



COMMENT

Promoting education is preventive medicine at its best

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The skillful doctor treats those who are well. Ch'in Yueh-jen [ca. 225 BCE]

Since at least the third century BCE, leaders in medicine have exhorted physicians to work first to prevent disease rather than address only its management once expressed, and this concept has been repeatedly advocated over the centuries. Public health preventive initiatives such as sanitation, clean water, safe food, immunizations, food fortification, and vehicle safety have led to huge gains in health and lifespan. But medical schools and residencies have focused primarily on teaching diagnosis and disease management, insurance companies have not paid well for prevention, and public health agencies, at least in the United States, have been under-funded in their drive to prevent the underlying challenges to good health.

In spite of spending the highest percentage of gross domestic product on healthcare among 11 wealthy democracies, in 2016 the United States had the highest percentage of adults who were overweight or obese at 70%, the highest infant mortality at 5.8 deaths per 1000 live births (range for the other 10 countries 2.1–5.1), and the lowest life expectancy among the 11 comparable nations.¹ And children born in the United States have a 57% greater chance of dying before adulthood than do children in 19 other wealthy countries using data compiled by the Organization for Economic Cooperation and Development (OECD).²

Progress toward improving health will continue to gain from basic, translational, and clinical research. Developing precision medicine, patient-centered medical homes, and more emphasis on value in determining payment are worthy goals. The overriding challenge to the American healthcare system at the moment, however, is not the quality of care given to those who can obtain it, but rather, the large number of individuals who present for patch-up of disease conditions that could have been prevented by a healthier lifestyle. Patients presenting with *preventable* disability and ill health continue to suffer and die before their time, thereby adding substantially to healthcare costs, using dollars that could go to improving education and broader support of health.^{3,4}

A promising approach to improving health is at hand, however. It has become clear in recent years that, in order to improve the health of its people, all countries, not just the United States, must address in a meaningful way the social determinants of health, including economic stability, education, safe and affordable housing, safe neighborhoods, availability of healthy foods, and access to health services. In 2000–2009, states in the United States with a higher ratio of social service and public health spending to spending on healthcare had significantly better measures of health.⁵ Comparisons of 30 OECD countries from 1995 to 2005 showed similar results: Countries that spent more on social services than healthcare had better health outcomes.⁶

The social determinants of health are inter-dependent, but education exerts a fundamental influence on the other determinants beginning with its effects on earnings. A review by the World Bank shows that education offers a path out of poverty in countries across the world; for example, in the United States the average of yearly returns from stocks and bonds from 1966 to 2015 was 2.4%, whereas the average yearly return in earnings to an individual's investment in 1 more year of education was 10.5%.⁷ The data relating income level to health and longevity are strong.^{8,9} But the gains in better health from education derive from much more than improved earnings.

Unfortunately, the quality of public education systems in the United States falls short of what it needs to be to address effectively the underlying social causes of ill health. For example, data from 2015 show that American 15-year-olds are ranked 24th among 71 educational systems in reading, 25th in science, and 40th in math.¹⁰ Among 23 participating countries, only 22% of American 12th graders are rated proficient or better in science.¹¹ Many American children receive a good education, but the rankings of averages show that too many do not.

Are the poor educational performances and poor health outcomes related? A large body of well-conceived experimentation, including studies from the United States (reviewed in refs. ^{12–18}), Sweden,¹⁹ Britain, Ireland, Portugal,²⁰ Russia, Belarus, Hungary,²¹ Italy,²² and 41 low- or middle- income countries,²³ argues that a causal relationship exists between poor education and poor health outcomes. This is not just an American problem. Poorly educated individuals are more likely to suffer poor health in every country.

The data describing an education–health association is strong, consistent, and related in dose–response fashion (reviewed in refs. ^{12–15,18}). For example, findings from the National Health Interview Survey for 2002–2016 show that, as educational attainment drops from college degree to associate's degree, some college, high school, and less than high school, there is a step-wise increase in self-reported poor/fair health, multiple morbid conditions, and functional limitations in both men and women from White, Black, and Hispanic groups.¹³ White men and women without a high school diploma had a roughly 57% chance of reporting poor or fair health compared with only 9% of college graduates.¹³ Better educated adults live longer healthier lives than their less educated peers wherever they live. More schooling is clearly linked with better health.^{12–18} What is the basis for this relationship?

Education improves knowledge, reasoning skills, social skills, and a belief in the validity of science, all of which prepare an individual to understand the value of a healthy lifestyle and how to achieve it.¹² Poorly educated adults are more likely to be obese, smoke, eat an unhealthy diet, abuse drugs, and fail to exercise

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(references in refs. ^{12–14,17}). Low academic achievement by 16 years of age in Swedish adolescents was associated with a significantly increased risk of drug abuse 15–20 years later.¹⁹

Identifying the relationship to health of social determinants has begun to draw attention to improved education as a means of improving health, but organized medicine and public health have largely ignored the relationship in spite of the fact that every specialty of contemporary medicine faces the frustrating effects of poor education and bad health behaviors. Pediatrics has been the exception with its promotion of early childhood education as a fundamental means of promoting child development. Pediatricians can make a lifelong impact on our patients' health; and age-appropriate *prevention* is embedded as a core principle of our practice. But the need to improve education extends beyond kindergarten. Gains from early childhood education, as fundamental as they are, must be followed by high-quality elementary, middle school, and high school education that will optimize the child's potential for a healthy life.

What can pediatricians do to improve education? Pediatricians in every country have the opportunity through their professional societies and with every clinical encounter to promote education in a variety of ways that depend on the respect that they carry rather than the time required.^{24,25} In the United States, the National Academies of Medicine, Engineering, and Science,²⁶ the Pediatric Policy Council (PPC) (representing the American Pediatric Society, Society for Pediatric Research, Academic Pediatric Association, and Association of Medical School Pediatric Department Chairs),²⁷ and the Federation of Pediatric Organizations (FOPO) (PPC organizations plus American Board of Pediatrics, American Academy of Pediatrics, and Association of Pediatric Program Directors) can offer guidance, leadership, and perhaps a unifying strategic plan to address opportunities in the United States. Recognition that social deficiencies can profoundly affect health has exposed a major need for research on how best to implement improvements, and these organizations could also provide an overall research plan. These leadership groups, our nurses and social services staffs, and our public and non-profit partners represent a powerful voice for children; but it has not yet been fully deployed to promote public education.

Support of education should not be a politically partisan issue: Education increases individual economic stability and thereby the national economy, reduces the terrible human costs of poverty, and reduces the need for governmental aid, all goals of both conservatives and liberals. But the challenge comes from providing the funding. Improving public education in the United States will require the regular commitment of more Federal, state, local, and non-governmental dollars. Investing in schools returns long-standing humanitarian and economic gains. But its returns come in the future, and when budget dollars get tight, legislators too commonly fund immediate needs at the expense of the future. Pediatricians and our professional organizations need to speak up at every chance for education at local, state, and national levels^{12,24,28}—for all-day kindergarten, reduced class size, better support of the needs and salaries of teachers, early development programs like book distribution and book sharing,²⁹ and certainly for elimination of disparities in the quality of education across racial and cultural lines. It will be difficult to reduce health disparities without first reducing disparities in public education. And we need to work with educators to reduce chronic absenteeism and to help shape legislation that favors these goals.

What can we do that will have a greater impact on the health, happiness, economic stability, and general well-being of our patients than seeing that they have access to high-quality education and encouraging their full participation in it? If *prevention* is the guiding principle of pediatric care and education *prevents* disease, should promotion of education from infancy through adolescence not be a stated standard of care for the discipline of pediatrics?

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