination programs).

28. *Id.* at 12.

those diseases. The total cost of immunization per child (including needles, syringes and cold storage) to accomplish this has been about fifteen dollars.²⁹ This achievement has been called by James Grant "the greatest public health success story of the past decade."³⁰ It translates into averting about three million deaths annually,³¹ and represents a monumental triumph for modern medicine.

NUTRITION

Nutrition is at once one of the most complicated of topics and also one of the simplest. It is enormously complicated to understand the wisdom of the body with respect to absorption, processing, storage and utilization of nutrients. Much of what is understood about the function of vitamins, trace elements and amino acids has come from studies of inborn errors or deficiency states. A recent example is a study of the efficacy of periconceptual folic acid supplements to prevent recurrence of seventy percent of neural tube defects.³²

Awareness of the pervasive and persistent nutritional deficiencies of some of the world's population is illustrated by vitamin A deficiency in groups in Southeast Asia and Africa.³³ Not only was xerophthalmia prevented or cured, but strikingly, the severity of respiratory tract infections and measles has lessened significantly with vitamin A supplementation.³⁴ One can only wonder to what extent other moderate vitamin or nutrient deficiencies are exacerbating illnesses. One of the rewards of having knowledge of nutritional requirements is effective therapy as well as the successful intravenous alimentation that has made surgical correction of major intestinal problems possible. Although much has been learned, our knowledge is still fragmentary. So much for the complexity.

29. UNICEF. *FACTS AND FIGURES 1993* (1993).

30. UNICEF 1992, *supra* note 4, at 14.

31. *Id.* at 12.

32. CDC, *Use of Folic Acid*, *supra* note 11, at 514-15.

33. See Laxmi Rahmathullah et al., *Reduced Mortality Among Children in Southern India Receiving a Small Weekly Dose of Vitamin A*, 323 *NEW ENG J MED* 929 (1990) (detailing Rahmathullah's study of Vitamin A therapy in India).

34. See Alfred Sommer et al., *Impact of Vitamin A Supplementation on Childhood Mortality*, 1986 *LANCET* 1169, 1172-73 (finding reductions in these diseases after a controlled scientific study administering vitamin A to children in Sumatran villages in Java).

Why do I say nutrition is also simple? It is known that the average diet of individuals in developing countries who are not impoverished supports a life span into the late seventies³⁵ in striking contrast to much shorter life spans, even among the affluent, in centuries past. More dramatic illustrations come from examination of the effect of changing diet in pre- and post-World War II Japan, where presumably increased caloric intake was primarily responsible for the increased stature of the young post-World War II Japanese.³⁶ Fortunately, as a consequence of evolutionary changes, the adaptability of individuals to dietary excesses and deficiencies is really quite remarkable. What is unequivocal, however, is that everyone needs a basic daily caloric intake without which death by inanition in approximately one to two months would occur. The enormous variability in foods from which the needed caloric intake comes allows us to survive as a species in the face of extraordinary stresses and strains, some imposed by nature and some imposed by man or illness.

One of the greatest injustices of our times is that starvation of groups of people has been used as a weapon.³⁷ War is cruel under any circumstances, but the deliberate starvation of groups of people by other people is surely one of the most ruthless, indiscriminate means of oppression, which can never be met with airlifts of temporary food supplies, but can only be met by universal abhorrence of such means, just as we also deplore use of nuclear bombs and poison gases and bacteria in warfare.

UNICEF AND ORAL REHYDRATION THERAPY

I think we should acknowledge the remarkable impact that UNICEF, under the leadership of James Grant has had in the worldwide reduction of infant mortality.³⁸ While the standing of the U.S. among the industrialized nations of the world is

35. See UNICEF 1992, *supra* note 4, at 72-73 tbl. 1 (providing statistics on life expectancy at birth).

36. M. Murata & I. Hibi, *Nutrition and the Secular Trend of Growth*, 38 HORMONE RESEARCH 89 (Supp. 1992).

37. See Jane Green Schaller, *Children and Childhoods: Hidden Casualties of War and Civil Unrest*, 268 JAMA 642 (1992) (discussing the effects of civil war on children). Some current examples of the starvation of people being used as a weapon are the Kurds, some of the Slavs and individuals in parts of Africa.

38. See UNICEF 1992, *supra* note 4.

only twenty-second or twenty-third,³⁹ it should be noted that all the industrialized countries of the world have lower infant mortality rates than they did a decade ago.⁴⁰ In fact, infant mortality rates worldwide, except in areas of famine and war, are falling.⁴¹ Since most of these deaths are in the first year of life,⁴² it is clear that a significant component in the reduction in deaths from diarrheal diseases has been accomplished by the widespread use of oral rehydration therapy.⁴³ The strategy was based on the sound scientific principle of facilitated intestinal absorption of a one to one molar ratio of glucose to sodium (coupled transport).⁴⁴ In practice it became clear that administering the oral electrolyte solution slowly by a spoon, over a period of time, would reverse the lethal dehydration from even continuing diarrhea.⁴⁵ Although precise statistics are hard to find, it is obvious as one travels to the developing countries that many individuals are fully informed of the indications for and methods of administering to infants with severe diarrhea appropriate electrolyte solutions, which are inexpensive and widely distributed. Continuing research is, of course, needed to find caloric supplements from locally available foods that can combat some of the caloric deprivation that accompanies the chronic diarrheas, as well as correcting the dehydration.⁴⁶ Reports from the recent epidemics of cholera in Peru make it clear that the anticipated mortality rates there were dramatically lowered in association with the implementation of oral rehydration therapy.⁴⁷

39. *Id.* at 73.

40. *Id.*

41. *Id.* at 72-73.

42. See UNICEF, STATE OF THE WORLD'S CHILDREN 1993, at 69 tbl. 1 (1993) (providing regional summaries of under-five mortality rates and infant mortality rates).

43. See Mary E. Avery & John D. Snyder, *Oral Therapy for Acute Diarrhea — The Underused Simple Solution*, 323 NEW ENG. J. MED. 891 (1990).

44. See John D. Snyder, *Use and Misuse of Oral Therapy for Diarrhea: Comparison of U.S. Practices With American Academy of Pediatrics Recommendations*, 87 PEDIATRICS 28, 28 (1991).

45. *Id.*

46. *Id.* at 893 (indicating that some foods, especially those high in starch, are effectively absorbed even during diarrhea).

47. 46 WORLD HEALTH 6 (1993).

CONCLUSION

In any review of medical progress and persisting challenges, some major advances go unmentioned or are treated lightly.

Some of the advances benefit thousands of individuals, such as immunization or oral rehydration therapy. Others could be considered incremental in that the new science is enormously important for the few, as in screening for PKU. Some are single leaps forward, while others comprise a "package of services" illustrated by the evolution of neonatal intensive care, which has shown continual improvement in recent years. The conclusion is inevitable that the necessary conditions are a stable socio-economic background and the systematic application of new scientific knowledge and technology.

At a time when we have achieved for some children optimal social, psychological and preventive and therapeutic medical care, we are surrounded with information about the tragic plight of children globally. The haves, and the have nots. The rich and the poor. We, the haves, wrestle with our responsibilities. The continued search for and dissemination of new knowledge is one task we can perform. Knowledge alone, without regard to how that knowledge is applied on behalf of all the world's children, is insufficient. The latter larger challenge will only be met by recognition that it is essential to the survival of civilization to put the best interests of children and their families first on our national and international agendas.

