

# Current and Future Public Health Challenges

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**D**URING THE PAST CENTURY, PUBLIC HEALTH HAS faced numerous challenges and has made much progress. Childhood immunizations, antibiotics, fortified foods, and clean water are just a few of the public health advances of the 20th century that have extended life expectancy from 45 years at the turn of the century to more than 75 years today. In fact, for the first time, this year's census forms offer a 3-digit space for entering one's age—an accommodation to the approximately 70 000 centenarians living in the United States.<sup>1</sup> Moreover, knowledge and attitudes about healthy behaviors also have contributed to improved longevity and quality of life, such as knowledge of the hazards of smoking, the value of personal and food hygiene, and the concept that injuries in the workplace, at home, or on the roads can be prevented.

While there is reason to be justifiably proud of the past century's advances in medicine, technology, and public health, it is also sobering to revisit the medical and public health status of the early 1900s, when pneumonia and tuberculosis were the leading causes of death. At that time, even the most prescient physicians could not have anticipated the great advances that lay ahead, such as fluoridated water, antibiotics, and immunizations. Nor could they have predicted the deadly health hazards in store. For example, motor vehicle injuries were awaiting the widespread ownership and use of automobiles. (Only 4000 cars were sold in 1900.) Similarly, widespread marketing of tobacco as a consumer product—and its terrible toll on the nation's health—was decades away.

No doubt, unanticipated challenges of similar magnitude lie ahead. Whether working in the public, private, or academic arenas, physicians can only hope to have the powers of observation to detect these challenges early and the resources and will to act wisely in response. But not all future challenges are obscure. Some can be anticipated, and tools available today can address them. By applying ourselves to the known and anticipated challenges, the medical community will be better prepared to address the inevitable unknown challenges as well. As Pasteur observed, "Chance favors the prepared mind."

## TEN CHALLENGES

At the Centers for Disease Control and Prevention (CDC), we see at least 10 future health challenges in the decades ahead. These challenges encompass changes in health care systems, chronological milestones of childhood and old age, the risks posed by our lifestyles and the environment, the mysteries of the brain and human behavior, and new scientific frontiers. While this list is limited to 10 items, many other important health challenges also exist, such as substance abuse (including alcohol and tobacco), which merit continued vigorous efforts for prevention and control.

To position the nation for the century ahead, we believe that the medical, scientific, and public health communities must do the following:

### Institute a Rational Health Care System

The United States needs a health care system that balances equity, cost, and quality. The fact that 45 million Americans are uninsured<sup>2</sup>—in many cases, despite being employed—is just 1 symptom of an unnecessarily uneven distribution of health care resources. Similarly, the fact that half of the deaths that occur each year are from preventable causes<sup>3</sup> suggests that the health care system has unexploited potential to emphasize prevention as well as treatment of diseases, injuries, and disabilities.

### Eliminate Health Disparities

Health disparities among racial and ethnic groups are reflected in different rates, severity, and treatment of heart disease, cancer, diabetes, human immunodeficiency virus and acquired immunodeficiency syndrome, and other conditions.<sup>4</sup> Infant mortality rates, for example, are 2.5 times higher for African Americans than for whites.<sup>4</sup> These unacceptable disparities require improved access to quality health care and innovative community-based strategies tailored to different racial and ethnic groups.

### Focus on Children's Emotional and Intellectual Development

Attention to children's physical development must be matched with a parallel focus on their emotional and intel-

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lectual development. Although vaccinations and other health advances have made infancy and childhood less perilous, an essential challenge is to encourage home, preschool, and community environments, interactions, and relationships that permit each child to achieve his or her full potential.

### **Achieve a Longer "Healthspan"**

In 1900, about 1 in 25 Americans was elderly<sup>5</sup>; in 1990, the proportion was 1 in 8,<sup>5</sup> or 10 times greater than in 1900. This trend will continue and accelerate as baby boomers reluctantly age. By 2050, the elderly population is expected to number 79 million people—twice its present size.<sup>5</sup>

In addition to achieving a longer lifespan for the rapidly growing aging population, increasing their healthspan must be a priority. Information based on research on healthy aging must be applied—especially promoting lifelong dietary and physical activity habits that increase the chances of being healthy, active, and independent in the last years of a long life.

### **Integrate Physical Activity and Healthy Eating Into Daily Lives**

An obesity epidemic—fueled by “supersized” portions, unhealthy diets, and lack of physical activity—contributes to 300 000 premature chronic disease deaths each year.<sup>3</sup> Most alarmingly, the percentage of American children who are overweight has more than doubled since the 1960s—from 5% in 1964 to nearly 13% in 1994 (<http://www.cdc.gov/nccdphp/nutrisk.htm>)—making them more susceptible to diabetes and the precursors of heart disease and stroke. These trends need to be reversed, but will require broad societal changes in current views about food, eating habits, and integrating physical activity—whether walking, gardening, or more strenuous activity—into daily routines.

### **Clean Up and Protect the Environment**

Some earlier progress—such as reducing pollution from cars and industries and identifying and mitigating hazardous waste sites—is being eroded. Frequent smog alerts and polluted lakes and rivers (damaged by storm water runoff from our increasingly paved living areas) are some of the warning signs that not enough attention has been given to balancing growth with environmental protection. The environment will be increasingly challenged by toxic exposures, population growth, continued urbanization, and urban design that hinder healthy behaviors, such as physical activity.

### **Prepare to Respond to Emerging Infectious Diseases**

During the past 30 years, at least 30 new viral, bacterial, and parasitic diseases have been classified as “emerging”<sup>6</sup>—meaning that they have newly appeared in a population or have suddenly increased their incidence or geographic scope. Migration and travel, international trade, agricultural practices, and constant microbial adaptation are factors that practically guarantee that the United States will face more exotic and heretofore unusual diseases, as with West Nile

virus in New York last year,<sup>7</sup> as well as an increasing challenge of antibiotic resistance to many pathogenic organisms. Preparing state and local systems to detect and respond to emerging infections is important in its own right and also simultaneously helps prepare for the possibility of newly engineered bioterrorist agents.

### **Recognize and Address the Contributions of Mental Health to Overall Health and Well-being**

As a recent surgeon general’s report on mental health<sup>8</sup> noted, the impact of mental health on both physical health and productivity is underrecognized. In fact, when the burden of disease is measured in disability-adjusted life years, mental illness becomes the second leading cause of disability and premature mortality in the United States and other market economies.<sup>8</sup> Because the efficacy of mental health treatments is well established and a range of treatments can be offered for most mental disorders, this disease burden could be reduced considerably. The challenges are to identify risk factors, improve access to treatment (including removing the stigma from seeking help), and promote good mental health in all communities.

### **Reduce the Toll of Violence in Society**

Homicide, suicide, and other forms of violence can be viewed as public health issues that warrant examination of risk factors and interventions to address them. Public health approaches could include targeted interventions in communities, schools, workplaces, and churches and use of mass media. Many observers have bemoaned the fact that violence has become ingrained in US society and glorified in virtually every entertainment medium. However, only a few decades ago, another generally accepted societal norm—tobacco use—seemed similarly entrenched. Social norms can and do change but only after identification of the problem, development of effective interventions, and broad community support.

### **Use New Scientific Knowledge and Technological Advances Wisely**

The mapping of the human genome is an example of exciting developments in new technology that are full of potential. It is, however, only a beginning. (As 1 scientist observed, the genome creates the equivalent of a genetic dictionary full of letters and words, but most have not yet been given any meaning.)<sup>9</sup> This development holds promise for advancing health through sophisticated screening and targeted interventions, but, as with other breakthroughs, the challenge will be to apply this new knowledge equitably, ethically, and responsibly. Genetic breakthroughs and other emerging technologies will have considerable public health impact.

## **MEETING PUBLIC HEALTH CHALLENGES**

Collectively, these 10 challenges reflect the breadth and complexity of the challenges ahead. They point to the importance of health at the community level, for advances in most

of these areas depend on strong community support and activity. However, this should not obscure the fact that these concerns are not only local (in the most literal sense of the word) but also global. Americans justifiably fear microbes crossing US borders, undetected in a tourist's or immigrant's luggage or in a shipment of produce. Yet US citizens also share another type of disease burden across borders—the toll taken by unhealthy behaviors. Along with other countries, the leading preventable causes of death in the United States involve tobacco use, diet, lack of physical activity, and injuries. These challenges affect everyone—rich and poor, insured and uninsured, young and old, male and female—and suggest the need to expand and update the ways health status and the burdens of disease and disability are measured, as, for example, the use of disability-adjusted life years highlights the impact of depression and arthritis on health status.

In many of these areas—child development, mental health, obesity and physical activity, the environment, bioterrorism, and aging—promising, science-based interventions are available and deserve support and broader implementation. For example, missed opportunities for cost-effective preventive services in clinical settings, including tobacco cessation counseling, pneumococcal vaccine, and chlamydia screening, can be identified.

In other areas—particularly delineating a rational health care system, eliminating health disparities, curbing violence, and managing new genetic knowledge—the course of action is less clear or even potentially divisive. However, in these areas, public health and medicine have important contributions to make regarding how these policy debates are framed and interpreted.

## CONCLUSION

What might a health care professional at the end of this century think about the accomplishments then or lack thereof?

It is important to consider how today's actions will be viewed decades from now. Even if we, as physicians, do not triumph over all or most of these challenges to health, will the record show that the medical profession struggled to meet them, however difficult, or stood by and watched them worsen?

In the decades ahead—in our lifetimes—physicians and public health professionals have both a responsibility and an unprecedented opportunity to apply our current knowledge to improve the health of the nation. It has already been demonstrated in the 20th century that individual behavior and the environment in which those behaviors occur can be affected. To this considerable record of accomplishment, we can add a set of early triumphs that apply what is already known, exploit unrealized potential, and free talent and resources to address the unexpected challenges that certainly are coming.

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**Table.** Hospitalization for Acute Myocardial Infarction for Use of Selected Antibiotics by Dose\*

Group of Antibiotics	Cases (n = 628)	Controls (n = 1615)	Matched Odds Ratio (95% CI)
Fluoroquinolones			
Low dose	5 (0.8)	14 (0.9)	1.05 (0.35-3.15)
High dose	5 (0.8)	32 (2.0)	0.34 (0.12-0.93)
Quinolones			
Low dose	1 (0.2)	3 (0.2)	1.01 (0.09-10.8)
High dose	4 (0.6)	11 (0.7)	0.81 (0.24-2.73)
Tetracyclines			
Low dose	170 (27.1)	379 (23.5)	1.13 (0.90-1.42)
High dose	6 (1.0)	13 (0.8)	0.95 (0.35-2.62)
Macrolides			
Low dose	11 (1.8)	25 (1.5)	1.02 (0.48-2.14)
High dose	13 (2.1)	22 (1.4)	1.58 (0.74-3.35)
Other			
Low dose	131 (20.9)	290 (18.0)	1.22 (0.95-1.57)
High dose	100 (15.9)	247 (15.3)	1.04 (0.78-1.38)

\*"Use" is defined as receiving a course of antibiotics for more than 5 days; "high dose" as a course longer than 6 days with standard doses. Data are presented as number (percent) of subjects hospitalized for acute myocardial infarction. CI indicates confidence interval.

as courses longer than 6 days with standard doses (details are available from the authors). Patients with several courses of antibiotics were classified as having received a high-dose based on at least a single high dose course. Analysis was by conditional logistic regression analysis using version 2.0.3 for Windows (Cytel Software Corp, Seattle, Wash).

**Results.** Case and control groups were not different with respect to age, sex, person-years of registration (median, 4.5 years), number of hospitalizations, treatment for respiratory complaints, or presence of chronic diseases. The median age was 57 years (25th-75th percentile, 49-65 years). Nearly 80% of the case and control patients were male.

Only high doses of fluoroquinolones were associated with a lower risk of acute MI (TABLE). For those who took more than 1 course of fluoroquinolones, the odds ratio was 0.12 (95% CI, 0.02-0.94). For all other antibiotics, no significant association was observed.

**Comment.** Our study found an association of fluoroquinolones in the same direction as Meier et al<sup>1</sup> but our results are not completely compatible with an inhibitory effect on *C pneumoniae*. Particular tetracyclines and macrolides were not associated with a lower risk of acute MI even if given in high doses or given in multiple courses during a sufficient time. These results are consistent with those of Jackson et al.<sup>3</sup> Fluoroquinolones and quinolones have been reported to have a stabilizing effect on the cytoskeleton of endothelial cells<sup>4</sup> and have an effect on chondrocytes in humans.<sup>5</sup> Because calcification also plays a major role in the later stages of plaque formation in atherosclerosis,<sup>6</sup> it is possible that the negative association of fluoroquinolones with MI may be mediated via their nonbacterial inhibitory actions.

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## CORRECTIONS

**Incorrect Wording:** In the Research Letter entitled "Supplemental Oxygen and Mountaineer Death Rates on Everest and K2" published in the July 12, 2000, issue of THE JOURNAL (2000;284:181), the final sentence was worded incorrectly. The sentence that read "Mountaineers considering whether to use supplemental oxygen should consider the risk of death during descent" should have read "Mountaineers considering whether to use supplemental oxygen can now consider the associated fatality risks during descent."

**Incorrect Wording:** In the Commentary entitled "Current and Future Public Health Challenges" published in the October 4, 2000, issue of THE JOURNAL (2000;284:1696-1698), there was incorrect wording. On page 1697, under "Achieve a Longer 'Healthspan,'" the sentence that read "In 1900, about 1 in 25 Americans was elderly; in 1990, the proportion was 1 in 8, or 10 times greater than in 1900" should end after "1 in 8." A new sentence should then read, "In absolute terms, the number of elderly Americans had increased 10-fold."