

THE NATIONAL ACADEMIES **INFOCUS**

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Who's Using the Radio Spectrum?

Potential of Plug-in Hybrids

Energy's Hidden Costs

A Healthy Menu for School Meals

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THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

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In Focus is prepared by the Office of News and Public Information.

Executive Director: William Skane

In Focus Editor: Valerie Chase

Assistant Editor: Sharon Yep

Staff Writers: Rebecca Alvania, Sara Frueh,
 Bill Kearney, Maureen O'Leary, Christine Stencel, Jennifer Walsh

Original Design: Francesca Moghari

Maintaining Scientific Integrity

As many of you have read in news accounts, hacked e-mails of climate scientists at the University of East Anglia's Climate Research Unit (UEA/CRU) last fall have led to worldwide publicity and formal inquiries concerning whether some scientists may have manipulated or suppressed the release of climate data or otherwise acted unprofessionally. My reading of the vast scientific literature on climate change is that our understanding is undiminished by this incident. But some polls show that this episode has damaged public trust in what we as scientists do. All of us need to be concerned about this. The perceived misbehavior of even a few scientists can diminish the credibility of science as a whole.



What needs to be done? Two aspects need urgent attention: the general practice of science and the personal behavior of scientists. Some efforts to address both issues have already begun, but we still must make advances on both fronts.

Clarity and transparency must be reinforced to build and maintain trust in science. Scientists are taught to describe experiments, data, and calculations fully so that other scientists can replicate the research. Last year, our Committee on Science, Engineering, and Public Policy put forth a framework for dealing with research data titled *Ensuring the Integrity, Accessibility and Stewardship of Research Data in the Digital Age*. This report emphasizes that “Research data, methods, and other information integral to publicly reported results should be publicly accessible.” Some journals have established policies that require the sharing of materials and data. However, post-publication complaints regarding data sharing persist. Despite many efforts, the scientific community has failed to uniformly integrate these standards into their practices.

It is essential that the scientific community make standards for analyzing, reporting, providing access to, and stewardship of research data operational, while also establishing when requests for data amount to harassment or are unreasonable. A major challenge is that acceptable and optimal standards will vary among scientific disciplines because of proprietary, privacy, national security, and cost limitations.

Failure to make research data and related information accessible not only impedes science, it also breeds conflicts. Contention over paleoclimatic data was at the heart of the UEA/CRU e-mail exchanges. Beyond data handling, the relationship between science and society depends on the appropriate conduct of scientists in all that they do. We have recently published an up-to-date guide to responsible conduct in research, *On Being a Scientist*, whose standards should be energetically pursued throughout the scientific community.

Scientists urgently need to develop standards for data access that work in their fields and carefully examine how they carry out their work. We need to demonstrate to the public that science is indeed self-correcting and worthy of its trust.

A handwritten signature in black ink that reads "Ralph J. Cicerone". The signature is written in a cursive style with a large, stylized 'R' and 'C'.

RALPH J. CICERONE
President, National Academy of Sciences

This column is based on Dr. Cicerone's editorial in Science magazine, Feb 5, 2009



TACKLING THE NATIONAL DEBT

Report Offers Several Paths to Fiscal Stability

The publicly held U.S. national debt has reached the unprecedented level of over \$7.5 trillion, and the sum continues to escalate. Right now the nation's level of debt is equivalent to about 55 percent of its Gross Domestic Product (GDP), the value of domestic goods and services plus the country's available capital.

If federal spending grows as projected under current policies and new taxes aren't added, by 2020 the debt will rise to nearly 80 percent of GDP, according to estimates from the Congressional Budget Office. What's behind this rapid growth? While the reasons are complex, a primary one is that an aging population and rising health care costs are driving up federal spending on the nation's big entitlement programs — Social Security, Medicare, and Medicaid — and tax levels are not keeping pace.

As the debt climbs, so too do the nation's interest payments, which will increasingly eat into funds available for government services, such as education,

defense, and transportation. And the effects may not arrive gradually, warns a new joint report from the National Research Council and National Academy of Public Administration. If the nation's creditors lose trust that the U.S. has a plan to repay its debts, they may suddenly raise interest rates, forcing the government into a rushed, ill-considered response that could hobble our economy for years and deprive citizens of needed services.

To lower the risk of a crisis, the government needs to take aggressive steps to restrain the growth of the debt starting in 2012, as soon as recovery from the current economic circumstances strengthens. U.S. leaders should set a target of stabilizing the ratio of the nation's debt to its GDP at a sustainable level by 2022. Holding the debt to 60 percent of the GDP is an achievable target within a decade, the report says; any higher ratio would create an unacceptable risk of higher interest rates and a financial crisis.

There are many paths the nation could take to hold its debt to a sustainable level, says the report, which lays out four scenarios to illustrate how it could be done. One is a "low-spending, low-taxes" approach that would keep taxes roughly unchanged but require defense and domestic spending cuts of 20 percent. At the opposite end of the spectrum is a path that would require substantially higher taxes but which would keep up with projected growth in payout of Social Security benefits and would allow spending levels for other programs to be higher than they are now. Also included are two paths that fall between these extremes, requiring combinations of spending cuts and tax increases that reflect different priorities.

The pathways are only four of many the government could take to restrain the debt, the report stresses; whether the solution leans in the direction of higher taxes or lower spending depends on citizens' and policymakers' views of the proper size and role of government. The important thing is that action be taken soon. Delaying by even five or 10 years will make fixing the nation's fiscal problems far more painful, requiring even higher taxes or lower levels of government services, said the committee that wrote the report.

"We know it will be hard for people and their representatives to come to agreement on the kinds of changes needed, given the obvious divisions among people in priorities and views of government," said committee co-chair Rudolph Penner, a fellow at the Urban Institute, Washington, D.C. "But everyone will benefit in the long term if we accept some short-term pain."

— *Sara Frueh*

■ **Choosing the Nation's Fiscal Future.** Committee on the Fiscal Future of the United States, National Research Council and National Academy of Public Administration (2010, 268 pp.; ISBN 0-309-14723-9; available from the National Academies Press, tel. 1-800-624-6242; \$53.95 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12808.html>).

The committee was co-chaired by **John Palmer**, distinguished university professor and dean emeritus, Maxwell School, Syracuse University, Syracuse, N.Y.; and **Rudolph Penner**, Institute Fellow, Urban Institute, Washington, D.C. The study was funded by the John D. and Catherine T. MacArthur Foundation.

PROGRAM PARTNERS U.S. AND PAKISTANI SCIENTISTS



Two engineers from Michigan State University and a counterpart in Risalpur, Pakistan, are exploring ways to help Pakistan recycle the asphalt pavement on its roadways — currently deteriorating because of steep growth in traffic over the last two decades. A scientist from the University of California and a researcher from Faisalabad are collaborating to develop varieties of wheat that can thrive in soils with high salt content, common in many areas of Pakistan. And a doctor from the U.S. Centers for Disease Control and Prevention is joining with a colleague in Karachi to study antibiotic resistance.

These are only a few of over 40 projects supported by a program run by the National Research Council and funded by the U.S. and Pakistani governments. The program offers grants to researchers from both countries who wish to collaborate on projects to boost research at Pakistani universities and use science and technology to improve the well-being of ordinary Pakistanis. In three competitions held since 2005, the program has awarded 46 grants spanning up to three years in length. Each country contributes funds to support the program, and both countries

have parallel peer-review processes to weigh the merits of projects competing for grants.

“I see the program as a model of real collaboration between Americans and Pakistanis, as opposed to a one-way assistance program,” said Kelly Robbins, who oversees the program for the National Research Council. “By working together on projects of practical importance, participants in the program build individual and institutional links in a wide range of fields unrelated to military or counterterrorism operations, which are often seen as the basis for the relationship between our countries.”

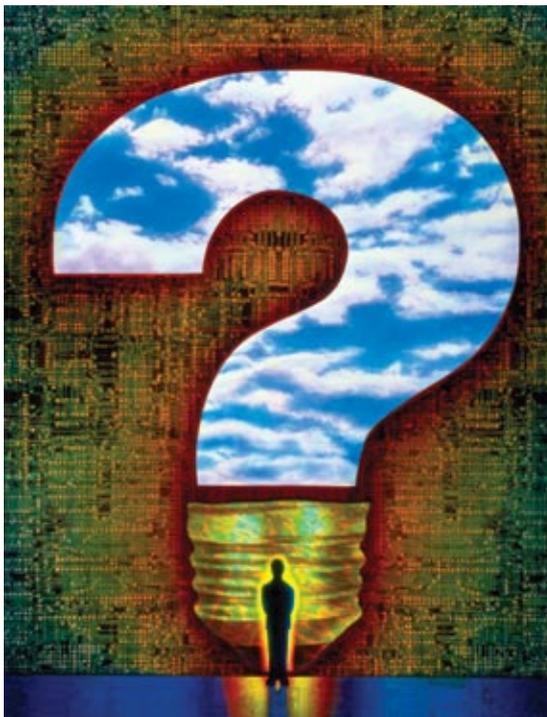
The program has had to navigate some challenges, such as visa snags that delayed or prevented some researchers from traveling back and forth. But it has also produced concrete results: One project that provided solar-powered water pumps to six villages led to lower rates of skin and gastrointestinal diseases in residents who now have more reliable access to clean water. Another trained hundreds of Pakistani health care professionals in infection control procedures.

Interest in the program is growing; for grants to be awarded in 2010, organizers received 270 proposals, far more than the 100 to 120 submitted in previous competitions. “Despite fluctuations in the political relationship between the U.S. and Pakistan in the last few years, the program has drawn increasing numbers of applicants and the Pakistani co-sponsors have repeatedly expressed support for continuing and expanding the activity,” said Robbins.

— *Sara Frueh*

To learn more, visit [<sites.nationalacademies.org/PGA/dsc/pakistan/>](http://sites.nationalacademies.org/PGA/dsc/pakistan/).

Shedding Light on **ENERGY'S HIDDEN COSTS**



Given fluctuating — and often escalating — energy prices in recent years, consumers may be used to scowling at their home heating bills or prices at the gas pump. But however high the numbers may be, they are lower than they would be if all of energy's true costs were reflected, such as the harm inflicted on our health by the pollution generated by burning coal or gasoline.

These kinds of damages — the ones not reflected in market prices — are the “hidden costs” of energy. A new report from the National Research Council aims to bring these costs into view so that policymakers, utilities, and consumers can see the full picture when making energy choices.

When possible, the report attaches a price tag to the damages. Damage to human health from burning coal for electricity, for example, totaled about \$62 billion in 2005. Driving motor vehicles produced \$56 billion in health and other damages. And using natural gas to heat our homes, workplaces, and factories resulted in about \$1.4 billion in harm. All told, the damages from U.S. energy use that the study committee was able to quantify added up to an estimated \$120 billion in 2005.

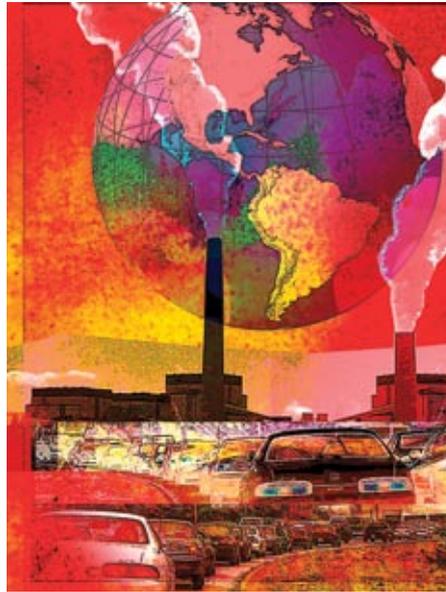
Not included in those dollar figures was harm from climate change, which the committee found impossible to estimate as a

single number because of the wide-ranging possibilities for the damages. Instead, it estimated ranges for the climate-related damages; for example, the cost of those that result from burning coal to generate electricity range from about 0.1 cents to 10 cents per kilowatt-hour. Whatever the exact price of the damage, the report notes, the harm

caused by each ton of CO₂ emissions will be far worse in 2030 than it is now, even if the total amount of CO₂ emitted each year remains steady.

The study turned up some surprises. For example, the committee found that almost half the damages to human health and other nonclimate-related harms caused by coal-fired power plants could be traced to a relatively small number of plants — 10 percent of them. And electric vehicles and plug-in hybrids — generally considered environmental favorites — were estimated to have greater damages than many other vehicle technologies because the electricity used to power them still comes mainly from burning fossil fuels; those costs climb even further because energy is also used to create the batteries and electric motors. Corn-based ethanol also had higher damages than many other types of vehicle fuel because of the energy used to produce the corn and convert it to fuel.

How should the nation lower these hidden costs? While the committee was not asked to recommend specific approaches,



it did note that a case can be made for government interventions, such as regulations, taxes, or tradable permits, to address such damages, given the market's failure to do so. The most efficient policies to tackle hidden costs are likely to be targeted at the damages themselves, not the energy use — for example, by taxing the sulfur dioxide

emissions from power plants rather than the electricity generated by them.

Fully implementing federal rules for diesel would result in a sizeable decrease in nonclimate-related damages from diesel vehicles by 2030, the report adds. Other initiatives to reduce emissions, improve energy efficiency, or shift to a cleaner mix of electricity generation — one involving renewables, natural gas, and nuclear — could also lower damages, including those from electric and plug-in hybrid cars. — *Sara Frueh*

■ **Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use.** Committee on Health, Environmental, and Other External Costs and Benefits of Energy Production and Consumption; Board on Environmental Studies and Toxicology, Division on Earth and Life Studies; Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences; and Board on Science, Technology, and Economic Policy, Division on Policy and Global Affairs (2010, approx. 350 pp.; ISBN 0-309-14636-4; available from the National Academies Press, tel. 1-800-624-6242; \$54.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12794.html>).

The committee was chaired by **Jared L. Cohon**, president, Carnegie Mellon University, Pittsburgh. The study was funded by the U.S. Department of the Treasury.

UNTAPPED POTENTIAL

Natural Gas Supplies Could Be Augmented by Methane Hydrate Deposits

To help feed the nation's increasing appetite for energy, government and industry are searching not only for more sources of energy but also for ones that are unconventional, more reliable, and less carbon-intensive.

One such energy source is natural gas, which in recent years has supplied 20 percent to 25 percent of all energy consumed in the United States, including heat and electrical power. It is also the cleanest of all fossil fuels, emitting up to 50 percent less carbon dioxide than either oil or coal. Given its relatively clean environmental footprint, potential for securing significant domestic supplies, and compatibility with existing infrastructure, natural gas could become a cornerstone of an environmentally and economically sound domestic energy portfolio. But how can natural gas supplies be expanded to meet future needs?

A recent report from the National Research Council says they could be augmented with methane — the principal component of natural gas — produced from methane hydrate deposits.

A solid composed of methane and water, methane hydrate occurs in abundance on the world's continental margins and in permafrost regions. The existence of this large and untapped form of energy has provided a strong incentive to explore how methane might be produced from methane hydrate safely, economically, and in an environmentally sensible way. One initiative undertaking such work is the U.S. Department of Energy's Methane Hydrate Research and Development Program, which the report says has made considerable progress toward



understanding and developing methane hydrate as a possible energy resource.

“DOE’s program and other initiatives provide increasing confidence from a technical standpoint that some commercial production of methane from methane hydrate could be achieved in the United States before 2025,” said Charles Paull, chair of the committee that wrote the report, and a senior scientist at Monterey Bay Aquarium Research Institute in California.

Crucial research hurdles remain, however. Technology proved to produce methane efficiently from solid methane hydrate must be established. Understanding how or if methane hydrate can act as a geohazard during drilling also must be determined to create safe and reliable production methods.

To move toward commercial application, the report recommends that DOE’s program focus on research and development areas that design production tests, appraise and mitigate environmental issues related to production, and locate the methane hydrate resources on the Alaska North Slope and in marine reserves with greater accuracy.

— Jennifer Walsh

■ **Realizing the Energy Potential of Methane Hydrate for the United States.** Committee on Assessment of the Department of Energy’s Methane Hydrate Research and Development Program: Evaluating Methane Hydrate as a Future Energy Resource, Board on Earth Sciences and Resources, Division on Earth and Life Studies (2010, approx. 150 pp.; ISBN 0-309-14889-8; 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/12831.html>).

The committee was chaired by **Charles Paull**, senior scientist, Monterey Bay Aquarium Research Institute, Moss Landing, Calif. The study was funded by the U.S. Department of Energy.



PLUG-IN POTENTIAL

Will New Electric Vehicles Have an Impact on Our Oil Addiction?

General Motors plans to launch the Volt plug-in hybrid electric vehicle later this year. It will be able to travel 40 miles on battery power before the gasoline engine kicks in to finish the trip. Then it can be plugged into an electric outlet to charge up for another 40 miles. Toyota will follow with a plug-in version of the Prius hybrid by 2011, which may have an electric range of 10 to 15 miles. Many other large auto companies have also announced plans to mass produce their own electric plug-in vehicles in the near future. According to a new report from the National Research Council, however, these vehicles are unlikely to have a major impact

on U.S. oil dependence or on transportation greenhouse gas emissions until tens of millions of them are on the road, which will take decades.

The primary hurdle to widespread adoption of plug-in vehicles is the bill. According to the report, manufacturing costs for a first generation plug-in hybrid with a 10-mile range (PHEV-10) is likely to be about \$6,000 more than for an equivalent conventional vehicle, while a PHEV-40 could cost \$14,000 to \$18,000 more. The cost of batteries, the major contributor to these costs, is declining, but dramatic reductions are unlikely without major technological breakthroughs. In addition, the

electrical system upgrades needed for some homes would add to the overall price tag of purchasing a plug-in.

Aside from the high cost, there are additional challenges in transitioning the U.S. automotive market toward a new technology like electric plug-ins. The nationwide electrical grid would need to be up to the task of charging millions of vehicles. For now, while the number of these vehicles on the road remains low, the grid is expected to be able to handle the additional demand, especially if people charge their vehicles at night during off-peak hours. Other factors, such as difficulty finding places to plug in while traveling and consumer resistance to having to remember to plug their car in every day, will also play a part in slowing adoption of this new technology. According to the report, a realistic penetration rate by 2030 would be approximately 13 million plug-in vehicles — out of 300 million total vehicles on the road.

PHEVs save a significant amount of gasoline relative to conventional vehicles, but compared with current hybrids capable of achieving 40 miles per gallon, a PHEV-10 saves less than 20 percent or about 70 gallons per year for the typical driver. Therefore, 13 million PHEV-10s would save about 60,000 barrels of gasoline per day; U.S. consumption of gasoline is about 9 million barrels per day. PHEV-40s do better, saving about 55 percent, but at much higher cost. As more and more plug-ins enter the market, the savings would add up and could become substantial by 2050, the report says.

PHEVs will reduce emissions of carbon dioxide even less than the consumption of gasoline, because lowered emissions from



the car are partially offset by the emissions produced at fossil-fuel powered electricity generating stations. Emission reductions could become significant if the electricity can be produced from nuclear power plants, renewable energy technologies, or fossil-fuel powered plants with carbon capture and storage capability.

Plug-in vehicles are one of several technologies — including hydrogen vehicles and biofuels — in development to aid in reducing the nation's oil dependence. The best approach, the report says, would be to make plug-ins part of a larger portfolio of research, development, and demonstration, as it is not yet clear which technology, or combination of technologies, will be most effective. — *Rebecca Alvania*

■ **Transitions to Alternative Transportation**

Technologies — Plug-in Hybrid Electric Vehicles.

Committee on Assessment of Resource Needs for Fuel Cell and Hydrogen Technologies, Board on Energy and Environmental Systems, Division on Engineering and Physical Sciences (2010, approx. 130 pp.; ISBN 0-309-14850-2; available from the National Academies Press, tel. 1-800-624-6242; \$32.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12826.html>).

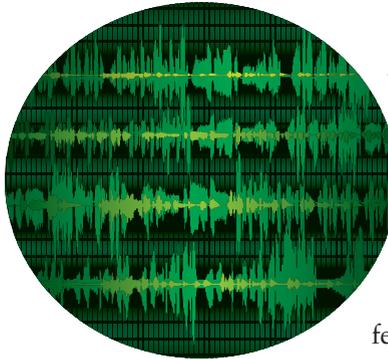
The committee was chaired by **Mike Ramage**, retired executive vice president, ExxonMobil Research and Engineering Co. The study was funded by the U.S. Department of Energy.

CALLING ALL FREQUENCIES

Cell phones, wireless Internet devices, even garage-door openers, all emit radio signals when used. As new technologies are developed, the radio spectrum — a finite resource — is allocated to more users. The proliferation of these technologies is a boon to industry and consumers. But the explosion of radio signals flying through the air is having some unintended effects on areas of scientific research that monitor radio emissions from natural sources, such as hurricanes or distant galaxies. Interference from “active” users — technologies emitting a radio signal — can drown out the natural emissions monitored by scientists. A new report from the National Research Council examines usage of the radio spectrum and how it can be managed to balance the needs of all users.

All matter emits signals at a characteristic frequency that depends on its temperature. Cold gases, the dust between stars, and materials on Earth (e.g., water, soil, atmospheric gases) tend to emit signals in the radio portion of the electromagnetic spectrum, which lies well below the visible range. For decades, scientists have been monitoring natural radio emissions to learn about Earth’s atmosphere and climate as well as aid in our understanding of the universe.

The radio spectrum, however, is limited. Interference with natural emissions can occur when active users transmit at frequencies inside or outside their assigned band — usually inadvertently — causing background noise in quiet bands protected for scientific use. In the U.S., the radio spectrum is regulated by the National Telecommunications and Information Agency (NTIA) for federal



government users and by the Federal Communications Commission (FCC) for all others. Users are assigned specific frequency bands and given maximum allowable power levels for their emissions. The interference problem is a one-way street, though; “passive” users of

the radio spectrum — researchers who are only monitoring and not emitting signals — cannot interfere with other users.

Both active and passive use of the radio spectrum is increasing. The elevating tension between competing needs suggests that the procedures currently in place for regulating spectrum use, which were developed prior to 1950, should be updated. According to the National Research Council report, the White House Office of Science and Technology Policy should create a permanent advisory body to identify ways to improve spectrum sharing among all users. The report also recommends that the FCC and NTIA ensure that scientific access to spectrum is preserved in the development of future spectrum policy. — *Rebecca Alvania*

■ **Spectrum Management for Science in the 21st Century.** Committee on Scientific Use of the Radio Spectrum, Standing Committee on Radio Frequencies, Board on Physics and Astronomy, Division on Engineering and Physical Sciences (2010, 248 pp.; ISBN 0-309-14686-0; available from the National Academies Press, tel. 1-800-624-6242; \$52.75 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12800.html>).

The committee was co-chaired by **Marshall Cohen**, professor emeritus, California Institute of Technology, Pasadena, and **Albin Gasiewski**, professor of electrical and computer engineering, University of Colorado, Boulder. The study was funded by the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, and the National Science Foundation.



CLEARING THE AIR ABOUT SMOKING BANS

New Report Dispels Uncertainties About Secondhand Smoke and Bans

No one seriously doubts that smoking harms one's heart and lungs, but just how dangerous is smoke inhaled secondhand by nonpuffing bystanders? It seems obvious to many public health officials and proponents of smoke-free policies that breathing air laden with chemicals from tobacco smoke is harmful.

Skeptics of the risks have pointed to limitations in researchers' abilities to measure nonsmokers' exposures and to conclusively pinpoint what amounts are necessary to trigger heart attacks. This view recently got harder to sustain, however, in light of a report from the Institute of Medicine released in October. The report concludes that the science not only shows the health risks to nonsmokers but also underscores smoking bans' effectiveness in reducing these risks.

"It's clear that secondhand smoke can cause heart disease and that smoking bans reduce the risk of heart attack in nonsmokers as well as smokers," said environmental health scientist Lynn Goldman of Johns Hopkins' Bloomberg School of Public Health in Baltimore and chair of the committee that wrote the report.

Despite their variations and limitations, studies of environmental tobacco smoke exposure consistently show that breathing secondhand smoke increases the risk of coronary heart disease in nonsmokers, the committee noted. The more people breathe in, the greater their risk.

There is no direct evidence that a brief encounter with secondhand smoke could precipitate a heart attack, but the committee called “compelling” the indirect evidence indicating that even short exposures could affect someone already at risk. Results of studies looking at smoke from factories and other pollution sources suggest that even a relatively brief exposure to millions of tiny pollutant particles can constrict blood vessels and increase clotting, both potential precursors to a heart attack. Fine particles are a major component of secondhand smoke, too. Many people are not aware they have heart disease until their first heart attack, so avoiding secondhand smoke is generally a prudent move, said physician and committee member Neal Benowitz of the University of California, San Francisco.

Pinpointing the effects of smoke-free policies is more challenging, and some of the committee members were skeptical that they would be able to draw firm conclusions. The totality of the evidence proved convincing, said statistician Stephen Fienberg of Carnegie Mellon University in Pittsburgh. Eleven key studies assessed rates of heart attacks in communities that enacted smoking bans and consistently found that the rates went down. Although the drops might be explained to some extent by improvements in smokers’ health, two studies distinguished whether patients were nonsmokers

or smokers and saw the number of heart attacks go down in both groups.

The declines ranged from 6 percent to 47 percent across the studies. Given the studies’ variations and the limited data on people’s exposures to secondhand smoke before and after the bans, the committee could not precisely determine the magnitude of the effect. “Whether the risk reduction is less than 10 percent or greater than 40 percent, either way it means significantly fewer deaths,” Goldman said.

Upon its release, the report was quickly picked up by individuals and groups urging their elected officials to pass smoking ordinances. Although the majority of the states and largest metropolitan areas have enacted some form of smoke-free policies, about 43 percent of nonsmoking children and 37 percent of nonsmoking adults are still exposed to secondhand smoke. But fewer will be in 2010; two-thirds of voters in St. Louis approved a countywide ban on smoking in public venues last November. Last December, Michigan became the 38th state to ban smoking in at least some public places, and Kansas took a big step toward becoming the 39th in February this year when a ban passed the state legislature.

— *Christine Stencel*

■ **Secondhand Smoke Exposure and Cardiovascular Effects: Making Sense of the Evidence.** Committee on Secondhand Smoke Exposure and Acute Coronary Events, Board on Population Health and Public Health Practice, Institute of Medicine (2010, 240 pp.; ISBN 0-309-13839-6; available from the 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/12649.html>).

The committee was chaired by **Lynn R. Goldman**, professor of environmental health sciences, Bloomberg School of Public Health, Johns Hopkins University, Baltimore. The study was funded by the U.S. Centers for Disease Control and Prevention.

A Healthy Menu for School Meals

An apple on the teacher's desk is an iconic image, but what food springs to mind when we think of students? Pizza? French fries? If these associations readily arise, maybe it's because such foods have long been staples in many school cafeterias. But as concerns about malnutrition and hunger give way to worries about childhood obesity, parents and public officials alike have begun to scrutinize lunchroom fare and call for upgrades to the nutritional quality of school meals.

In a recent report, the Institute of Medicine provides policymakers with a menu of changes that would improve the healthfulness of school meals and meet the nutritional needs of growing kids.

The key recommendations are to increase the amounts and variety of fruits and vegetables, to decrease meals' sodium content and minimize saturated and trans fats, to replace a substantial amount of refined grains with whole-grain products, and to provide 1 percent or nonfat milk rather than whole or 2 percent milk. The report also calls on the school meal programs to set age-appropriate calorie limits on meals for the first time as well as meet minimum calorie requirements. This recommendation reflects today's greater concerns about obesity, but still acknowledges that hunger remains an issue for some disadvantaged groups in America.

The recommendations will bring school meals in line with the latest Dietary Guidelines for Americans and Dietary Reference Intakes. But implementing them likely will raise the costs of providing meals, largely because of the greater amounts of



fruits, vegetables, and whole-grain foods involved. A combination of higher federal meal reimbursement, capital investment, and additional money for training food service operators will be needed to make the necessary changes in school cafeterias.

Of course, not all schoolchildren eat breakfasts or lunches provided through the school meals programs. Many bring lunches from home or opt for the food and beverages available in vending machines, a la carte service in cafeterias, or snack bars. While the IOM has not addressed packed lunches, it did recommend nutrition standards for the offerings sold in schools in competition with school meals in a 2008 report. The recommendations in these two reports work in tandem to ensure a level nutritional playing field for all foods and beverages sold in schools. And if implemented together, these reports would reassure parents that their children have access to healthy food on school grounds. — *Christine Stencel*

■ **School Meals: Building Blocks for Healthy Children.**

Committee on Nutrition Standards for National School Lunch and Breakfast Programs, Food and Nutrition Board, Institute of Medicine (2010, 252 pp.; ISBN 0-309-14436-1; available from the National Academies Press, tel. 1-800-624-6242; \$55.00 plus \$5.00 shipping for single copies; also on the Internet at <www.nap.edu/catalog/12751.html>).

The committee was chaired by **Virginia A. Stallings**, Jean A. Cortner Endowed Chair in Pediatric Gastroenterology, Children's Hospital of Philadelphia, and professor of pediatrics, University of Pennsylvania School of Medicine, Philadelphia. The study was funded by the U.S. Department of Agriculture.

*Live From Africa ...
It's Science in Action!*



Each reaching a milestone anniversary of its own, the African Science Academy Development Initiative (ASADI) held its fifth annual conference in Accra, Ghana, hosted by the 50-year-old Ghana Academy of Arts and Sciences. ASADI also celebrated the release of an important new report on ways to reduce staggering rates of maternal, newborn, and child mortality across Africa.

Authored by representatives of the seven African science academies that participate in ASADI and a team of 60 experts they assembled, the report documents how scaling up proven health care interventions could save the lives of hundreds of thousands, if not millions, of mothers and children. The authors titled the report *Science in Action* to emphasize the impact that scientific findings could have if their application were accelerated. Harnessing the latest science through reports such as this, so that it can be employed by policymakers, is the goal of ASADI.

The U.N. Millennium Development Goals aim to reduce under-five mortality by two-thirds and maternal mortality by three-fourths by 2015. The report notes pockets of improvement in maternal and child health in sub-Saharan Africa — where



half of the world's 10 million maternal and child deaths each year occur — but says most countries are not on track to meet the U.N. goals.

“There is clear evidence that progress can be achieved, however many African governments are not yet fully exploiting existing scientific knowledge,” said former U.N. Secretary-General Kofi Annan in a video message delivered at the conference. “National academies of science have an important role to play by sharing the best knowledge and engaging policymakers more actively to help African governments translate evidence-based science into appropriate policies.”

The report authors used modeling software called the Lives Saved Tool to analyze the impact of increasing coverage of interventions essential to maternal, newborn, and child health. Under a scenario where coverage of essential interventions reached 90 percent of mothers and children under 5 years old by 2015, the model suggests that almost 4 million lives could be saved annually in sub-Saharan Africa. Another scenario showed that 770,000 lives could be saved annually in nine countries if essential care were provided for all births that take place in facilities and if coverage

of select interventions provided outside facilities were increased by just 20 percent within two years. The report says priority interventions are “extremely affordable” on a per capita basis, noting that the cost of increasing the interventions used in the nine-country example is less than \$2 per capita.

The report was supported by the U.S. National Academies; Save the Children; the Academy of Sciences of South Africa; Johns Hopkins Bloomberg School of Public Health; Mars Inc.; and UNICEF. The report and videos by Annan and other science and health leaders, including NAS President Ralph J. Cicerone and IOM President Harvey V. Fineberg, are available at national-academies.org/asadi. ASADI is administered by the U.S. National Academies and supported by the Bill & Melinda Gates Foundation.

— *Bill Kearney*

NAS, IOM Members to Serve as Science Envoys to Muslim World

In November, Secretary of State Hillary Clinton named former NAS President Bruce Alberts, former NIH Director and IOM member Elias Zerhouni, and Nobel prize-winning chemist and NAS member Ahmed Zewail as the first three U.S. Science and Technology Envoys and announced that the State Department will expand positions for environment, science, technology, and health officers at U.S. embassies.



“We want to help Muslim-majority communities develop the capacity to meet economic, social and ecological challenges through science, technology, and innovation,” Clinton said.

The U.S. Science Envoy program is part of President Barack Obama’s “New Beginning” initiative with Muslim communities around the world that he launched last June in Cairo, Egypt. He pledged that the United States would “appoint new science envoys to collaborate on programs

that develop new sources of energy, create green jobs, digitize records, clean water, and grow new crops.”

The envoys will travel to countries in North Africa, the Middle East, and South and Southeast Asia, where they shall engage their counterparts, deepen partnerships in all areas of science, technology, and health, and foster meaningful collaboration to meet major challenges facing the world today. Additional U.S. scientists, engineers, and health professionals will be invited to join the Science Envoy program to expand it to other Muslim-majority countries and regions of the globe.

The envoys will be supported by new embassy officers who will also engage with international partners on a full range of environmental, scientific, and health issues, from climate change and the protection of oceans and wildlife to cooperation on satellites and global positioning systems.

“The most exciting part of this new challenge to me is the chance to demonstrate what a science envoy program can do,” said Bruce Alberts. “As the first envoys, we have an opportunity to make this experiment so successful that the U.S. government decides to recruit envoys for every major nation of the world, not just the Muslim-majority ones. Over the long run, the many new relationships we help U.S. scientists form with their counterparts abroad will contribute to a more rational and peaceful world,” he said.

— *Valerie Chase*

InterAcademy Council to Review IPCC

The Intergovernmental Panel on Climate Change (IPCC), whose exhaustive assessments of climate change science are seen as a basis for governments to move toward agreements to reduce greenhouse gas emissions, has been criticized in recent months after errors were discovered in its fourth assessment, issued in 2007. Those errors fueled a firestorm that was already burning in the media over hacked e-mails from the Climate Research Unit of the University of East Anglia.

In response to the situation, U.N. Secretary-General Ban Ki-moon and IPCC chair Rajendra Pachauri requested an independent review of IPCC processes and procedures by the InterAcademy Council (IAC), an Amsterdam-based organization of many of the world's science academies, including the U.S. National Academy of Sciences. "We need to ensure full transparency, accuracy, and objectivity, and minimize the potential for any errors going forward," Ban said in explaining his decision to initiate the review.

Ban announced the review to reporters at the U.N. on March 10. He was accompanied by Pachauri, who added, "We expect that this review will help us in strengthening the entire process by which we carry out preparation of our reports."

At a separate U.N. press conference, Robbert Dijkgraaf, president of the Royal Netherlands Academy of Arts and Sciences and co-chair of the IAC, noted that the council was established in 2000 to carry out these types of reviews for the U.N.



and other international organizations. He emphasized that the review would be conducted completely independently of the U.N. and IPCC, with "no preconceived conclusions." Dijkraaf said that among the issues IAC had been asked to address is how the IPCC assures the quality of data in its assessments, whether literature that is not peer-reviewed could be cited, and how errors discovered later on are handled. The IPCC's management structure and capacity for effectively communicating its findings will also be examined.

The "Independent Evaluation Group" appointed by IAC to carry out the review has been asked to deliver its report to the U.N. by August 31, in advance of an IPCC meeting on its fifth assessment, which is currently under way. The review will be funded by the United Nations Environment Programme. The IAC can be found on the Web at <www.interacademycouncil.net>.

— *Bill Kearney*

NAS Hosts Premiere and Discussion with “Whiz Kids”

“America’s future rests on the shoulders of the next generation.” That message resonated during the D.C. premiere of the film “Whiz Kids” held at the Academy in December.

“Whiz Kids” is a coming-of-age documentary that tells the story of three passionate 17-year-old scientists who vie to compete in the nation’s oldest, most prestigious science competition, the Intel Science Talent Search. Each year 40 finalists come to Washington, D.C., to find out who has won up to \$630,000 in awards, and share their original research with professional scientists and the public in the Great Hall of the National Academy of Sciences.

After the film, Bob Edwards, host of “The Bob Edwards Show” on Sirius/XM Radio and Public Radio International, moderated a lively discussion with the whiz kids themselves and film director Tom Shepard. Shepard was a finalist in the same science competition in 1987. He shared his experience from then and compared it to now and found several traits that were consistent among the kids — “an insatiable curiosity, a deeply felt determination to communicate their work to the public, and a passion to make a difference in the world.” He added that “kids today are more interdisciplinary.” The panelists noted the important role that informal science learning played in their lives.

“Whiz Kids” is slated to air in fall 2010 on PBS. — *Maureen O’Leary*



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