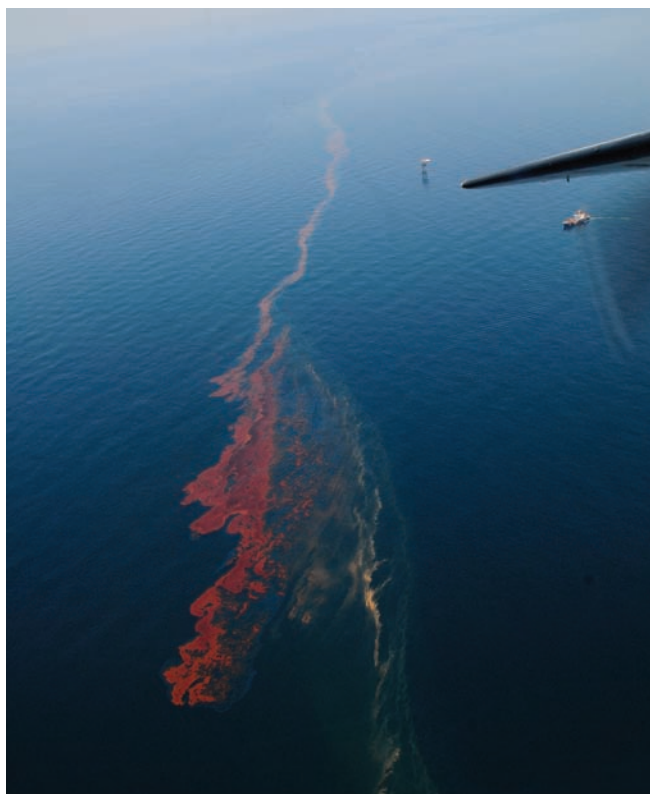
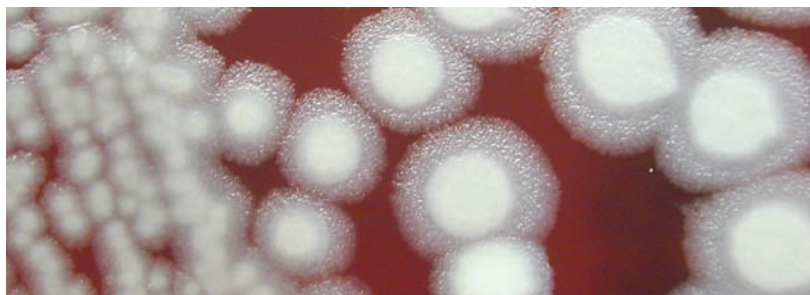


THE NATIONAL ACADEMIES **INFOCUS**

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Why Life Spans Fall Short in the U.S.

FBI's Investigation of the Anthrax Letters

A Lab to Study Hazardous Animal Pathogens

Deepwater Horizon: Searching for Answers

Spring 2011

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THE NATIONAL ACADEMIES

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Cover:

(clockwise from upper right) *Bacillus anthracis* colony, photo courtesy Larry Stauffer, Oregon State Public Health Laboratory/Centers for Disease Control and Prevention; oil spilled by Deepwater Horizon and dispersant seen from a spotter plane, U.S. Coast Guard photo by Petty Officer 3rd Class Stephen Lehmann; photo by Jeff Vanuga/USDA Natural Resources Conservation Service; ©Science Photo Library/Corbis

- Page 1: (col. 1, from top) Electron micrograph of *Bacillus anthracis*, ©Gary Gaugler/Photo Researchers Inc.; fire boat response crews battle blazing Deepwater Horizon oil rig in the Gulf of Mexico, April 21, 2010, U.S. Coast Guard photo; (col. 2) photo courtesy U.S. Department of Agriculture
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In Service to Our Nation and World

Last year's Deepwater Horizon accident and the recent nuclear plant disaster in northeastern Japan have raised disconcerting questions. Could better science and engineering have made a difference? Could more lives have been saved and the Gulf of Mexico and Japan been spared such extensive environmental damage? Most importantly, with better and deeper understanding, could these catastrophes have been prevented?

In this issue of *In Focus*, you'll read about the preliminary results of a National Academy of Engineering and National Research Council committee of experts who studied Deepwater Horizon. Those findings, published in time to inform the presidential commission that led the accident investigation, identified the lack of a suitable approach for managing the risks of deepwater drilling, including insufficient checks and balances for maintaining well safety. The panel's final report, due later this year, will recommend practices and systems to re-establish a "culture of safety" in oil drilling operations.

The consequences of the earthquake, tsunami, and radiation accident at Japan's Fukushima nuclear power facility are still unfolding. There is still much to learn including what occurred inside the reactors, which were designed in the 1960s when far less was known about plate tectonics, earthquakes, and tsunamis. Several National Research Council studies, including our 2006 report on the vulnerabilities of spent fuel rods in cooling ponds at nuclear power plants, have helped policymakers focus on the problem of spent nuclear fuel that needs to be stored onsite for many years. In addition, the Radiation Effects Research Foundation, our joint effort with the Japanese government to study the effects on radiation exposure for the survivors of Hiroshima and Nagasaki, has joined in monitoring effects of the Fukushima accident.

You'll also read here about two National Research Council studies commissioned to help leaders in very different fields: criminal forensics and education. The Federal Bureau of Investigation requested an independent assessment of the scientific methods used in their investigation of the "anthrax letters" sent to offices on Capitol Hill and in New York City in 2001. Our committee concluded that — based on science alone — it is not possible to conclude where the anthrax came from or who sent the letters. The other study looked at K-12 education reform, a pervasive issue throughout the country, including here in Washington, D.C. After the mayor took over control of the D.C. public schools in 2007, we were asked to help devise a framework by which to judge whether education was improving under planned reforms. Our panel's first report was cautionary: Although student test scores have risen since the reform began, at this early phase tests alone are not sufficient to judge success or failure.

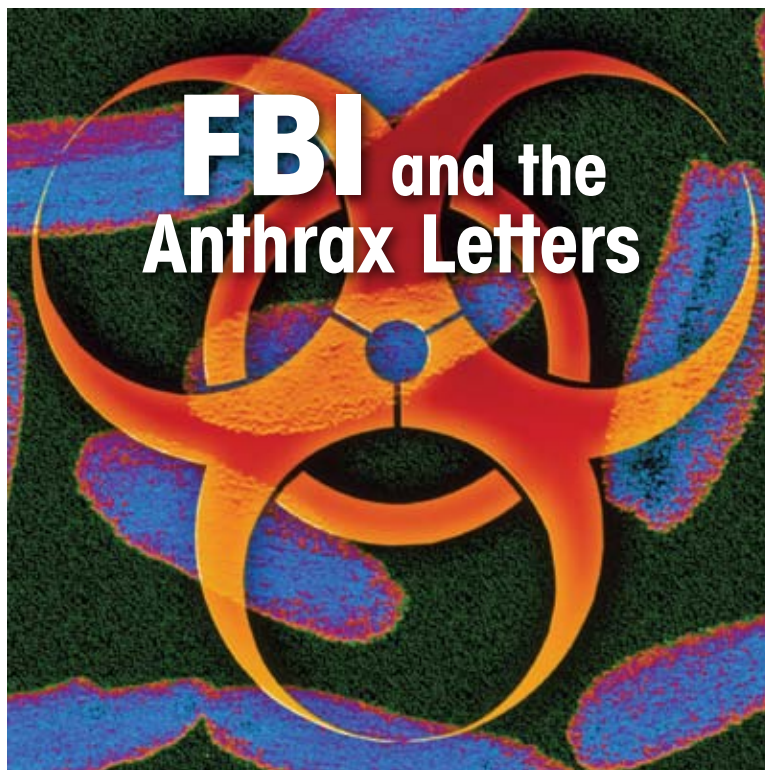
From the Gulf of Mexico and Japan to our nation's capital, we continue to make substantive contributions of knowledge and expert analysis.



RALPH J. CICERONE

President, National Academy of Sciences





NEW REPORT ASSESSES SCIENTIFIC APPROACHES USED IN THE INVESTIGATION

Weeks following the September 11 attacks, letters containing spores of *Bacillus anthracis*, the bacterium that causes anthrax, were sent through the U.S. postal system causing 22 cases of disease, five deaths, and a wave of fear and disruption in an already shaken nation.

The Federal Bureau of Investigation immediately began an extensive scientific investigation focused on characterizing the

material found in the letters and identifying those responsible. In early 2010, the U.S. Department of Justice closed the case, concluding that the attacks were carried out by Bruce Ivins, a scientist at a U.S. Army infectious disease laboratory in Frederick, Md., who committed suicide in 2008.

At the FBI's request, a committee of the National Research Council conducted an independent review of the scientific

approaches used in the bureau's investigation. Limiting its evaluation to the scientific evidence, the committee found that it is not possible to reach a definitive conclusion about the origins of the anthrax letters based solely on that evidence. It did not assess the guilt or innocence of anyone connected to the case.

The committee's report says the FBI correctly identified the dominant organism found in the mailed letters as the Ames strain of *B. anthracis*. Furthermore, the anthrax spores in the letters and in RMR-1029 — a flask at the infectious disease laboratory in Maryland identified by DOJ as containing the "parent material" for the anthrax in the attack letters — share a number of genetic similarities. While this is consistent with the FBI conclusion that the spores in the letters were derived from RMR-1029, other possible explanations for the similarities were not fully explored during the investigation, the committee found. Although the FBI's scientific data provided leads as to the origin of anthrax spores in the letters, the data do not rule out other possible sources. The committee noted that the strength of the connection between the materials in the letters and the flask is limited by the probability that similar genetic mutations can occur independently, and by problems with the repository created by the FBI of samples of *B. anthracis* Ames gathered from laboratories around the world for comparison with the letter materials.

"The committee commends the FBI for reaching out to the scientific community for assistance early in the anthrax letters investigation," said Alice P. Gast, chair of the committee and president of Lehigh

University. "We believe this independent review will help strengthen the law enforcement and national security community's scientific and analytical capabilities in future investigations."

In addition, new relevant "molecular" scientific methods and insights became available over the last few years of the investigation. "Using tools such as high-throughput, 'next generation' DNA sequencing could have strengthened or weakened the association between spores found in the mailed letters and spores from RMR-1029," said vice chair of the committee David A. Relman, Thomas C. and Joan M. Merigan Professor at Stanford University School of Medicine. "Such new technology will be important to similar investigations in the future."

— *Jennifer Walsh & William Skane*

■ **Review of the Scientific Approaches Used During the FBI's Investigation of the 2001 Anthrax Letters.** Committee on the Review of the Scientific Approaches Used During the FBI's Investigation of the 2001 Bacillus Anthracis Mailings; Board on Life Sciences, Division of Earth and Life Studies; Committee on Science, Technology, and Law, Division on Policy and Global Affairs (2011, approx. 250 pp.; ISBN 0-309-18719-2; available from the National Academies Press, tel. 1-800-624-6242; \$50.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/13098.html>).

The committee was chaired by **Alice P. Gast**, president, Lehigh University, Bethlehem, Pa.; and vice chaired by **David A. Relman**, Thomas C. and Joan M. Merigan Professor of Medicine and Microbiology and Immunology, Stanford University, Palo Alto, Calif. The study was funded by the Federal Bureau of Investigation.



In the Defense of Food and Health

On an isolated island two miles off the coast of New York lies the research keystone of the nation's defense against biological attacks on the animals, farmers, and ranchers that furnish a large part of our food supply. But this federal research center is aging, prompting the need for a new and more modern laboratory.

A proposed National Bio- and Agro-Defense Facility (NBAF) to be constructed in Manhattan, Kansas, will study hazardous animal pathogens including highly contagious foot-and-mouth disease, which can decimate cattle and other cloven-hoofed animals, and zoonotic pathogens that are transmissible between animals and people. Before funds are allocated for construction, Congress asked the National Research Council to review a U.S. Department of Homeland Security site-specific risk assessment associated with operating this new lab.

The committee that wrote the report recognized the need for a biocontainment facility like the one proposed but found several major shortcomings with the risk assessment performed by DHS, including that the risks and costs of an accidental pathogen release could be significantly higher than the assessment indicates. Based on data from the DHS assessment, the committee calculated a nearly 70 percent chance over the 50-year lifetime of the facility that a release of foot-and-mouth disease could result in an infection outside the laboratory, impacting the economy between \$9 billion and \$50 billion.

Overall, the committee said that the assessment had reached many legitimate conclusions but it did not fully account for operating a biocontainment facility of the

highest level. Important operation risks and mitigation issues, such as the hazards associated with the daily cleaning of large animal rooms, were not included.

Moreover, the assessment failed to address how pathogens might be accidentally released, especially foot-and-mouth disease, and is overly optimistic about its spread throughout the United States after a release. For example, the assessment did not consider the NBAF's close proximity to the Kansas State University's College of Veterinary Medicine clinics and football stadium or that roughly 9.5 percent of the U.S. cattle inventory lies within a 200-mile radius of the proposed facility. The committee urged that mitigation strategies for an extensive outbreak of foot-and-mouth disease be put in place before the facility opens.

"Building a biocontainment facility that is capable of working with large animals presents new and unknown risks that could not be accounted for in the assessment," said committee chair Ronald Atlas. "This should be viewed as a starting point. As more information emerges, an updated analysis could be appropriate." — *Jennifer Walsh*

■ *Evaluation of a Site-Specific Risk Assessment for the Department of Homeland Security's Planned National Bio- and Agro-Defense Facility in Manhattan, Kansas.*

Committee on the Evaluation of a Site-Specific Risk Assessment for the Department of Homeland Security's Planned National Bio- and Agro-Defense Facility in Manhattan, Kansas; Board on Life Sciences and Board on Agriculture and Natural Resources; Division on Earth and Life Studies (2010, 146 pp.; ISBN 0-309-16281-5; available from the National Academies Press, tel. 1-800-624-6242; \$35.50 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/13031.html>).

The study was chaired by **Ronald Atlas**, professor of biology and public health and co-director of the Center for Health Hazards Preparedness at the University of Louisville in Kentucky. The study was funded by the U.S. Department of Homeland Security.



When the Deepwater Horizon oil rig exploded in the Gulf of Mexico a year ago, killing 11 people, it marked the start of what turned out to be the largest accidental oil spill in history.

A mile below the ocean's surface, BP's exploratory Macondo well had blown, triggering the rig's explosion. By the time the well was capped three months later, an estimated 5 million barrels of oil had gushed into the Gulf. The disaster provided a terrible demonstration of the risks and complications posed by deepwater drilling operations.

In the weeks following the explosion, the U.S. Department of the Interior asked a committee of the National Academy of Engineering and National Research Council to examine the probable causes of the accident and identify measures that could prevent such a catastrophe in the future. The committee issued its preliminary findings in November.

It may not be possible to definitively establish exactly which mechanisms caused the blowout and explosion, says the interim report, given the deaths of potential witnesses, the loss of the oil rig and important records, and the difficulty in obtaining reliable forensic information from the Macondo well. However, the committee

DRILLING FOR **ANSWERS**

What Went Wrong
During the Deepwater
Horizon Accident?



says that it has been able to develop a good understanding of a number of key factors and decisions that may have contributed to the disaster.

Of particular concern was the apparent lack of a suitable approach for managing the risks, uncertainties, and dangers associated with deepwater drilling, the report says. It cites many questionable decisions about a number of technical and operational breakdowns that occurred prior to the accident. “It’s also important to note that these flawed decisions were not identified or corrected by BP, its service contractors, or by the oversight process employed by the U.S. Minerals Management Service and other regulatory agencies,” said Donald C. Winter, chair of the committee, former secretary of the Navy, and professor of engineering practice at the University of Michigan.

The events suggest insufficient checks and balances for considering well safety and for making critical decisions affecting the schedule for “temporarily abandoning” the Macondo exploratory well — in other words, sealing it for later use. The report points out various dubious decisions, such as continuing abandonment

operations at the site despite tests that indicated the cement put in place to temporarily seal the well was not an effective barrier to prevent gases from entering it. In addition, several clear failures in monitoring the well appear to have been partly responsible for its blowout.

The report also notes that a previous loss of hydrocarbon circulation in the Macondo well in the weeks before the accident presented missed opportunities to take actions that would mitigate future risks.

For its final report, due out this summer, the committee will examine ways to establish practices and standards to foster a culture of safety and methods to ensure that schedule and cost decisions do not compromise safety. The committee will assess the extent to which there are gaps, redundancies, and uncertainties in responsibilities of agencies and professional societies that oversee deepwater drilling operations, and it will consider the merits of an independent technical review to provide operation checks and balances by enforcing standards and reviewing deviations.

The committee will also evaluate forensic evidence from the Macondo well’s blowout preventer, which had just been recovered at the time the interim report was issued. — *Molly Galvin*

■ **Interim Report on Causes of the Deepwater Horizon Oil Rig Blowout and Ways to Prevent Such Events.** Committee for the Analysis of Causes of the Deepwater Horizon Explosion, Fire, and Oil Spill to Identify Measures to Prevent Similar Accidents in the Future, Transportation Research Board and Division on Earth and Life Studies (2010, 28 pp.; available only online from the National Academies Press at www.nap.edu/catalog/13047.html).

The chair of the committee is **Donald C. Winter**, former secretary of the Navy, and professor of engineering practice, University of Michigan, Ann Arbor. The study is funded by the U.S. Department of the Interior.

The Next Level for COMPUTER PERFORMANCE



To illustrate the incredible advances in information technology that have occurred over the last several decades, consider that the average modern cell phone can deliver the raw performance of a 1970s supercomputer. In the last 20 years, computing performance has increased on the order of 10,000 times. The expectation that these advances will continue unabated well into the future, popularly referred to as Moore's law, has become engrained in our society. In fact, many sectors of the U.S. economy — including medicine, defense, entertainment, and communications — have come to depend upon it.

A report from the National Research Council warns, however, that these rapid advances in information technology could stall unless the nation aggressively pursues fundamental research and development of parallel computing — hardware and software that enable multiple computing activities to process simultaneously.

Much of the growth in computing performance has been driven by advances in single-processor, sequential computer microprocessors. However, power limitations and other technological constraints have made it impractical to continue improving computer performance in this way much longer, the report says. Parallel computing, therefore, is the only known alternative for improving computer performance without significantly increasing costs and energy usage.

Despite some mainstream successes in parallel computing — such as the MapReduce programming framework used by Google to process large data sets using thousands of computers — most parallel computing in use now is limited to comparatively narrow scientific and engineering

applications. To enable parallel computing for broader use, new algorithms, programming models, operating systems, and computer architectures will be required, the report says, and research and development in these areas should be pursued. In particular, advances are necessary to develop new parallel programming methods and supporting computing systems. Although computing hardware such as semiconductor chips that contain eight or more microprocessors have already been developed, software that can keep that many or more processors busy in parallel is not available for most computing applications.

Research and development should also focus on making computer systems more energy efficient, the report says. Power constraints now affect systems ranging from handheld devices to the largest computing data centers. Most computer chips are designed with silicon-based complementary metal oxide semiconductor (CMOS) technology. While the number of devices per CMOS chip continues to double every few years, the technology has essentially reached its threshold with regard to power efficiency. Even as new parallel computing models and solutions are found, most future performance will ultimately be limited by power capacity. — *Molly Galvin*

■ **The Future of Computing Performance: Game Over or Next Level?** Committee on Sustaining Growth in Computer Performance, Computer Science and Telecommunications Board, Division on Engineering and Physical Sciences (2010, 200 pp.; ISBN 0-309-15951-2; available from the National Academies Press, tel. 1-800-624-6242; \$36.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12980.html>).

The committee was chaired by **Samuel H. Fuller**, chief technology officer and vice president of research and development for Analog Devices Inc., Norwood, Mass. The study was funded by the National Science Foundation.



Bone-Building Nutrients

IONM UPDATES DIETARY INTAKES FOR CALCIUM AND VITAMIN D

How much vitamin D do you need? Depending on which experts or sources you consult, you could be urged to get anywhere between several hundred to several thousand international units (IUs) daily. While recommendations for the interrelated nutrient calcium do not vary as dramatically, some people — particularly older women wanting to hedge their bets against osteoporosis — heed advice to consume quantities well above the amounts that nutrition research deems necessary.

This clashing guidance has arisen from a profusion of new findings and ongoing research into these nutrients. Increased awareness of osteoporosis and its precursor osteopenia have heightened women's interest in getting enough calcium. Scientific papers have pointed to intriguing possibilities for vitamin D's role in several health concerns, including heart disease, cancer, and a variety of immunological disorders. Moreover, as tests that measure patients' vitamin D levels have become routine,

stories of widespread deficiencies among Americans have stoked anxieties.

Besides, it just seems logical that if a base amount of an essential vitamin or mineral prevents disease, then higher doses would surely afford more protection. But when it comes to nutrients, you can get too much of a good thing.

A recent Institute of Medicine report brought some clarity to the vitamin D and calcium confusion. The report details how much of these two nutrients is required and the amounts at which risks arise. In short, most Americans and Canadians up to age 70 need no more than 600 IUs of vitamin D per day, and those 71 and older may need as much as 800 IUs. The amount of calcium needed ranges, based on age, from 700 to 1,300 milligrams per day.

These are amounts necessary to build and maintain strong, healthy bones. Proponents of higher amounts of vitamin D had hoped that the committee of experts who wrote the report would also identify amounts necessary to promote heart health and prevent cancer, among other health issues. However, the evidence about vitamin D's role in these areas is uncertain. Positive study findings — and, consequently, the ones more likely to garner public attention — are countered by negative findings, creating a mixed bag of evidence that did not allow the committee to draw definite conclusions.

The evidence shows many people are getting the necessary amounts of these nutrients through some combination of dietary intakes, supplements, and sun exposure in the case of vitamin D, the report says. This finding may set at ease the minds of many people worried that

they are part of a deficiency “epidemic.”

A fundamental lack of agreement about blood test measurements underlies the reports of rampant vitamin D deficits, the report notes. Because there is not a standard measurement marking the point at which a person is deficient, different laboratories that process these tests use different cutpoints, including some that define deficiency at levels lower than the evidence shows are appropriate.

New research may eventually answer questions about the role of vitamin D in health areas besides skeletal health and also elucidate initial hints at potential harmful effects of long-term high doses of the vitamin. “Past cases remind us that some therapies — such as high doses of vitamin E and beta carotene — that seemed to show initial promise for treating or preventing health problems ultimately did not work out and even caused harm,” said committee chair Catharine Ross. “This is why it is appropriate to approach emerging evidence about an intervention cautiously, but with an open mind.” — *Christine Stencel*

■ **Dietary Reference Intakes for Calcium and Vitamin D.** Committee to Review Dietary Reference Intakes for Vitamin D and Calcium, Food and Nutrition Board, Institute of Medicine (2010, 482 pp.; ISBN 0-309-16394-3; available from the National Academies Press, tel. 1-800-624-6242; \$69.95 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/13050.html>).

The committee was chaired by **A. Catharine Ross**, professor and Dorothy Foehr Huck Chair, department of nutritional sciences, Pennsylvania State University, University Park. The study was funded by the U.S. departments of Health and Human Services, Agriculture, and Defense, and by Health Canada.

HEALTHIER FARE

Updating Nutrition Standards for a USDA Food Program

The U.S. Department of Agriculture has made great strides in the last few years in improving the nutritional quality of its food programs for low-income, disadvantaged populations. The agency proposed upgrades to the nutrition standards of federal school meal programs earlier this year and made changes to the WIC program. Now USDA has its sights on improving meals and snacks for children and adults in supervised day care programs.

Supervised care centers, homes, and shelters serve millions of children and hundreds of thousands of elderly and disabled adults. The federal Child and Adult Care Food Program (CACFP) reimburses the food expenditures of qualified facilities that serve low-income clients, helping to keep day care affordable for those who need it most. The program also promotes healthy eating through the nutrition standards it sets.

But more than two decades have passed since the program's nutritional requirements were last updated. Abundant new evidence has emerged on the links between nutrition and chronic disease. Concerns about obesity have joined worries about disadvantaged populations not getting enough food. USDA turned to the Institute of Medicine for advice on updating the CACFP's meal requirements.

The resulting guidance boils down to less fat, salt, and added sugars, and more fruits, vegetables, and whole grains. The IOM's report calls on supervised care facilities to limit their use of foods and ingredients that are high in sodium, saturated fat,



trans fat, and added sugars. Controlling the amount of fat and added sugars and adhering to portion sizes will help keep calories in check. While children under age 2 should receive whole milk, the milk for everyone

else should contain no more than 1 percent fat. Facilities should also use vegetable oils and limit the salt when preparing meals.

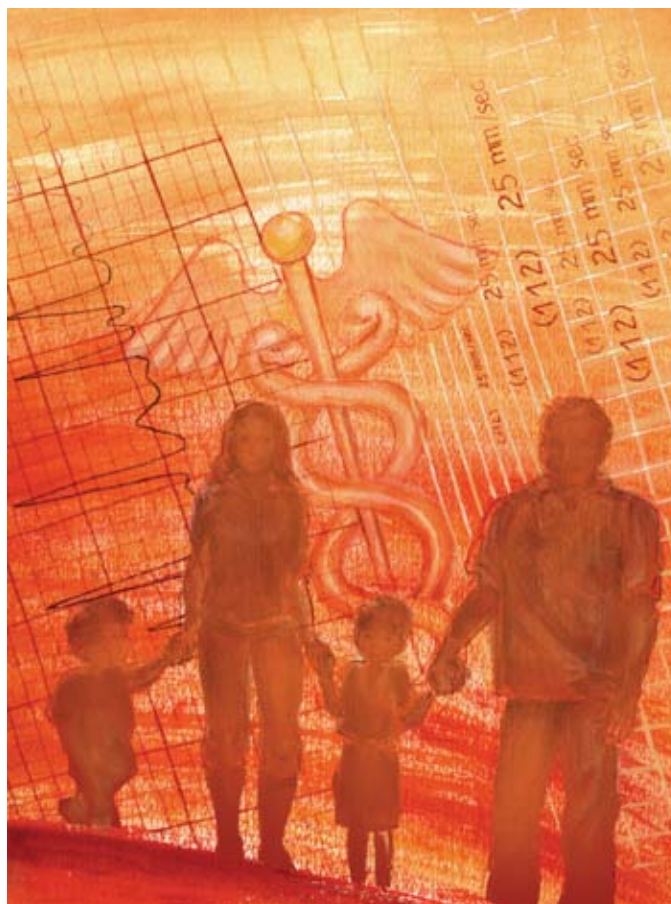
In addition, the report says each meal should include one serving of fruit and two of vegetables, and facilities should increase the amount of dark green and orange vegetables served each week while limiting starchy vegetables. At least half of the grain products served should be rich in whole grains, and baked or fried grain products high in fat and added sugars should be allowed only once a week.

Supervised care providers will need resources and assistance to comply with the recommended changes, noted the committee that wrote the report. USDA personnel should work with state agencies and health professionals to help participating sites plan menus and purchase and prepare foods. USDA should streamline the way CACFP monitors facilities' compliance and reimburses them. — *Christine Stencel*

■ **Child and Adult Care Food Program: Aligning Dietary Guidance for All.** Committee to Review Child and Adult Care Food Program Meal Requirements, Food and Nutrition Board, Institute of Medicine (2010, approx. 208 pp.; ISBN 0-309-15845-1; available from the National Academies Press, tel. 1-800-624-6242; \$48.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12959.html>).

The committee was chaired by **Suzanne P. Murphy**, researcher and professor, Cancer Research Center of Hawaii, University of Hawaii, Honolulu. The study was funded by the U.S. Department of Agriculture.

Why U.S. Life Spans Fall Short



OBESITY, PAST SMOKING AMONG THE CULPRITS

While the U.S. spends more on health care than any other nation, this outlay has not bought us longer lives. Life expectancy has been rising at a slower rate in the U.S. than in many other high-income countries, such as Japan and France. Between 1980 and 2006, life expectancy for U.S. women increased from 77.5 to 80.7 years, but women in 21 other countries saw their life spans stretch 40 percent beyond that, on average. U.S. men had a similar, though less stark, shortfall. Concerned about the gap in

longevity, the National Institute on Aging asked the National Research Council to delve into the reasons for it.

A new Research Council report says that the nation's history of heavy smoking bears much of the blame. Three to five decades ago many Americans smoked, and smoked heavily — more so than people in Europe or Japan did — and the results of that are still playing out in today's mortality rates. As of 2003, smoking was responsible for 78 percent of the longevity gap between women in the U.S. and those in other countries, and

41 percent of the gap for men, the report says. The habit has also damaged longevity in two other relative underachievers, the Netherlands and Denmark.

Rising rates of obesity are also likely a significant factor, the report says, though there's still a good deal of uncertainty about the nature of the link between obesity and mortality. Obesity may account for a fifth to a third of the longevity shortfall.

The committee that wrote the report also looked at whether differences in health care systems make a difference. Certainly lack of universal access to health care in the U.S. has increased mortality and lowered life expectancy, the report says. However, this is less of a factor in deaths among Americans over 65, who have access to care through Medicare. For the main causes of death at older ages — cancer and cardiovascular disease — available data do not suggest that the U.S. is failing to prevent deaths that could be averted elsewhere. In fact, cancer detection and survival appear to be better in the United States than in most high-income nations, and survival rates following heart attacks are favorable too.

Other factors that may make a difference in longevity are difficult to quantify, the report says. For example, some evidence suggests that adults 50 and older are somewhat more sedentary than those in Europe, but the research base is insufficient to say how much of a role this has played. Certain other factors that have

been offered as explanation — such as the use of hormone therapy in women — do not appear to have played a role.

What does the future look like?

Because there is a lag of two to three decades between smoking and its peak effects on mortality, and smoking rates have been reduced in the past 20 years, life expectancy for men in the U.S. is likely to improve relatively rapidly in coming decades. For U.S. women, whose smoking behavior hit its highest level later than men's, declines in mortality are apt to remain slow for the next decade. Similarly, life expectancy in Japan is expected to improve less rapidly than it otherwise would, because of more-recent high smoking rates.

If the obesity trend in the U.S. continues, though, it may offset the longevity improvements expected from reductions in smoking. Recent data suggest that the prevalence of obesity in the U.S. has leveled off, however, and some studies indicate that the mortality risk associated with obesity has declined. — *Sara Frueh*

■ **Explaining Divergent Levels of Longevity in High-Income Countries.** Committee on Population, Division of Behavioral and Social Sciences and Education (2011, approx. 200 pages; ISBN 0-309-18640-4; available from National Academies Press, tel. 1-800-624-6242; \$39.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/13089.html>).

The committee was co-chaired by **Eileen Crimmins**, professor of gerontology and sociology, University of California, Davis, and **Samuel Preston**, Frederick J. Warren Professor of Demography, University of Pennsylvania, Philadelphia. The report was sponsored by the National Institute on Aging's Division of Behavioral and Social Research.





Weighing the Impacts of SCHOOL REFORMS IN D.C.

Studies that follow the same group of students over time would be a better way to discern what's behind the rise in scores, the report says. But it also cautions against getting fixated on test scores, which are only one important indicator of whether students are faring well. Evaluators should look at a range of outcomes — such as rates of absenteeism, and whether more students go on to college.

They also need to examine the ways the reforms are implemented, how conditions in the schools are changing, and how well the school district is meeting all of its responsibilities. This would involve regular collection and reporting of key data, as well as in-depth studies of high-priority issues. The mayor's office should produce an annual report on the schools' status, including an analysis of trends and complete underlying data.

Because the effects of any reform don't reveal themselves overnight, the report recommends that D.C. establish an ongoing evaluation program, one that is independent of school and city leaders and can generate high-quality research on what's happening in the city's schools — regardless of who is in charge. — *Sara Frueh*

■ **A Plan for Evaluating the District of Columbia's Public Schools: From Impressions to Evidence.**

Committee on Independent Evaluation of D.C. Public Schools, Division of Behavioral and Social Sciences and Education (2011, approx. 220 pages; ISBN 0-309-20936-6; available from National Academies Press, tel. 1-800-624-6242; \$48.00 plus \$5.00 for single copies; also on the Internet at <www.nap.edu/catalog/13114.html>).

The committee was co-chaired by **Robert Hauser**, executive director of the National Research Council's Division of Behavioral and Social Sciences and Education, and **Christopher Edley**, dean, School of Law, University of California, Berkeley. The report was sponsored by the Government of the District of Columbia, National Science Foundation, CityBridge Foundation, Philip L. Graham Fund, Kimsey Foundation, World Bank, and the Diane and Norman Bernstein Foundation.

Faced with chronic low levels of achievement by students and management problems in its public schools, the District of Columbia opted in 2007 to do what some other troubled school districts have done — give the system a “jolt” by changing how the schools are managed. In D.C.'s case, that meant transferring control of the public schools from an elected school board to the mayor's office, and creating the position of chancellor. The mayor's appointee for that position, Michelle Rhee, made controversial decisions — such as changing teachers' pay structure — and had both strong fans and critics.

The 2007 reform law also mandated a five-year evaluation to determine whether the reforms are working well enough to continue. The National Research Council was asked by the City Council to offer a plan for evaluating the reforms, along with a preliminary review of their implementation so far.

The D.C. government has made a good-faith effort to execute the mandated changes, says the Research Council's report, and many of the new management structures have been put in place. As for the reforms' effects, though, it's too soon to tell whether they are actually helping students learn. Although test scores have continued a modest rise under the reform law, the climb alone says nothing about its causes. The reason might be the reforms, or the sizable demographic shifts that are typical of D.C. schools, or some mix of factors.



An Aging Asia

REPORT AND CONFERENCES EXPLORE CHALLENGES AHEAD

While the surging economies of China and India have increasingly drawn the world's eyes toward Asia, another growth trend in the region has gotten less attention: the escalating size of the elderly population. Between 2000 and 2050, the proportion of those 65 and older is projected to more than triple in China, India, and Indonesia, and more than double in Japan.

Responding to the social and economic challenges raised by this aging trend will be among the toughest tasks facing Asian governments in the first half of the 21st century, says a new report by five science academies from China, India, Indonesia, Japan, and the U.S. To respond effectively, policymakers will need to know more about the needs and resources of their aging populations — a body of knowledge that is currently underdeveloped in Asia.

In particular, the report calls for more research to shed light on how changing

roles in the family are affecting the care, labor-force participation, and health status of elderly people. Studies should also examine how two other trends sweeping through Asia — large-scale migrations from rural areas to urban ones, and rapid economic growth — are affecting seniors.

The report was released to open a December conference in Beijing hosted by the Chinese Academy of Social Sciences, the first of two international conferences that have brought together researchers from around the world to present the latest findings on this demographic shift in Asia. The second was held in New Delhi in March and was hosted by the Indian National Science Academy.

Among the research presented in Beijing were new findings on family support for the elderly in China. For example, researcher Yi Zeng of Peking University found that both elderly parents and their adult children benefitted from sharing a household;

the elderly parents tended to have better cognitive function, while the child care they provided allowed more of their daughters to work outside the home. But such multi-generational living situations are becoming less common in China as more young adults leave rural areas to seek work in cities.

Although relocating can leave children less able to provide direct care to parents, it can help them provide financial support, as research by Xianghong Wang of Renmin University of China revealed: Forty-four percent of money sent back home by migrant workers is used to support parents. In general, money and other resources are flowing from children to parents in Asia, University of California researcher Ronald Lee reported — unlike in Latin America and many other industrialized nations, where resources tend to be transferred in the opposite direction.

The wide range of research presented at the India conference included the first results from the Longitudinal Aging Study in India (LASI). Currently in its pilot phase, the study will eventually be expanded to follow the health, economic status, and social support of about 30,000 people over time.

David Bloom of Harvard University, one of the study's principal investigators, explained LASI's context, noting that the aging trend will be difficult for India. With fewer children living close to their parents, family-based support systems are eroding.

In such situations people usually look to the government for support, but in India there is currently a vacuum. LASI will provide data that can be used to shape policies to fill that void.

The pilot LASI findings were explored in several subsequent presentations, including one by P. Arokiasamy of the International Institute for Population Sciences in Mumbai and Jinkook Lee of Rand Corp. Their preliminary analysis of the data found that in India — in contrast with many developed countries — higher levels of education are linked to greater prevalence of diabetes and hypertension.

During a final roundtable discussion at the conference, participants explored some of the major challenges ahead for researchers, including finding funds for aging research given the recent economic downturn and helping policymakers understand the benefits of long-term studies. Also mentioned was the need for researchers to understand “the people behind the data” and their particular social and cultural context — one of the benefits offered by international collaborations. — *Sara Frueh*

More information on the Beijing and Delhi conferences, as well as a free PDF of the report “Preparing for the Challenges of Population Aging in Asia,” can be found at <national-academies.org/AgingInAsia.html>. The project is sponsored by the U.S. National Institute on Aging.



Lights, Camera, Educate!

Using Entertainment to Spark Interest in Learning Science



Two-and-a-half years ago the National Academy of Sciences paired up with Hollywood filmmakers to launch the Science & Entertainment Exchange, which matches scientists with screenwriters, directors, and producers in an effort to more accurately portray science, and scientists, on screen. Since then, the Exchange has arranged for scientists to consult on dozens of hit movies.

Now the Exchange is exploring how to tap the creative energy of the entertainment industry to produce science-themed products that not only entertain, but educate, too. This idea was the topic of a daylong summit held in February at the Paley Center for the Media in Beverly Hills, California.

NAE President Charles M. Vest told the summit audience that he thought the entertainment industry could ignite interest in science and technology by doing what it does best — telling moving, inspiring stories. Storytelling is what science, entertainment, and education have in common, added summit speaker Sean B. Carroll, an NAS member and vice president for science education at the Howard Hughes Medical Institute. He said that people learn from stories because, like science, they present a coherent argument in support of a conclusion. Carroll believes that the enormous



number of science stories presents a tremendous opportunity for Hollywood to tell them on the big screen. Half jokingly, he suggested that *Out of Africa* would make a great movie title again, only this time it should tell the story of the Leakey family's archaeological adventures discovering the roots of humanity in eastern Africa.

Other ideas for how entertainment could be used to engage students surfaced at the summit. NAS President Ralph J. Cicerone recalled a suggestion made by film producer Janet Zucker that electronic press kits of behind-the-scenes footage could include commentary on scientific concepts in a film to make them useful in a classroom.

Many participants at the summit thought entertainment could be particularly useful in making science relevant to students. For instance, Tony DeRose, senior scientist and leader of research at Pixar Animation Studios, described a project he initiated to show students how much geometry, trigonometry, algebra, and other math it takes to make animation. Teacher Tyler Johnstone agreed that often the secret to teaching science is making the subject matter tangible to students: "When it's relevant to them, they are engaged and will buy into black holes or string theory or whatever else we throw at them."

Video and computer games are another entertainment medium with teaching value, explained game developer Will Wright, best



known as the creator of the virtual reality game SimCity. He noted that playing a computer game requires learning from a series of successes and failures in a process of experimentation that mimics the scientific method.

Film director Jerry Zucker, husband of Janet, declared that he believed the market for entertaining educational material is potentially huge. "If a studio put its mind to it, it could create teaching tools and be profitable," he said. Meanwhile, the Gordon and Betty Moore Foundation, which sponsored the summit, announced that it was making \$225,000 available to fund pilot projects that leverage entertainment media to improve science learning.

— William Kearney

Video of the Summit on Science, Entertainment, and Education can be viewed at seenas.ning.com/. NAS President Ralph J. Cicerone chairs the advisory board of the Science & Entertainment Exchange. Filmmakers Jerry and Janet Zucker are vice chairs, as is Patrick Soon-Shiong, former chairman and CEO, Abraxis BioScience Inc., and co-founder of the Chan Soon-Shiang Family Foundation. More information on the Exchange is available at www.scienceandentertainmentexchange.org/.

AAAS Recognizes Schweitzer's Science Diplomacy

At its annual meeting this year, the American Association for the Advancement of Science recognized Glenn E. Schweitzer “for his outstanding record of achievements in demonstrating the powerful role that high caliber science cooperation can have in building international relations.” Schweitzer, director of the National Research Council’s Office for Central Europe and Eurasia was chosen to receive the 2010 AAAS Science Diplomacy Award as a tireless advocate

“Throughout Dr. Schweitzer’s career, spanning more than 50 years, he has been a peerless advocate for using science to build dialogue between nations.”

for international science cooperation and the role of science in foreign relations.

Schweitzer was honored for his efforts to engage Russia and Iran in science diplomacy, dating back to 1963 and 1999 respectively. His work has ranged from building lasting relationships with Soviet scientists during the Cold War to laying the groundwork for the Obama administration’s efforts to foster scientific interaction and outreach with the Muslim world. He has also contributed to the field as the author of books, articles, and reports.

“Throughout Dr. Schweitzer’s career, spanning more than 50 years, he has been a peerless advocate for using science to build dialogue between nations,” said AAAS Chief International Officer Vaughan



Turekian. “He has led the way in demonstrating how non-governmental organizations, including the National Academies and AAAS, can benefit foreign policy.”

Schweitzer directed the Research Council study that produced the 1999 report “The Pervasive Role of Science, Technology, and Health in Foreign Policy,” which led to the establishment of the Office of the Science and Technology Adviser to the Secretary of State and underscored the links between the State Department’s science and technology capabilities and strategic goals. Schweitzer has also spent time developing relationships with Iranian scientists and facilitating cooperation between the U.S. National Academies and the Iranian Academy of Sciences.

(Excerpted from the AAAS press release; for more information on AAAS awards, see <www.aaas.org/aboutaaas/awards/>.)

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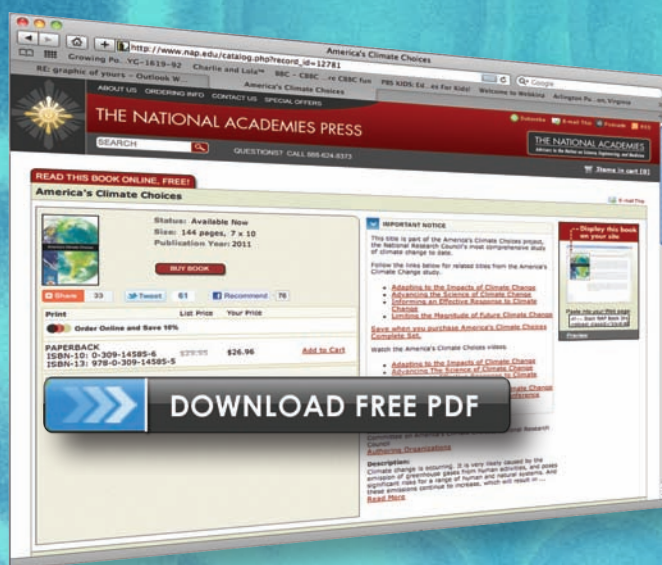
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