Informing the Future
Critical Issues in Health

SEVENTH EDITION

INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES
Funding: This document was produced using internal National Academies funds.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. C. D. Mote, Jr., is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. C. D. Mote, Jr., are chair and vice chair, respectively, of the National Research Council.

For more information about the Institute of Medicine, visit the IOM home page at: www.iom.edu.

Copyright 2013 by the National Academy of Sciences. All rights reserved.

Printed in the United States of America

The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The serpent adopted as a logo-type by the Institute of Medicine is a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.
“Knowing is not enough; we must apply. Willing is not enough; we must do.”
—Goethe
Contents

Advising the Nation, Improving Health 1
The U.S. Health Care System and Health Reform 5
Food and Nutrition: Keys to Health 29
Building a Healthier Future for Children 41
Regulatory Strategies and Guidelines 61
Fighting Diseases: Prevention, Treatment, and Living Well 69
Protecting the Health of the Military and Veterans 85
Information Technology in Health Care 101
Safeguarding the Health of the Population 111
Promoting and Sustaining Health Around the World 137
Research Strategies, Priorities, and Methods 151
Fostering Leadership: Fellowships at the Institute of Medicine 169
Increasing Collaboration Through Forums and Roundtables 173
Recent and Upcoming Reports 185
Contact Us 233
Advising the Nation, Improving Health

The Institute of Medicine (IOM) was established in 1970 as the health arm of the National Academy of Sciences. Within its first few years, the IOM had begun to shape health policy, influencing President Nixon’s war on cancer and creating a standard methodology for estimating medical education costs.

In the succeeding decades, the work of the IOM ranged across every dimension of health policy, from confronting AIDS to access to health insurance, from the safety of childhood vaccines to the future of nursing, and from the use of laboratory animals in research to enhancing the safety and quality of health care. Reports from the IOM—which may be self-initiated or begin as mandates by Congress or requests from federal agencies and independent organizations—are published after a rigorous research, deliberation, and peer review process. The IOM also engenders dialogue in its forums and roundtables among individuals from government, industry, academia, and the public; and IOM workshops cover a variety of timely and important topics ranging from pandemic preparedness to biomarkers in clinical trials.

The IOM is an honorific association as well as an advisory body, and election to membership is considered a high mark of professional achievement. In recognition of the breadth of expertise that bears on health, by charter, at least one-quarter of members must come from outside the health professions—scientists, engineers, humanists, lawyers, administrators, and others who contribute to improving health. Up to 75 new members are elected annually from the United States and around the world. The IOM also works to educate promising early and mid-career scientists.
and professionals through its fellowship programs. The first of these, the Robert Wood Johnson Foundation Health Policy Fellows program, is in its 40th year, while the most recent was launched in 2012, illustrating both longevity and dynamism in the IOM’s ever-expanding efforts to educate future health care leaders as well as the public.

Through decades of service, the IOM remains an independent, non-profit organization dedicated to advising the nation to improve health. The organization is also committed to extending its reach, particularly by increasing its impact, enhancing the ways in which it convenes experts, and encouraging adoption and implementation of its recommendations.

In order to better conduct its business in a changing world, the IOM’s convening strategies have adapted to new technologies and opportunities. Committee members can now meet via remote conferencing system, and consensus studies are produced in shorter periods of time, reducing costs and increasing efficiency. In addition, meetings of forums and roundtables, which bring together diverse groups of stakeholders from both the public and private sectors, have employed webcasts and e-conferencing to facilitate broader-reaching conversations with an expanded group of participants.

The IOM is also focused on building on high-level discussions to create tangible impact. A subset of roundtable and forum participants called action collaboratives convene small groups of experts with similar interests and responsibilities to work in partnership and share information. They aim to advance goals developed in roundtables and forums as well as findings from IOM reports of mutual priority. For example, after a September 2010 workshop of the Roundtable on the Promotion of Health Equity and the Elimination of Health Disparities, representatives from Walgreens and the Department of Health and Human Services (HHS) Office of Minority Health partnered to help the uninsured receive flu vaccines during the 2011 flu season. In total, Walgreens provided more than $10 million in vouchers for free flu shots, which HHS then distributed to approximately 350,000 eligible people in 15 U.S. communities.

Perspectives—published electronically as discussion papers and commentaries—are another way for the IOM to engage with leaders in fields that impact health. Individually authored by members of roundtables and forums, these articles give leading experts a platform to convey their observations and opinions on advances and challenges in health and health care. One discussion paper, “A CEO Checklist for High-Value Health Care,”
was co-written by 11 health care executives and contains the 10 strategies they have found most effective to improve quality and reduce costs in their organizations. The piece was well received and disseminated broadly; in a joint effort between the IOM and the American Hospital Association, the checklist was sent to nearly 7,000 health executives across the country to inform them about innovative strategies employed by their peers.

In addition to conveying important health information to policy makers and public health leaders, the IOM strives to communicate its messages more effectively to the public. Social media platforms, infographics, and interactive tools and quizzes expand the IOM’s Web presence and help to provide information in comprehensible formats for a broad audience. For example, in 2012, the IOM was tasked with examining the public health dimension of epilepsy disorders. In conjunction with its report, the IOM developed an online, five-point quiz to amplify information about, interest in, and public understanding of this disease. The quiz was adopted and distributed online by many of the study’s sponsors, greatly extending the reach of the IOM’s work on epilepsy.

In working to mobilize individuals and communities to improve their health, the IOM has developed a series of partnerships along with informational products and programs. The Kellogg Health of the Public Fund supports endeavors to inform the public and local health and public officials about the IOM’s work, with a particular focus on underserved and disadvantaged communities. One such project, the Smart Bites program, works at the local level to promote healthy eating among youth. Participating restaurants offer discounts and incentives to those who carry Smart Bites “cards” and who choose healthy menu items.

Other partnerships have built on the IOM’s portfolio of work on obesity by communicating relevant information in ways that encourage individuals and communities to take their health into their own hands. The Weight of the Nation project, presented by HBO Documentary Films and the IOM in association with the Centers for Disease Control and Prevention and the National Institutes of Health and in partnership with the Michael & Susan Dell Foundation and Kaiser Permanente, features four documentary films and a three-part series of specials for young people on how they and their families can improve their health through healthy eating and physical activity. In this instance, television provided a valuable platform for communicating key health messages about the importance of changes in people’s diet and exercise habits. Both the original series and
the children's series were nominated for Emmy awards. *Victor’s Garden*, a children’s book developed in concert with Scholastic as a companion to *The Weight of the Nation* series, is another tool the IOM uses to help elementary students and their parents learn about healthy food and physical activity.

By employing new and effective methods to advance the dialogue about health and motivate positive change, the IOM endeavors to uphold the high standards of its past while advancing health in novel ways. This book highlights the work of IOM committees completed over the last 2 years and also describes public workshops, collaborative activities, and fellowship programs at the IOM. The final section provides a comprehensive bibliography of IOM reports published since 2011. We hope you find this an informative and useful compendium and welcome your comments and suggestions.
The U.S. Health Care System and Health Reform

The nation’s health care system is in a time of significant change, driven by a variety of factors. Implementation of the Patient Protection and Affordable Care Act of 2010 (ACA) is under way, bringing changes to both the public and private health sectors. Fiscal challenges continue to restrict the availability of resources, and the population is growing older, placing a strain on the health care system. At the same time, scientific progress continues apace, bringing new technologies and treatments along with questions about their costs and appropriate applications.

In this shifting environment, the Institute of Medicine (IOM) plays a central role. Government and private groups alike regularly ask the IOM to examine the performance of programs and policies, assess new proposals, and recommend pathways that will take the nation into a healthier future.

Building a smarter system

Even as the health care system has witnessed an explosion in knowledge and innovation, it has fallen short in quality, outcomes, cost, and equity. Recent years have brought growing demand for change. With support from the Blue Shield of California Foundation, the Charina Endowment Fund, and the Robert Wood Johnson Foundation, the IOM evaluated the performance of the health care system and recommended strategies for fundamental improvements.

In Best Care at Lower Cost: The Path to Continuously Learning Health Care in America (2012), the IOM committee concluded that the U.S. health
The U.S. health care system has become far too complex and costly to sustain—but the knowledge and tools now exist to put the system on a better course. Vast computing power is increasingly affordable, and connectivity allows information to be accessed in real time. Human and organizational capabilities offer expanded ways to improve the reliability and efficiency of health care. And health care organizations and providers recognize that effective care must be delivered by collaborative teams of clinicians in which each member plays a vital role. By capitalizing on these and other tools and approaches, the health care system will be positioned to provide better care at lower cost.

The IOM committee stressed that these goals cannot be achieved through incremental upgrades or changes made by individual hospitals or providers. Rather, an across-the-board commitment will be needed to transform the health care system into one that continuously “learns” by capturing and broadly disseminating lessons from every care experience and research discovery.

The committee concluded that organizations and clinicians should embrace new health information technology (IT) tools, such as electronic health records, for collecting and using data at the point of care. Patients also should be encouraged to use new health IT tools, such as personal health information portals, to actively engage in their care. The federal government and private developers of health IT should ensure that these systems are robust and interoperable, and regulators should work to clarify and improve rules governing the collection and use of clinical data to safeguard patient privacy while promoting the seamless use of data for better care coordination and management.

Health care delivery organizations should develop organizational cultures that encourage continuous improvement by incentivizing the incorporation of best practices, transparency, open communication, staff empowerment, coordination, teamwork, and mutual respect. In addition, medical schools and health professional groups should incorporate basic concepts of continuous learning and improvement, as well as specialized applications, into health professionals’ education, licensing, certification, and accreditation requirements.
Because economics is a strong driver of health care, the committee noted that payers will need to restructure their practices as well. The prevailing approach to paying for health care, based predominantly on individual services and products, encourages wasteful and ineffective care. Instead, payments should reward desired care outcomes and value—the best care at lower cost. Payers should adopt outcome- and value-oriented payment models, contracting policies, and benefit design that reward and support high-quality, team-based care focused on patients' needs. Health care delivery organizations, clinicians, and payers should increase the availability of information about the quality, price, and outcomes of care, and professional specialty societies should encourage transparency in the information provided by their members. Likewise, payers should promote transparency to help their members make better decisions. And consumer and patient organizations should disseminate this information to spur conversations and promote informed decision making.

In conjunction with the report’s release, the IOM developed an infographic to convey key findings and recommendations of the report to a wider audience. Titled “What’s Possible for Health Care?,” it presents some of the goals for a learning health care system and how they might be achieved by adopting practices already in use in other industries, such as banking, aviation, and manufacturing. The infographic was featured by blogs at the Washington Post and National Public Radio.
When the report was released, a number of public and private groups made statements of support, including the American College of Physician Executives and the American Society of Clinical Oncology. Modern Healthcare, a business publication targeting executives in the health care industry, ran an editorial stating that the report (along with the ACA and the Supreme Court’s ruling to uphold the law) ranked among the most significant health care documents of recent years, adding that the report had a much lower “cost per page” than the other two. In addition, the New York Times published a special quiz on cutting health care costs that used Best Care at Lower Cost as its reference. In recognition of the report’s contributions, the Healthcare Financial Management Association awarded the IOM in May 2013 its Richard L. Clarke Board of Directors Award for “significant contributions to the health care financial management profession and the health care industry.”

Realizing this vision of a continuously learning health care system is a key focus of the IOM’s Roundtable on Value & Science-Driven Health Care. Drawing on insights and leadership from the scientific, clinical, commercial, voluntary, and public sectors, the roundtable and its members work to foster the advancement and application of science that will achieve the best possible health outcomes for Americans.

Among its activities, the roundtable convenes and supports Innovation Collaboratives that engage key stakeholders with similar interests and field responsibilities in cooperative activities. The collaboratives promote information sharing and cooperation across the health and health care system, explore emerging issues facing particular sectors of the health system, and harness the talent and expertise of the participants in practical efforts to advance the field. The roundtable’s collaboratives currently focus on six overlapping and complementary areas:

1. **Best Practices**: Health professional societies and organizations brought together by their common interest in fostering evidence-based best practices, including team care and shared decision making.
2. **Clinical Effectiveness Research**: Innovative research scientists and institutions—public, private, and academic—working to improve research methods, identify priorities, and stimulate innovation.

3. **Digital Learning**: Care delivery and health IT organizations using digital tools to accelerate the effectiveness and efficiency of care and the real-time development of new knowledge.

4. **Evidence Communication**: Marketing experts and decision scientists developing communication strategies that improve health outcomes through more effective use of evidence in the shared decisions of patients and their clinicians.

5. **Systems Approaches for Health**: Medical, engineering, and IT leaders fostering joint projects aimed at eliminating patient injury using successful systems approaches for care improvement and research evaluation.

6. **Value Incentives**: Health financing and health care organizations working to design, develop, test, and evaluate innovative approaches to economic and professional incentives that reward value.

In another approach to fostering greater awareness and understanding of pressing topics in health care, roundtable members and other invited experts contribute to the IOM’s Perspectives series. Perspectives, which take the form of discussion papers and commentaries, provide leading experts with the opportunity to offer their observations and opinions on innovations and challenges in health and health care. These are authored documents made available by the IOM, and are thereby distinct from reports of the IOM. In June 2012, the roundtable sponsored a discussion paper called “A CEO Checklist for High-Value Health Care,” in which the leaders of 11 major health care organizations explained the methods they use to promote value in their institutions. The paper received broad approbation, with the American College of Physician Executives, for example, endorsing it and disseminating it widely.

The roundtable also convened a series of workshops—collectively called the Learning Health System Series—that identified key elements of the health care system whose transformation can drive improvements
in the value of medical care delivered in the United States. There is now general agreement, for example, that the quality of health care should be judged not only by whether clinical decisions are informed by the best available scientific evidence, but also by whether care is tailored to a patient’s individual needs and perspectives. However, too often it is the provider’s, rather than the patient’s, preference and convenience that drive what care is delivered. At a roundtable workshop, presented in *Patients Charting the Course: Citizen Engagement and the Learning Health System: Workshop Summary* (2011), participants explored communications strategies, policy levers, and various other factors that can help to advance patients’ involvement in their personal care and in the health care system at large.

Another common theme explored in the Learning Health System Series is that the nation needs better ways to measure progress across health care and the health care system. Without a strong measurement capability, we cannot learn what initiatives and programs work best, resources cannot be guided toward the most promising strategies, and there is little ability to promote accountability in results. *Core Measurement Needs for Better Care, Better Health, and Lower Costs: Counting What Counts: Workshop Summary* (2013) captured discussions on this topic at a Roundtable workshop sponsored by the Blue Shield of California Foundation. Participants explored sets of measures needed to track progress toward better quality, lower cost, improved patient and public engagement, and better health outcomes, and they considered factors influencing the implementation of core measure sets (including data infrastructure, resources, and policies) across organizations and providers. Participants agreed that further work will be needed to better define and resolve these problems, and the IOM is developing a study panel to build on this work and propose a core measure set. In conjunction with the workshop, the IOM produced an infographic, titled “Counting What Counts,” which portrays some of the major themes of the workshop (available at http://www.iom.edu/countingwhatcounts).
Improving insurance to expand health care

**Essential health benefits**

A major goal of the ACA is to help millions of uninsured Americans obtain affordable health care coverage. Under the law, private companies will offer health insurance plans to low- and moderate-income individuals and small business employers through state-based purchasing exchanges, often with financial help. The exchanges—and certain other insurance providers—will be required to offer plans that include a package of diagnostic, preventive, and therapeutic services and products that have been defined as “essential” by the Department of Health and Human Services (HHS).

For help in making this initial determination and updating the results to meet changing conditions, HHS turned to the IOM. In *Essential Health Benefits: Balancing Coverage and Cost* (2011), the IOM study committee laid out a detailed process and set of standards that HHS could use to identify a core package of benefits that would cover many health care needs,
promote medically effective services, and be affordable to purchasers. The committee also recommended that HHS seek input from small business employers and the public to inform the process, keep it transparent, and make it more likely to gain wider acceptance.

According to the IOM’s recommended blueprint for action, HHS should determine which benefits small businesses typically offer their employees; assess potential services and products against a set of criteria that include medical effectiveness, safety, and relative value compared with alternative options; and evaluate whether the package as a whole protects the most vulnerable individuals, promotes services that have proved effective, and prioritizes the medical concerns of greatest importance to the public. To promote affordability, HHS should balance the package’s comprehensiveness with its potential cost. The com-

---

**Essential Benefits Categories in the Patient Protection and Affordable Health Care Act**

**Essential Health Benefits**
- Ambulatory patient services
- Emergency services
- Hospitalization
- Laboratory services
- Maternity and newborn care
- Mental health and substance use disorder services, including behavioral health treatment
- Pediatric services, including oral and vision care
- Prescription drugs
- Preventive and wellness services and chronic disease management
- Rehabilitative and habilitative services and devices

*SOURCE: Essential Health Benefits: Balancing Coverage and Cost, p. 6.*
The committee proposed that HHS determine what the national average premium of small employer plans would be in 2014 and structure the package’s scope of benefits to stay within this amount.

As HHS works to define the benefits package, it also should develop a strategy to cut the health care spending growth rate, the committee urged. Without efforts to limit medical inflation, the range of benefits that can be covered affordably within the package will erode, eventually resulting in minimal coverage for the people who need it most.

**Medicare**

Medicare is the nation’s largest health insurer, covering more than 39 million people aged 65 years and older and 8 million people with disabilities or end-stage renal disease. Although it is a national program, Medicare adjusts its fee-for-service payments to hospitals, physicians, and other clinical practitioners based on their geographic location, to account for regional variations in business costs that are beyond the providers’ control. But there are disagreements about how to adjust these payments, stemming from concerns about inconsistencies in the definitions of payment areas and labor markets, the appropriateness of data used to calculate adjustments, and lack of transparency, among other problems.

HHS, which oversees Medicare, commissioned the IOM to conduct a two-part study to identify inaccuracies and inequities in the geographic adjustments and recommend ways to overcome them. The first report, *Geographic Adjustment in Medicare Payment, Phase I: Improving Accuracy*, issued in September 2011, concluded that Medicare’s rationale for fine-tuning payments based on geographic variation is sound and should be continued, but the program should make several fundamental changes in its data sources and methods used for calculating adjustments.

The IOM committee recommended that Medicare use the same geographic boundaries and payment areas for hospitals and individual health care providers, use different datasets for computing the compensation of clinical and administrative staff at hospitals and at office-based sites, and expand the types of occupations used to make the geographic adjustments. The committee concluded that together, these
changes would improve the accuracy of geographic adjustments in payments, streamline the payment process for a broader range of providers, and decrease the burden of cost reporting.

To help inform a broad array of stakeholders, including the public, about the report and its findings, the IOM developed an online interactive infographic that highlights the principles behind the adjustments and illustrates how the proposed changes will simplify and improve the process. The graphic can be accessed at http://www.iom.edu/geoadjustmentgraphic.

In the second phase of the study, the IOM committee determined the effects its proposed recommendations would have on health care providers and services. Geographic Adjustment in Medicare Payment, Phase II: Implications for Access, Quality, and Efficiency, released in July 2012, concluded that the IOM recommendations would result in an increase or decrease in payment of less than 5 percent on average for the majority of hospitals and most physicians. For example, the proposed changes would result in an overall payment reduction of just under 3 percent to health professionals in nonmetropolitan counties and an increase of less than 0.5 percent in
metropolitan counties. Although the changes seem small, they are significant for providers and organizations striving to provide high-value health care. This fact, the committee stressed, magnifies the importance of accurately setting geographic adjustments.

To help stakeholders visualize the potential payment changes, the IOM used data gathered by the committee to develop an online tool that simulates payments to hospitals, physicians, and other clinical care providers, broken down by region (and even to the county level, in many cases). The tool can be accessed at http://www.iom.edu/geoadjustmenttool. It has been used by state hospital and medical associations, congressional staff, and other interested parties to assess the potential impact of payment changes in various geographic areas.

Beyond these financial projections, the IOM committee offered recommendations to improve access to efficient and appropriate levels of care and noted the importance of a health care workforce sufficient to serve all beneficiaries, regardless of where they live. Such broad goals cannot be achieved using geographic adjustments, the committee concluded. Instead, Medicare should support strategies that enable all qualified health professionals, including nurse practitioners and physician’s assistants, to

Distribution of primary care physicians among urban and nonurban areas.

NOTE: GP = general practitioner.

SOURCE: Geographic Adjustment in Medicare Payment, Phase II: Implications for Access, Quality, and Efficiency, p. 69.
practice to the full extent of their education and training. The committee also recommended that “telehealth” services that use IT and communications tools to exchange information between providers and patients in different locations should be covered for Medicare patients in all medically underserved areas, and not only for those in rural areas.

In another study requested by HHS, the IOM focused on large variations in Medicare fee-for-service spending and service use across geographic regions, seemingly unrelated to health outcomes. Some observers have interpreted these variations to mean that high-spending areas are overusing or misusing medical care. Policy makers, seeking strategies to reduce Medicare costs, wonder if cutting payment rates to such areas would save money without adversely affecting health care quality and outcomes for beneficiaries. Other observers have cautioned that reducing payments within high-spending areas may have adverse effects if the variations are caused by other variables, such as increased incidence of illness among beneficiaries or local policies that influence health outcomes. Further, if there are substantial differences in provider practice patterns within a high-cost region, cutting payments across the board would unfairly punish low-cost care providers.

In this context, the IOM study committee was asked to investigate geographic variation in health care spending and quality and to analyze Medicare payment policies that might encourage high-value care, including adoption of a “geographically based value index” that would modify payments based on composite measures of cost and quality of health care providers in given areas. To help with its deliberations, the committee commissioned an extensive body of original empirical analyses of public and commercial databases and four papers from subject-matter experts, and held two public workshops to complement its review of existing literature. In order to make its findings available in a timely manner to Congress as it considered Medicare reform, the committee released an interim report containing only key preliminary observations in March 2013.

In its final report, Variation in Health Care Spending: Target Decision Making, Not Geography (2013), the committee presented its definitive findings and offered a set of recommendations for how Medicare can improve
its use of geographic variations in setting payments. Based on its analyses, the committee concluded, among other things, that geographic variation in spending and utilization is real, with variations persisting across geographic units, health care services, and over time; that regional differences in price markups, rather than utilization of health care services, comprise a dominant source of variation in the commercial insurance market; and that variation in total Medicare spending across geographic areas is largely driven by variation in the utilization of post-acute care services and, to a lesser extent, acute care services.

The committee recommended that Congress should not adopt a geographically based value index for Medicare. Because most health care decisions are not made according to geographic unit, a geographic value index would be a poorly targeted mechanism for encouraging value improvement. Adjusting payments geographically, based on any aggregate or composite measure of spending or quality, would unfairly reward low-value providers in high-value regions and punish high-value providers in low-value regions.

To improve value, the committee recommended that the Centers for Medicare & Medicaid Services (CMS) continue to test payment reforms that incentivize the clinical and financial integration of health care delivery systems and thereby encourage coordination of care among individual providers, real-time sharing of data and tracking of service use and health outcomes, receipt and distribution of provider payments, and assumption of some or all risk in managing the care continuum for their populations. Further, CMS should pilot programs that allow beneficiaries to share in savings achieved through higher-value care.

During the transition to new payment models, CMS should conduct ongoing evaluations of the impact on value of the payment reforms it puts in place by measuring Medicare spending and beneficiaries’ clinical health outcomes. CMS should use the results of these evaluations to iteratively
improve payment models, and it should monitor how these reforms impact Medicare beneficiaries’ access to medical care.

To aid in continuing evaluations, the committee also recommended that Congress encourage and financially support CMS in providing access to Medicare and Medicaid data for research purposes. CMS should collaborate with private insurers to collect, integrate, and analyze standardized data on spending, as well as clinical and behavioral health outcomes, to enable more extensive comparisons of payments and quality and evaluation of value-based payment models across payers.

**Strengthening education and training**

**Geriatric mental health and substance use**

To operate at peak effectiveness, the health care system needs a strong workforce of well-educated and well-trained professionals. The aging of the U.S. population is placing a strain on this workforce. At least 5.6 to 8 million older adults—almost 1 in 5 people aged 65 or older—have one or more mental health and substance use (MH/SU) conditions. At the request of Congress, HHS asked the IOM to assess the geriatric MH/SU workforce, identify areas for improvement, and recommend a course of action.

In *The Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?* (2012), the IOM committee concluded that the magnitude of the problem is so great that no single approach or isolated change in federal agencies or programs can provide a sufficient remedy. Rather, the nation must undertake a major effort to significantly boost the number of health professionals and other service providers able to supply needed care as the population ages.

The committee found that depressive disorders and dementia-related behavioral and psychiatric symptoms are the most prevalent among older adults. Rates of accidental and intentional misuse of prescription medications are increasing, and although the rate of illicit drug use among older individuals is low, studies indicate that it will likely increase as baby boomers age. Older adults are also more likely to have physical limitations and functional impairments that can complicate
the detection and treatment of MH/SU problems. The committee noted that inattention to MH/SU conditions in older adults is associated with higher costs and poorer health outcomes. For example, older individuals with untreated depression are less likely to properly take medications for diabetes, high blood pressure, and heart disease, and they are more likely to require repeated costly hospital stays.

To confront this shortcoming, the committee recommended that schools that train health professionals, along with accrediting agencies and license providers, should ensure that all health professionals who see older patients (including primary care physicians, nurses, physicians’ assistants, and social workers) can recognize signs and symptoms of geriatric mental health conditions, neglect, and substance abuse and are able to provide at least basic care to these patients. In addition, Medicare and Medicaid should redesign their payment rules to guarantee coverage of counseling, care management, and other types of services crucial for treating MH/SU conditions so that clinicians are more willing to provide this care.

Government also should ensure adequate funding to meet these needs, the committee concluded. At HHS, funds for MH/SU services are dwindling, and in some cases have been eliminated. Congress should arrange for HHS to have sufficient funds for these programs, and HHS officials should ensure that department agencies prioritize the development of an adequate workforce. Congress can assist this effort by appropriating the funds to carry out ACA provisions that support loan forgiveness and scholarships for individuals who work with or are preparing to work with older adults with MH/SU problems.

**Occupational health nurses**

Occupational health nurses (OHNs) work in a variety of settings, including agriculture, construction, health care, manufacturing, mining, transportation, oil and gas extraction, and public safety. Workers in many of these settings require protective measures to safeguard them from a range of respiratory hazards, such as dust in construction sites and chemical sprays in agricultural sites. As key members of the occupational health and safety workforce, OHNs need adequate education and training in respiratory
Key Barriers and Issues Related to and Strengthening the Geriatric MH/SU Workforce

Defining the Geriatric MH/SU Workforce
- The geriatric MH/SU workforce is made up of many types of providers. Workforce roles are often poorly defined and overlapping.

Estimating Workforce Supply and Demand
- The standardized workforce data trended over time that are required to make accurate predictions of workforce supply and demand are not available.

Shortage of Geriatric MH/SU Providers
- The workforce prepared to care for geriatric MH/SU is inadequate in sheer numbers, with the growth of the population threatening to exacerbate this.

Recruiting Geriatric MH/SU Providers
- Across all health professions, relatively few opportunities for specialization in geriatric MH/SU exist. There is little support or mentorship available for those who do pursue specialization.
- Financial incentives are not in place to encourage geriatric MH/SU providers to enter and stay in this field.

Inadequate Preparation of the Geriatric MH/SU Workforce
- Professional training in geriatric MH/SU is inconsistent and not well documented because national standards and requirements in these areas are minimal and vague. MH/SU specialists have little required training in geriatrics; geriatric specialists have little required training in MH/SU; and most general providers do not have extensive requirements in either area.
Training the Geriatric MH/SU Workforce

- Many professions have made progress on geriatric MH/SU competency development and workforce development, though these efforts are often done in silos where their dissemination and impact are not easily measured.
- Innovations in geriatric MH/SU workforce development are often vulnerable to grant cuts, and many promising programs end without adequate documentation or evaluation to assist future development.

Strengthening the Role of Direct Care Workers (DCWs) in Geriatric MH/SU Care

- Complex factors, including poor working conditions, low wages, lack of training, and limited opportunities for advancement, deter the development of a stable DCW workforce.
- DCWs have the most contact with older adult patients, yet do not have adequate training in geriatrics or MH/SU, and virtually never receive training in both.

Empowering Older Adults and Their Families

- There is a growing emphasis on peer support and self-care, including for older adult populations.
- Family members play a major role as caregivers, but receive little support and training for caring for older adults with any medical conditions, including MH/SU conditions.

SOURCE: The Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?, pp. 8-9.
protection in order to ensure both their own safety and the safety of their coworkers.

At the request of the National Personal Protective Technology Laboratory (NPPTL) of the CDC’s National Institute for Occupational Safety and Health, the IOM examined current respiratory protection curricula in OHN programs. In *Occupational Health Nurses and Respiratory Protection: Improving Education and Training: Letter Report* (2011), the study committee concluded that current respiratory protection education for OHNs is highly variable. Different education programs devote different amounts of dedicated time and resources to the subject, and they use a variety of approaches in their instruction. Among its recommendations, the committee identified essential content that should be included in education and training programs for OHNs and the best approaches to teaching that content.

The NPPTL began its response to the recommendations by holding a webinar to disseminate the information to nursing schools and other organizations involved in education and training of OHNs. The NPPTL also established a stakeholder working group that included nursing professional associations to plan strategies for implementing the report’s recommendations, including the development of a nationwide survey to assess current occupational health nurse roles and responsibilities relevant to respiratory protection.

**Global health education and training**

During the past century, health professions and the settings in which health professionals work have undergone major change. There are many more types of health specialists; the demographics of societies and disease burdens have shifted; and technology is transforming health and educational systems. These changes are causing many stakeholders around the world to call for new health professional education models that better reflect the diseases and populations health professionals serve.

In 2010, an independent commission of academic leaders from around the world published a major report through the medical journal *Lancet* recommending comprehensive reform in the training of health
professionals. The Lancet Commission, as it came to be called, promoted the formation of national forums to allow educational, professional, and government leaders to share information and gain perspectives on instructional and institutional reforms. This recommendation led to the formation of the IOM’s Global Forum on Innovation in Health Professional Education. The forum also drew insight from the landmark IOM report *The Future of Nursing*, released in 2010.

The forum brings together stakeholders from a variety of sectors to engage in dialogue about contemporary challenges in health professional education. Further, it provides a mechanism to cultivate new ideas through four Innovation Collaboratives—located in Canada, India, South Africa, and Uganda—that represent formal partnerships between university-based health institutions working to adopt the ideas proposed by the Lancet Commission and *The Future of Nursing*.

The forum’s first two workshops, held in 2012, focused on linkages between interprofessional education (IPE) and collaborative practice. Discussions from both workshops were combined and reported in *Interprofessional Education for Collaboration: Learning How to Improve Health from Interprofessional Models Across the Continuum of Education to Practice: Workshop Summary* (2013). Participants explored, among other things, what IPE is and the value it adds to health care and societies more broadly; the challenges of initiating IPE activities; how educators measure the impact of IPE activities and the potential of newly emerging measurement tools; and how IPE fits into the larger educational and health system continuum.

**Advancing the contribution of genomics**

The field of genomics is playing an increasingly important role in the advancement of medical science. Put simply, genomics is the study of genomes, the interactions of genes with each other and with the environment, and the functional relationship of genes to disease. Translating genomic innovations into practice involves many disciplines and occurs in different economic, social, and cultural contexts—necessitating increased communication and understanding across fields. Furthermore, genomic
innovations raise questions about economic implications, equal access, and public perspectives.

The IOM’s Roundtable on Translating Genomic-Based Research for Health brings together leaders from academia, industry, government, foundations, and associations who have a mutual interest in this field. The roundtable’s mission is to advance the field of genomics and improve the translation of research findings to health care, education, and policy. One way the roundtable approaches its mission is to hold workshops focused on particular topics of interest or concern.

Technology for sequencing genes has evolved at such a rapid pace in the past decade that what initially took years to accomplish can now be done in a matter of days. As the technologies become more accessible and decline in cost, genomics is being incorporated into clinical practice. Already, genetic and genomic tests are used to assess the risk of breast and ovarian cancer, diagnose diseases such as cystic fibrosis, and identify the best treatment options for various cancers—and it is expected that the number of health care applications for genomics will only continue to grow. At a roundtable workshop described in Integrating Large-Scale Genomic Information into Clinical Practice: Workshop Summary (2012), participants explored how genomics data can best be integrated into the clinical setting in order to maximize patient benefit.

Although the development of genome-based diagnostic tests is providing increasingly personalized treatment options, evidence of improved outcomes is lacking for many tests, leading to limited adoption. A roundtable workshop held in 2010 examined current approaches for generating evidence and how evidence is viewed by different stakeholders. In a follow-up roundtable workshop, described in Genome-Based Diagnostics: Clarifying Pathways to Clinical Use: Workshop Summary (2012), participants further discussed differences in evidence required for clinical use, regulatory oversight, guideline inclusion, coverage, and reimbursement of genomic diagnostic tests.

The translation of genomic discoveries into clinical use also has economic implications. Although the identification of links between specific genetic variants and diseases has tremendous promise for personalized
medical treatment, stakeholders disagree on whether the current understanding of genomic information is ready for clinical use. Some are concerned that genomic technologies will add costs to the health care system without providing commensurate benefits, while others maintain that health care costs could be reduced by identifying unnecessary or ineffective treatments. Economic models are frequently used to anticipate costs and benefits of new health care technologies, policies, and regulations. However, health economic assessments are often limited by a lack of data on which to base the examination. The roundtable held a workshop to explore ways to better understand the health economic hurdles that may arise in the course of integrating genomic data into health care. Workshop discussions are captured in The Economics of Genomic Medicine: Workshop Summary (2013).

**Improving delivery of health care**

**Health literacy**
For the health care system to best meet public needs, health care organizations and professionals must be able to communicate effectively with the people they serve. However, approximately 80 million adults in the United States have low health literacy, or a limited ability to obtain, process, and understand basic health information. Low health literacy creates difficulties in communicating with clinicians, poses barriers in managing chronic illness, lessens the likelihood of receiving preventive care, heightens the possibility of experiencing serious medication errors, increases the risk of hospitalization, and results in poorer quality of life. It is therefore important for health care organizations to develop strategies that can improve their health literacy, yet organizations often find it difficult to determine exactly what it means to be health literate. Improving health literacy is critical to transforming health care quality. Goals for safe, patient-centered, and equitable care cannot be achieved if consumers cannot access services or make informed health care decisions.

The IOM’s Roundtable on Health Literacy commissioned a paper that defined a health literate organization as one “that makes it easier for people to navigate, understand, and use information and services to take care of their
health.” The roundtable then held a workshop, described in *How Can Health Care Organizations Become More Health Literate?: Workshop Summary (2012)*, that used the paper as a starting point for discussing the growing recognition that health literacy depends not only on individual skills and abilities but also on the complexities of the health care system. Providers from different health care settings—including a health care executive working in a public hospital system, the director of a public clinic, a physician in private practice, a pharmacist in a pharmacy chain, a dentist in private practice, and a nurse from a visiting nurses association—offered their observations on the commissioned paper and on health literacy in general.

**Cancer care**

The costs of cancer treatment, estimated to be $125 billion in 2010, are expected to increase in the coming decades due to a rapid influx of new cancer diagnoses as the population ages. In addition, as more expensive
therapies and technologies become the standard of care, there are concerns that the costs of cancer treatment could begin to outpace health care inflation as a whole. The IOM’s National Cancer Policy Forum convened a workshop to examine the current and projected drivers of cancer care costs, as well as potential ways to curb these costs while maintaining or improving the quality of care. The workshop discussions are captured in *Delivering Affordable Cancer Care in the 21st Century: Workshop Summary* (2013).

**Health care in disaster scenarios**
Health care systems, as part of the critical infrastructure of any community, are subject to disasters, whether natural or caused by humans. Many elements required for post-disaster recovery—such as information sharing, identifying and leveraging existing capabilities of medical providers, and developing trusted relationships—are also fundamental to the day-to-day operations of these systems. Investing in improved health care delivery systems can enhance economic development and growth before a disaster, and also prove instrumental in sustaining services and recovery after a disaster.

Investing in improved health care delivery systems can enhance economic development and growth before a disaster, and also prove instrumental in sustaining services and recovery after a disaster.

The IOM’s Forum on Medical and Public Health Preparedness for Catastrophic Events sponsored a town hall session at the 2012 Public Health Preparedness Summit held in Anaheim, California, to explore ways that health care systems can prepare for and recover from a disaster. As described in *Post-Incident Recovery Considerations for the Health Care Service Delivery Infrastructure: Workshop Summary* (2012), participants examined ways to sustain health care delivery beyond the initial response to a disaster and to facilitate the long-term recovery of affected local health care delivery systems. Although participants acknowledged that local community services will be both the first responders and the drivers of long-term recovery, they outlined important supportive roles for the federal government, the private sector, nongovernmental organizations, and state officials.
To be healthy and active, people need a diet that is adequate to meet energy and nutrient needs and safe from harmful agents. But for many people in the United States, a healthy diet is elusive. Some people consume more than they need, contributing to the growing obesity epidemic. Some face food shortages, often for economic reasons, that interfere with physical, mental, and social development. Many people consume nutrients, such as sodium, at levels higher than recommended, or eat foods contaminated by disease-causing microorganisms. And yet others experience some combination of these challenges simultaneously. Beyond human health risks, some food items are produced or processed in ways that may harm the environment.

Continuing a long tradition, the Institute of Medicine (IOM), through the work of its Food and Nutrition Board, regularly examines the diverse challenges related to food and nutrition, often at the request of the federal government or private organizations, and sometimes independently in response to a particular recognized need.

**Fighting obesity: A major goal**

Two-thirds of adults and almost one-third of children in the United States are overweight or obese—a public health problem that affects young and old, urban and rural, and all ethnic and racial groups. This epidemic of excess weight is associated with major causes of chronic disease, disability, and death.
In acknowledgment of the urgency of the obesity epidemic and to identify actions that can spur progress in the effort to combat it, the IOM convened the Committee on Accelerating Progress in Obesity Prevention. Sponsored by the Robert Wood Johnson Foundation (RWJF) (and with additional funding from the Michael & Susan Dell Foundation), the committee met for the first time in September 2010 with a charge to review the IOM’s past obesity-related recommendations, identify a set of critical recommendations for future action and acceleration of progress, and recommend indicators of progress in implementing these actions. In March 2011, the committee held a workshop described in Measuring Progress in Obesity Prevention: Workshop Summary (2012) to explore and understand the ways in which measurement techniques, strategies, and data sources can impede or promote acceleration of progress toward prevention of obesity; and to understand what additional knowledge regarding assessments of environments and policies is needed to support measurement efforts. In its consensus report, Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation (2012), the committee concluded that solving this complex, stubborn problem will require a comprehensive set of solutions that work together to spur across-the-board societal change. As a blueprint for action, the report identifies five critical steps:

1. integrating physical activity into people's daily lives,
2. making healthful food and beverage options available everywhere,
3. transforming marketing and messages about nutrition and activity,
4. making schools a gateway to maintaining healthy weight, and
5. galvanizing employers and health care professionals to support healthy lifestyles.

Within each area, the report proposes specific strategies and actions that public and private stakeholders can employ to support individuals’ and families’ abilities to make healthful choices where they work, learn, eat, and play.

According to the report, government action at all levels should include adopting fiscal policies that increase access to healthful foods
and activity—for example, providing flexible financing or tax credits that could encourage developers to build sidewalks near housing complexes to promote physical activity or locating supermarkets in communities that lack them to expand residents’ choices of healthful foods. Congress, the White House, and federal policy makers (along with private foundations) should also develop and implement a sustained national social marketing campaign on physical activity and nutrition. Carefully targeted, culturally appropriate messages should be aimed at key audiences with clear action items that will help people achieve and maintain a healthy weight.

Based on the committee’s efforts, the IOM produced an infographic that conveys the key findings and recommendations of the report. The infographic is available to download for free at www.iom.edu/obesitygraphic and may also be purchased as a poster—more than 8,000 orders have been received. Additionally, the IOM produced a series of documents collectively called “Take Action: What Can You Do to Combat Obesity?” Written in clear, precise language, the two-page documents cover making healthy foods and beverages available everywhere, activating health care partners and employers, marketing what matters for a healthy life, integrating physical activity every day in every way, and strengthening schools as the heart of health.

**Government action at all levels should include adopting fiscal policies that increase access to healthful foods and activity.**

![Infographic](Image)  
Snapshot from infographic for *Accelerating Progress in Obesity Prevention.*
Upon release of the IOM report, a number of public and private groups responded positively and initiated their own actions. For example, The California Endowment supported the translation of the infographic into Spanish. Working with *La Opinion*, a major Spanish-language newspaper, the foundation used the infographic and other materials in a campaign called *La Salud Empieza Aqui* (Health Happens Here) to reach the region’s Hispanic communities, which have been hit especially hard by the obesity epidemic.

In Hawaii, the State Department of Health and the University of Hawaii issued a joint statement in support of the report. The department’s director, Loretta Fuddy, said that it “will be an invaluable resource for our Childhood Obesity Prevention Task Force as we assemble members and determine ways to reverse troubling obesity trends in Hawaii.” The department later convened a symposium to review the report and consider how its recommendations might be implemented.

The IOM released the report in conjunction with The Weight of the Nation campaign, launched in early 2012 as a collaborative effort of the IOM, HBO Documentary Films, the Centers for Disease Control and Prevention (CDC), and the National Institutes of Health, in partnership with the Michael & Susan Dell Foundation and Kaiser Permanente. The multifaceted campaign is aimed at spurring individuals and groups to get involved in local efforts to promote healthy eating and physical activity.

As a centerpiece of the campaign, HBO developed a four-part series of documentaries called The Weight of the Nation. First aired in 2012, the films shed new light on the facts and myths of this public health epidemic and explore how obesity is affecting the nation and the health care system. HBO also developed and aired a three-part series of films in 2013 focused specifically on preventing childhood obesity, called The Weight of the Nation for Kids. Both series can be viewed online at [www.iom.edu/weightofthenation](http://www.iom.edu/weightofthenation).

The Weight of the Nation campaign also makes the films available in a DVD set that includes 10 extra short films that highlight diseases and conditions directly linked to obesity. The DVD set comes with a companion
booklet that provides additional information about obesity and describes actions researchers, laypeople, and communities have taken to overcome the problem. Still ongoing, the campaign supports extensive outreach efforts that capitalize on social media and other community-based communications strategies to provide people with tools for overcoming or preventing obesity.

**Promoting consumer education**

To reach or maintain a healthy weight, people need accurate information about the foods and beverages they consume. The federal government requires that most packaged foods carry a standardized label, called the Nutrition Facts Panel, that provides nutrition information. In recent years, manufacturers have moved increasingly toward including additional nutrition messages on food packages. These messages are commonly referred to as “front-of-package” labeling. This proliferation of labeling has contributed to consumer confusion about critical nutrition information.

In response, Congress directed the CDC to support an IOM study aimed at determining how front-of-package labeling should be used as a tool to guide consumers to make healthier food choices. The Food and Drug Administration (FDA) and the Department of Agriculture’s (USDA’s) Center for Nutrition Policy and Promotion also provided support for the study, which was conducted in two phases. The study committee first reviewed current labeling systems and examined the strength and limitations of the nutrition criteria that underlie them. In *Examination of Front-of-Package Nutrition Rating Systems and Symbols: Phase I Report* (2010), the committee concluded that labels should focus on calories, saturated fats, *trans* fats, and sodium, because these nutrients are most strongly associated with risk of chronic disease. In addition, the labels should display calorie information and serving sizes in familiar household measures, such as “per slice” or “per cup.”

In the second phase of the study, the committee took a more comprehensive look at consumer use and understanding of labeling systems. In *Front-of-Package Nutrition Rating Systems and Symbols: Promoting Healthier Choices* (2011), the committee concluded that current labels,
which provide nutrition information but do not give clear guidance about their healthfulness, should be replaced with one label used consistently across all products that conveys nutrition information more clearly—through design simplicity, graphical clarity, and visual, rather than written, communication. The committee recommended that the FDA develop, test, and implement a single, standard front-of-package system that uses symbols to visually communicate critical information.

According to the IOM report, a standardized label should use a “points” system to assess whether the amounts of target nutrients—saturated and trans fats, sodium, and added sugars—are at or below acceptable levels. Healthier foods and beverages would have more points than less healthy options. Products that meet the established criteria would display a symbol, for example, check marks, stars, or some other visual indicator. Labels
for all products would prominently display the amount of calories per serving, as described in familiar measurements. The symbol system would also be linked to the standard Nutrition Facts Panel located on the back of the package for additional nutrient information.

**Sodium reexamined**

Sodium levels are widely regarded as a key dietary concern because of the association between high sodium intake and elevated blood pressure, which can lead to cardiovascular disease and stroke. Despite extensive public health efforts to encourage people to consume less sodium, adults in the United States still get an average of 3,400 mg per day. Current federal guidelines suggest that people ages 14 to 50 should limit their sodium intake to 2,300 mg daily—or just under 1 teaspoon of salt, the major source of dietary sodium—and that people ages 51 or older, African Americans, and those with hypertension, diabetes, or chronic kidney disease should adhere to an even stricter limit of 1,500 mg or less per day.

Despite extensive public health efforts to encourage people to consume less sodium, adults in the United States still get an average of 3,400 mg per day.

The current guidelines are based largely on studies that have linked higher sodium intakes to high blood pressure, which is an established risk factor for cardiovascular disease, particularly stroke. But some recent studies that examined links between sodium consumption and these as well as other health outcomes directly, that is, not mediated through blood pressure, suggest that very low sodium intakes may increase health risks in certain groups, specifically those who already have heart failure.

The CDC asked the IOM to examine the designs, methodologies, and conclusions in this latest body of research; to assess the implications for population-based strategies to gradually reduce sodium intake; and to identify gaps in data and research and suggest ways to close them. In *Sodium Intake in Populations: Assessment of Evidence* (2013), the study committee concluded that the research supports recommendations to lower sodium
intake from the current levels some Americans consume, but does not find—in contrast to the evidence on blood pressure—that evidence from the studies on direct health outcomes supports reduction in sodium intake to below 2,300 mg per day.

Despite a number of methodological and other limitations, the committee found that the recent studies provide some evidence that low sodium intake (in the range of approximately 1,500 to 2,300 mg daily) may be of benefit to those with pre-hypertension, but among people with pre-existing diseases, such as heart disease, chronic kidney disease, or diabetes, there is no evidence of benefit and some evidence suggesting possible adverse health effects within this intake range. The committee also noted that the studies did not directly examine health effects in African Americans or in people ages 51 or older. Thus, the collective evidence from the new studies on direct health outcomes does not support a recommendation to lower sodium intake to or below 1,500 mg daily in these subgroups. The committee called for more research focused on understanding effects of sodium intake, particularly at levels below 2,300 mg per day, in the general population and among subgroups of special concern.

Assessing a nutrition assistance program

Many people in the United States face challenges in accessing adequate supplies of healthful foods. The Supplemental Nutrition Assistance Program (SNAP), administered by the USDA, is the nation’s largest nutrition assistance program, serving more than 46 million low-income people at a cost of more than $75 billion.

To help evaluate the program, the USDA asked the IOM and the National Research Council (NRC) to consider whether it is feasible to objectively determine the adequacy of SNAP allotments for meeting the program’s goals of improving participants’ food security and their access to a healthful diet—and, if so, to outline how this could be done. In Supplemental Nutrition Assistance Program: Examining the Evidence to Define Benefit Adequacy (2013), the study committee concluded
that it is possible to determine the adequacy of the SNAP allotments provided to participants, and it proposed a framework that the USDA can use for evaluation.

The committee recommended that the USDA take into consideration a number of individual, household, and environmental factors that play a role in determining the adequacy of the allotments. Three factors may be most important. The first relates to SNAP's assumption that participants have sufficient time to produce healthy meals from scratch, which is out of sync with the practices of most households today. The second is that food prices vary greatly across the country and between urban and rural areas, which means that some SNAP participants may have less purchasing power with their allotment. The third is that low-income households, particularly in rural areas, can face limitations in getting to supermarkets or other food stores that offer a variety of healthful foods at reasonable cost. Given these factors, as well as certain characteristics of the SNAP program, it may well be that the current SNAP allotment falls short of enabling some participants to attain food security and access to a healthy diet.

The committee also recommended that the USDA investigate aspects of the SNAP program that impact the ability to define an adequate allotment. For example, the USDA should examine whether including the ability to purchase partially or fully prepared foods in the allotment would offset the need to devote a disproportionate amount of time turning basic ingredients into healthful meals. The USDA also should evaluate the portion of household income that SNAP participants are expected to devote to food purchases to more closely align with actual current household expenditures. In addition, the USDA should investigate the potential of nutrition education opportunities to increase participants’ resource management skills, enabling them to better use their SNAP benefits to make healthy food choices.

To aid in communicating the report’s messages after its release, the committee and IOM staff developed an infographic to illustrate the factors that influence food security and access to a healthy diet and how they are modified by the SNAP program. The infographic is available for download at http://www.iom.edu/SNAPadequacy.
Costs across a broader front

The U.S. food system has influences that extend far beyond the dinner table, including significant environmental and public health costs. These include greenhouse gas emissions, soil erosion, air pollution, the transfer of antibiotic resistance from food animals to humans, and risks from diet-related chronic disease, among others. Although some of these costs are reflected in the market price of food, many others are incurred by society at large.

A better understanding of the costs—as well as the benefits—of the food system would help decision makers, researchers, and practitioners make informed business and management decisions.
in Exploring Health and Environmental Costs of Food: Workshop Summary (2012). A major aim of the workshop was to identify information sources and methodologies to estimate the environmental and public health consequences associated with the food system. The workshop discussions helped lay the groundwork for a follow-up consensus study that will develop a framework for assessing the health, environmental, and social effects of the food system.

Food Forum: Confronting complexities

The IOM’s Food Forum convenes scientists, administrators, policy makers, and representatives from academia, government, industry, and the private sector on an ongoing basis to discuss topics related to food, food safety, and food regulation. The forum provides an arena to identify areas of concordance, compile information in useful formats, and develop possible solutions and innovations for diverse interest groups to consider.

For example, the forum held a workshop focused on how to build multisectoral food and nutrition partnerships that can achieve meaningful public health results. Many challenges in public health, such as combating rising obesity rates, are complex and cannot be solved effectively by any one sector in isolation. Instead, solutions will require collaborative actions from many sectors, including industry, government, academia, and nongovernmental organizations. At the workshop, as reported in Building Public–Private Partnerships in Food and Nutrition: Workshop Summary (2012), participants examined the benefits and risks of pursuing cross-sector partnerships; key features of successful partnerships; ways to foster communication among sectors; areas that would be most promising for partnerships; and what needs to be done to facilitate partnership development.

Another area in which multisectoral collaboration may prove valuable is the interplay between microbes and humans. The human gut plays a complex and vital role in health. The gastrointestinal tract harbors a vast and still largely unexplored microbial world—called the microbiome—that influences metabolic pathways and thereby affects the physiology and health of the human host. The forum held a workshop to explore the
microbiome, as described in *The Human Microbiome, Diet, and Health: Workshop Summary* (2012). Participants discussed a variety of topics befitting the complexity of this living realm and its full complement of bacteria, viruses, fungi, and protozoa, including current and emerging knowledge about the microbiome; microbes’ role in human health and disease; the way microbes respond to the host’s dietary intake; and what research avenues might be pursued to further understand the microbiome. Participants also examined how research findings might be better translated into tools and products that can improve the healthfulness of the food supply.
In almost every community in the United States, children and teens are struggling to maintain a healthy weight. Almost one-third are overweight, according to 2012 estimates, and nearly 18 percent are obese, up from just 5 percent three decades ago. This rise in obesity represents a major public health challenge. Being obese or overweight can trigger a range of health problems for youth—such as type 2 diabetes, once considered an adult disease—and set the stage for problems to emerge later in life.

From infancy through the teen years, youth face a variety of other health challenges as well, many of them unique. For decades, government and private organizations have called on the Institute of Medicine (IOM) to focus on health problems facing this population. Increasingly, the IOM is also working in collaboration with outside organizations to put lessons learned directly into practice to help keep children and teens—the nation’s future—healthy.

**Fighting obesity at school**

One factor helping to drive childhood obesity is the spread of sedentary behaviors. The school environment, where youth spend a large portion of their time, offers a good opportunity to promote physical activity. The IOM, at the request of the Robert Wood Johnson Foundation (RWJF), which has made a major commitment to reversing childhood obesity, examined the state of physical activity in schools and explored what can be done to help get students moving.
In its report, *Educating the Student Body: Taking Physical Activity and Physical Education to School* (2013), the IOM committee concluded that extensive scientific evidence links moderate or vigorous physical activity to a variety of desirable health outcomes, including lower fat levels and greater muscular strength. Most of the evidence comes from studies in adults, but the case is also strong for children. Beyond benefiting physically, active children show increased attention, have faster cognitive processing speed, and do better on standardized tests—traits that may improve their academic performance.

Schools have traditionally used physical education as a key way to promote physical activity, and there is sound evidence that it works. But many schools face a range of challenges—financial shortfalls, safety concerns, and policy pressures—when it comes to providing physical education classes or other opportunities for students to be active. Thus, a “whole-of-school” approach is needed. The promotion of physical activity should involve all stakeholders, including school staff and parents, and should marshal the fullest possible range

```
Minutes per Day of vigorous- or moderate-intensity physical activity gained by implementing school-based policies.

SOURCE: *Educating the Student Body: Taking Physical Activity and Physical Education to School*, p. 58.
```
of resources, from gyms and playgrounds within schools to sidewalks and pathways in surrounding communities.

The IOM committee recommended that schools provide at least 60 minutes per day of vigorous or moderate physical activity, more than half of which should be accomplished during regular school hours (including time before and after classes), and the rest in the greater school environment. These 60 minutes can include high-quality physical education classes, recess, and dedicated classroom activities. Before- and after-school programs, intra- and extramural sports, and active transportation to and from school can provide opportunities outside regular school hours.

As a follow-up to the report, the IOM created a short, animated video that illustrates key messages about physical activity to a broad audience, including students, educators, and parents. The video is available online at http://www.studentbodyvideo.

**Measuring fitness and health**

Physical fitness provides numerous benefits for youth beyond helping them maintain a healthy weight, including improved cardiovascular and metabolic health. The clear value of physical fitness has prompted a number of large-scale efforts over the past half-century to measure the fitness of the nation’s youth. Yet, fundamental questions have remained about the best measures of fitness and how to relate those measures to actual health outcomes. In response to such questions, the IOM, in a study supported by RWJF, offered guidance on how to interpret fitness scores and provided an agenda for research to fill remaining knowledge gaps.

In its report, *Fitness Measures and Health Outcomes in Youth* (2012), the IOM committee concluded that there is adequate evidence to support the use of three general types of fitness measures in children 5 to 18 years old. These measures comprise body composition (e.g., body mass index, skinfold thickness, and waist circumference); measures of cardiorespiratory endurance (e.g., performance on shuttle runs or treadmill tests); and measures of musculoskeletal fitness (e.g., handgrip
strength or performance in the standing long jump). The committee found that other types of measures, including flexibility tests, were not convincingly supported by the evidence, and called for further studies.

The IOM report concluded that national surveys can use the three proven measures to assess youth fitness with confidence. Schools, where many testing programs take place, may find them valuable as well. Along with providing a gauge of fitness, the measures may be useful as tools for teaching students and their families about the importance of physical fitness and helping them identify appropriate fitness and health goals. School leaders and teachers can tailor the measurement tools to their own settings, weighing variables such as physical space, the availability of equipment and test

### Appropriate and Inappropriate Practices Related to Fitness Testing in Schools and Other Educational Settings

<table>
<thead>
<tr>
<th>Appropriate Practice</th>
<th>Inappropriate Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>In elementary school, motor skills are the focus of instruction, with health-related fitness components being integrated into the curriculum and lessons focused on fitness education.</td>
<td>Health-related fitness is rarely integrated into instruction. Students fail to understand the benefits of health-related fitness and know little about how to develop a fitness plan.</td>
</tr>
<tr>
<td>Fitness testing is used to set individual goals as part of fitness education. At the secondary level, students use fitness test data to design and apply a personal fitness plan.</td>
<td>Fitness testing is conducted without meaningful understanding, interpretation, and application.</td>
</tr>
<tr>
<td>Physical educators use fitness assessment as part of the ongoing process of helping students understand, enjoy, improve, and maintain their physical fitness and well-being (e.g., students set fitness goals for improvement that are revisited during the school year).</td>
<td>Physical educators use fitness test results to assign a grade.</td>
</tr>
<tr>
<td>Children are physically prepared to participate in fitness testing.</td>
<td>Children are required to participate in fitness testing without proper preparation.</td>
</tr>
</tbody>
</table>

SOURCE: *Fitness Measures and Health Outcomes in Youth*, p. 224.
monitors, and overall costs. In communicating results to students and their families, school personnel should take into consideration confidentiality, self-esteem, and other sensitivities that often surround physical fitness testing.

**Fostering healthful eating**

The amounts and types of food that youth consume also contribute significantly to body weight. Past IOM reports and other studies have demonstrated that the way food and beverages are advertised and marketed influences children’s consumption, and is therefore an important area of focus.

With support from RWJF, the IOM convened a workshop in 2013 to examine contemporary trends in marketing and explore potential avenues of action, as well as to review progress made in achieving the recommendations of the IOM’s 2005 report *Food Marketing to Children and Youth: Threat or Opportunity?* The workshop, described in *Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary* (2013), explored public campaigns that take advantage of social media and other communication vehicles to mobilize policy makers as well as parents in improving food consumption patterns among youth.

Providing young people with better information about nutrition may be another route to helping them maintain a healthy weight, and there is growing interest in using schools as leverage points for such education. The IOM Board on Food and Nutrition held a workshop sponsored by the Department of Agriculture’s Food and Nutrition Service to explore the use of national nutrition education curriculum standards and learning objectives for elementary and secondary school children. Workshop discussions, recapped in *National Nutrition Education Curriculum Standards: Workshop Summary* (2013), highlighted current and promising practices, examined desirable attributes for standards, identified challenges to developing and implementing standards, and explored ways to build acceptance and use of standards among educators.
Putting ideas into action

Given the increasing toll of childhood obesity and the importance of promoting fitness, the IOM has complemented its studies and workshops by joining with other groups in projects that reach into everyday life.

The Weight of the Nation for Kids

As part of its effort to reach new and broader audiences, the IOM collaborated with HBO to develop The Weight of the Nation for Kids, a series of three short films that aired in May 2013. The series showcases what youth can do at home and in their communities to improve their diets (including improving their schools’ menus) and become more active on a regular basis. Two of the short films, The Weight of the Nation for Kids: The Great Cafeteria Takeover and The Weight of the Nation for Kids: Quiz Ed!, were nominated for Emmy awards in the category of Outstanding Children's Nonfiction, Reality, or Reality-Competition Program. The series is part of The Weight of the Nation campaign, which the IOM and HBO developed in association with the Centers for Disease Control and Prevention (CDC) and the National Institutes of Health, and in partnership with the Michael & Susan Dell Foundation and Kaiser Permanente.

Victor’s Garden

As part of The Weight of the Nation campaign, the IOM also worked with Scholastic, the world’s largest publisher of children’s literature, to create Victor’s Garden, a children’s book available for free in both English and Spanish at www.iom.edu/scholastic. With its lively style and rich illustrations, the book helps elementary school students and their parents better understand topics related to food and physical activity and equips them to make healthful decisions.

The IOM sends copies of Victor’s Garden to schools and extracurricular organizations, along with a leader’s guide called “Inspiring Action” that adults can use to encourage discussions and help children “lead the charge for a healthy community.” The American Heart
Association has agreed to provide *Victor’s Garden* and its companion mate-\-rials to all of its Teaching Garden Schools, and the IOM continues to seek other partnerships that will expand distribution of the book and its messages to children, families, and communities.

**The Smart Bites program**

In another project aimed at promoting healthy behaviors in youth, the IOM has developed and recruited partner communities to implement Smart Bites™, a program aimed at getting youth to make healthier food choices when eating in restaurants.

In 2008, the IOM supported a pilot launch of the Smart Bites program in Bowling Green, Kentucky. The brainchild of a local student, Smart Bites was designed to give youth clear and accurate information about the foods served in local restaurants. The Smart Bites program won broad support from the Bowling Green community, including key businesses and the youth participants themselves. Based on this early success, Smart Bites leaders developed a toolkit for other communities to use in developing their own programs.

The IOM, supported by the Kellogg Health of the Public Fund, launched the Smart Bites program nationwide for the 2013-2014 school year.
Three communities have signed on: the Eastern Shore of Virginia; Genesee County, Michigan; and San Diego, California. These communities will receive grants from the IOM to implement the program in their communities, along with technical and programmatic guidance. The IOM created a
national Smart Bites website, www.choosesmartbites.org, with personalized pages for each community to describe its program goals and list participating restaurants. Later, the IOM will formally evaluate each program to measure its success and help guide future efforts.

**Protecting children from maltreatment**

When it comes to ensuring children’s health and well-being, few matters are as compelling as protecting them from abuse, neglect, and other harms. In 1993, the National Research Council (NRC) released a report, *Understanding Child Abuse and Neglect*, that focused national attention on this problem and spurred a new wave of research. To gauge progress since then, the IOM and the NRC’s Board on Children, Youth, and Families (BCYF), with support from the Department of Health and Human Services (HHS) Administration for Children and Families, held a workshop in 2012 to examine past and current research in this area and explore continuing needs. *Child Maltreatment Research, Policy, and Practice for the Next Decade: Workshop Summary* (2012) presents the key themes of the workshop, including the causes and consequences of child maltreatment, with particular emphasis on the neurobiological effects of abuse and neglect; the findings of research on methods to prevent maltreatment and the impact of those findings on policy and practice; the design and delivery of prevention and treatment services; and the impact of system-level issues (in the United States and elsewhere) on efforts to respond to child maltreatment.

HHS also asked the IOM and the NRC to conduct a more comprehensive assessment to update the landmark 1993 report. In *New Directions in Child Abuse and Neglect Research* (2013), the IOM/NRC study committee concluded that the past 20 years have seen an explosion in research, which has allowed for a better—though still incomplete—understanding of the consequences of child abuse and neglect for the children involved, their families, and society. At the same time, government at all levels, as well as a variety of private organizations, has been devoting increased attention to policy and program initiatives that prevent
abuse and neglect and help children who have suffered such experiences. Researchers have conducted rigorous evaluations of these prevention and treatment interventions and identified multiple effective policies and programs.

Despite these gains, the IOM/NRC committee concluded that child abuse and neglect remain a serious public health problem. In its report, the committee called for the federal government to immediately implement a coordinated research response informed by the complex environments and systems in which child abuse and neglect occur. To guide this effort, the committee offered a detailed set of recommendations covering four main areas: (1) developing a national strategic research plan that focuses on priority topics identified in the report and spells out implementation and accountability steps across federal agencies; (2) creating a national surveillance system to better track the incidence, prevalence, and contextual factors of child abuse and neglect; (3) training more researchers to probe the many open questions related to child abuse and neglect in a multidisciplinary fashion; and (4) creating mechanisms to foster research that will provide an evidence base for policies intended to reduce the individual and national toll of child abuse and neglect.

Commercial sexual exploitation and sex trafficking of minors are especially abhorrent forms of child abuse. Although these crimes have received increasing attention in recent years, much of this attention has had an international focus, which has overshadowed the reality that commercial sexual exploitation and sex trafficking of minors also occur every day within the United States. At the request of the Department of Justice, the BCYF commenced a study to examine this topic. In *Confronting Commercial Sexual Exploitation and Sex Trafficking of Minors in the United States* (2013), the study committee found that commercial sexual exploitation and sex trafficking of minors in the United States are serious
problems with immediate and long-term adverse consequences for children and adolescents, as well as for families, communities, and society as a whole. While efforts to prevent these crimes are essential, they are largely absent. These crimes may be overlooked and underreported because they often occur behind closed doors and involve children and adolescents at the margins of society—such as those who have been neglected or abused; those who live in foster care or juvenile detention; or those who are homeless, runaways, or forced to leave home. As a result, there is no reliable estimate of the prevalence of commercial sexual exploitation and sex trafficking of minors nationwide and many victims go without help. In the committee’s view, a nation that is unaware of these problems and disengaged from solutions unwittingly contributes to the ongoing abuse of minors.

The study committee found that many professionals and individuals who interact with youth—such as teachers, health care providers, child welfare professionals, and law enforcement—are unaware that these crimes occur and often are ill-equipped with how to respond to victims, survivors, and those at risk. Further, the committee concluded that no one sector, discipline, or area of practice can fully understand or respond effec-

Risk factors for commercial sexual exploitation and sex trafficking of minors.

SOURCE: Confronting Commercial Sexual Exploitation and Sex Trafficking of Minors in the United States, p. 79.
tively to the complex problems surrounding commercial sexual exploitation and sex trafficking of minors. Therefore, participation from and cooperation among numerous individuals and entities—including victim and support service providers, health and mental health care providers, legislators, law enforcement personnel, prosecutors, public defenders, educators, and the commercial sector—is required.

To offer a way forward, the committee proposed a series of recommendations designed to (1) increase awareness and understanding of the problems; (2) strengthen the law’s response to these crimes; (3) support the development, evaluation, and dissemination of prevention and intervention strategies; (4) support multisector and interagency collaboration; and (5) strengthen information sharing. Implementing these recommendations will require diverse actions at numerous levels by a range of individuals and governmental and nongovernmental entities—a tall order, but one that the committee deemed necessary if the nation is to effectively identify, prevent, and respond to the commercial sexual exploitation and sex trafficking of minors.

**Assessing childhood immunizations**

Childhood immunizations, like the obesity epidemic, have regularly made headlines in recent years. Some families are concerned about the safety of vaccines and choose not to have their children vaccinated, giving rise to fears about the reemergence of diseases thought to have been eradicated in the United States, such as measles.

Numerous studies have shown childhood vaccines to be remarkably effective and safe, although, like all medical interventions, they carry some risk. Health care providers who vaccinate children follow a schedule prepared by the U.S. Advisory Committee on Immunization Practices. Some parents, however, have questioned the immunization schedule,
driven largely by worries about the potential side effects of the vaccines, the number of vaccines administered at the same time, and the concentration of immunizations over a relatively short period of time.

In response to such concerns, HHS asked the IOM to examine the performance and safety of the entire childhood immunization schedule—making it the first study ever to cast such a broad net. The IOM committee reviewed the scientific literature and collected input from a diverse group of stakeholders across government, academia, the private sector, and the public, including parents and advocacy groups.

In its report, *The Childhood Immunization Schedule and Safety: Stakeholder Concerns, Scientific Evidence, and Future Studies* (2013), the committee found no evidence that the schedule is unsafe. Nor did it find evidence suggesting that the schedule is linked to any of the health problems about

---

**Leading Research Questions of Interest to Select Stakeholders**

1. How do child health outcomes compare between those who receive no vaccinations and those who receive the full currently recommended immunization schedule?

2. How do child health outcomes compare between (a) those who receive the full currently recommended immunization schedule and (b) those who omit specific vaccines?

3. For children who receive the currently recommended immunization schedule, do short- or long-term health outcomes differ for those who receive fewer immunizations per visit (e.g., when immunizations are spread out over multiple occasions), or for those who receive their immunizations at later ages but still within the recommended ranges?

4. Do potentially susceptible subpopulations—for example, children from families with a history of allergies or autoimmune diseases—who may experience adverse health consequences in association with immunization with the currently recommended immunization schedule exist?

which concerns had been raised, including autoimmune diseases, asthma, hypersensitivity seizures, child developmental disorders, learning or developmental disorders, and attention deficit or disruptive disorders. Indeed, rather than exposing children to harm, following the complete immunization schedule is strongly associated with reducing vaccine-preventable diseases.

The report added that existing mechanisms to detect safety signals—including three major surveillance systems maintained by the CDC that are used to follow products approved by the Food and Drug Administration (FDA), as well as a supplemental vaccine safety monitoring initiative by the FDA—provide further confidence that the current childhood immunization schedule is safe.

Ensuring safe and effective medicines

Until recently, most drugs used to treat children had been tested for safety and effectiveness only in adults. In 1997, Congress passed laws to require or motivate drug developers to conduct pediatric studies of their products. The legislation included the Best Pharmaceuticals for Children Act (BPCA), which provided economic incentives for companies to conduct pediatric studies of drugs in response to requests from the FDA (and was extended in 2010 to cover biologics); and the Pediatric Research Equity Act (PREA), which allowed the FDA to require pediatric studies in certain circumstances.

To determine whether its efforts have paid off, the FDA, in response to a congressional directive, asked the IOM to review the current state of pediatric studies and catalog changes in products and product labeling that have resulted from pediatric drug legislation. In its report, Safe and Effective Medicines for Children: Pediatric Studies Conducted Under the Best Pharmaceuticals for Children Act and the Pediatric Research Equity Act (2012),
the IOM committee concluded that the legislation has spurred the development of data about the uses of therapies in pediatric patients and has expanded access to this new information.

The amount of information gained has varied by medical condition, type of product, and ages of the populations studied. Data have sometimes supported and sometimes countered expectations about a drug’s efficacy and safety among children of different ages. Based on these studies, the FDA has approved 400 labeling changes on pediatric medications.

Still, studies among children remain limited, especially in certain areas. The IOM committee identified a number of ways that Congress and the FDA could further improve the search for information, including

![Figure 7-1: Changes in drug labeling associated with BPCA, PREA (including the Pediatric Rule), or both, July 1998 through October 2011. The figure excludes changes for biologics regulated under the Public Health Service Act that were approved before September 27, 2007. It includes changes for some products (e.g., contraceptives) that were excluded from the committee’s analysis as well as one change that is attributed to the 1994 Pediatric Rule.](image)

**SOURCE:** Safe and Effective Medicines for Children: Pediatric Studies Conducted Under the Best Pharmaceuticals for Children Act and the Pediatric Research Equity Act, p. 178.
expanding innovative strategies to research drugs and biologics in children, increasing studies of medication use in newborns, and giving the FDA flexibility to impose sanctions for unreasonably delayed studies. The FDA also could make greater use of its authority to require developers to conduct long-term follow-up studies after their products have been approved for market. Because children's bodies and minds are continually developing, and because some therapies for chronic conditions may be used for many years, pediatric studies of drug safety and effectiveness over the long term are important, but they are not yet commonly required.

Following the release of the IOM report, several major organizations involved in children's health, including the American Academy of Pediatrics and the Elizabeth Glaser Pediatric AIDS Foundation, voiced their support of its findings and recommendations. Congress also permanently reauthorized both BPCA and PREA under the FDA Safety and Innovation Act of 2012. Several of the law's provisions are consistent with the IOM's recommendations, including its new requirement for the FDA's Pediatric Review Committee and the Office of Pediatrics to include expertise in neonatology. Finally, the FDA is required to report by 2016 on progress made on the recommendations in the IOM report.

Working across the lifespan

Health challenges for children, youth, and families emerge across the lifespan. Beginning in pregnancy (and even before), a mother's health—important in its own right—helps determine the health of her child. The IOM has released several reports setting guidelines on the amount of weight women should gain during pregnancy and maintain through the first year after delivery. The most recent of these reports, *Weight Gain During Pregnancy: Reexamining the Guidelines* (2009), updated the initial guidelines set by the IOM and added new recommendations for women who are overweight or obese.

As a follow-up to this report, with funding from the Health Resources and Services Administration, the BCYF of the IOM and the NRC held a workshop to discuss how best to communicate the guidelines and encourage women and their health care providers to adopt them. Participants
explored the idea that health care providers need innovative ways to provide women of childbearing age with useful information, not only when they are pregnant but also before, after, and between pregnancies. Workshop discussions are described in *Leveraging Action to Support Dissemination of the Pregnancy Weight Gain Guidelines: Workshop Summary* (2013). In conjunction with the workshop, the IOM developed a suite of communications materials designed for a broad audience, including an interactive Web experience that tailors information according to the user’s body mass index (BMI).

The BCYF also convened a workshop focused on birth settings. With support from the W.K. Kellogg Foundation, participants explored what is known about the health effects—for both mothers and newborns—of various procedures used in different types of birth settings, including conventional hospital labor and delivery wards, birthing centers (which may be hospital-affiliated or free-standing), and home births. As reported in *An Update on Research Issues in the Assessment of Birth Settings: Workshop*
Summary (2013), participants also discussed disparities in access to care among different populations or regions, workforce requirements, limitations on research data, and how to improve outcomes regardless of birth setting.

In collaboration with the NRC Committee on National Statistics, the BCYF also held a workshop to help guide a major federal effort on children’s health. Mandated by Congress, the National Children’s Study (led by the Eunice Kennedy Shriver National Institute of Child Health and Human Health...
Development in collaboration with a consortium of federal government partners) will follow large groups of children from birth, often including the prenatal period, through age 21 to examine the effects of exposure to pollutants and other environmental factors on their growth, development, and well-being. Discussions at the workshop, as summarized in *Design of the National Children’s Study: A Workshop Summary* (2013), focused on which environmental exposures should be measured and how subjects should be selected. These discussions are expected to aid the study directors in developing final plans.

The health and well-being of children depends on the care and education they receive during their early years. The early childhood care and education (ECCE) workforce plays a crucial role during this period. More than half of the 25.5 million children under age 6 in the United States are estimated to spend time in care arrangements including preschools, child care centers, nannies, and informal arrangements with friends, family, and neighbors. Despite the important role of the ECCE workforce, policy makers and researchers have paid it relatively little attention. The BCYF, with support from the HHS Administration for Children and Families, held a workshop to explore a range of ideas related to this workforce. Participants discussed ways to define, quantify, and describe the ECCE workforce and the economic and policy factors that affect it. Discussions also explored how the characteristics of the workforce affect children and their families, challenges that face the workforce, and strategies for building and strengthening the workforce and the profession. *The Early Childhood Care and Education Workforce: Challenges and Opportunities: A Workshop Report* (2012) captured the general themes that emerged from the workshop.

Although the health and well-being of children often capture more public attention, young adults face significant challenges as well. Individuals in this group (typically 16 to 26 years old) are at a significant and pivotal time of life, facing major decisions about education, work, and personal relationships, decisions that are influenced by their circumstances and resources. The BCYF, with funding from the HHS Health Resources and Services Administration, convened a workshop to examine the latest research on how young adults are faring. *Improving the Health, Safety, and Well-Being of Young Adults: Workshop Summary* (2013) captures the dis-
cussions and major themes. The workshop was the beginning of a larger effort by the IOM and the NRC that will focus on guiding research, practice, and policy aimed at improving the health, safety, and well-being of young adults.
Few safeguards to health are more fundamental than ensuring that the foods we eat and the medical products we use are safe and effective. Toward this aim, the U.S. government relies heavily on a broad net of regulations and guidelines developed and administered by the Food and Drug Administration (FDA) and other agencies. By most estimates, the system is fairly successful.

But problems still occur, as exemplified by recent high-profile cases in which microbe-contaminated foods and faulty drugs have resulted in illness and death. Potential threats may be growing as the United States increasingly imports a variety of foods and pharmaceuticals from other countries where safety regulations are limited. To reduce risks from substandard food and drugs, and to overcome them when they arise, the U.S. government turns to the Institute of Medicine (IOM) for guidance.

Promoting safer products globally

Imports of foods and medical products regulated by the FDA have increased by more than 13 percent per year since 2002. A significant proportion of drugs and active pharmaceutical ingredients on the U.S. market, as well as a large percentage of fruits, nuts, and seafood, originate in other countries. International food and drug regulatory systems, therefore, are crucial to the safety of food and drugs in the United States and, as such, must inform FDA policies.
In a study commissioned by the FDA, an IOM committee examined regulatory activities in about 150 developing countries, giving special attention to the emerging economies that trade heavily with the United States: Mexico, Brazil, South Africa, India, Thailand, and China. In *Ensuring Safe Foods and Medical Products Through Stronger Regulatory Systems Abroad* (2012), the committee concluded that many of these countries do not have adequate technology for effective oversight of food and drug safety. Other common obstacles include lack of resources and infrastructure, inadequate or poorly trained staff, outdated equipment, and weak or nonexistent legal foundations for regulation.

The report recommended 13 steps the FDA can take in the next 3 to 5 years to bolster food and drug safety, working in partnership with international regulatory and industry groups. Areas for action include encouraging the development of low-cost technologies to help regulatory agencies detect fraud, supporting expanded surveillance systems to track various products, and urging regulatory agencies and industry associations in developed countries to share the results of inspections they conduct in developing countries.

The FDA also should continue to monitor the performance of its Secure Supply Chain program, a promising initiative that could help tighten control of the often-complex supply routes for U.S. goods. The program grants expedited entry to the U.S. market to drug companies that can reliably track their products from manufacture to market. If the program proves successful in its current pilot phase, which will end in 2014, the FDA should expand the operation to include more medical products, as well as foods.

Following release of the IOM report, the FDA held a public meeting to seek input on a capacity-building plan proposed by Congress in the FDA Food Safety Modernization Act. Participants at the meeting discussed the report’s findings and explored ways to incorporate certain recommendations into the plan, especially the recommendation to train foreign regulators.

The importance of stringent drug safety standards captured national attention in late 2012 when contaminated steroid drugs produced by a
Massachusetts compounding pharmacy sickened more than 600 people in 23 states, killing 44 of them. Although such large-scale incidents are rare among U.S. pharmaceutical companies, they are common in poor countries where regulatory oversight is weak.

Experts agree that tackling the problem of unsafe drugs will require international cooperation, but disagreements among various stakeholders have hampered coordinated efforts. To jump-start international discourse and action, the FDA asked the IOM to assess current activities and identify potential areas of cooperation. In Countering the Problem of Falsified and Substandard Drugs (2013), the IOM study committee described factors that typically underlie the production of bad drugs in low- and middle-income countries and outlined steps governments and drug manufacturers can take to ameliorate the problem.

Neglect of good manufacturing, often due to cost constraints, is a root cause of poor-quality medicine. Running a modern pharmaceutical factory is expensive, and manufacturers in poor countries need hard-currency loans to upgrade their processes and equipment to international standards. National banks are often unwilling or unable to grant these loans, but development finance organizations such as the International Finance Corporation and the Overseas Private Investment
Corporation can step in to fill this need. It will also be important for governments to develop rigorous regulatory systems and act forcefully against falsified and substandard medicines in order to bolster confidence in good-quality products.

The IOM report also recommended that the global drug distribution system be made more secure. As a priority, the United States should restrict wholesale market access to companies approved by the National Association of Boards of Pharmacy, thereby promoting patient safety domestically and building momentum for better controls on drug wholesalers in developing countries.

**Conducting safety studies ethically**

The FDA bases its approval of a new drug on evidence that it is effective and safe, which involves an assessment of whether its benefits outweigh its risks. But the full range of a drug’s effects may not become apparent until it is used by a large, diverse population over an extended period of time. In 2007, the Congress provided the FDA with additional postmarketing regulatory tools to better protect the health of the public, including the authority to require manufacturers to continue studying drugs already on the market. The FDA’s expanded scope has brought new challenges, including how to determine when postmarketing studies are appropriate, which types of studies to require, how best to protect the rights and interests of patients who participate in research, and how to use research data in regulatory decision making.

In a study requested by the FDA, an IOM study committee recommended that the FDA adopt a more systematic and transparent process to collect, assess, and act on data about a medication’s benefit-risk profile at every stage of its development. In its report, *Ethical and Scientific Issues in Studying the Safety of Approved Drugs* (2012), the committee further recommended that the FDA require and maintain a comprehensive, publicly available benefit-risk assessment for every product, starting with its approval and including its entire time on the market, to serve as a central repository of drug information.
When deciding whether to require manufacturers to conduct post-market studies, the FDA should balance its ethical obligations to protect the public’s health with its obligations to protect research participants. The report recommended that the FDA require postmarket research only if a regulatory decision cannot be made based on existing safety evidence; if additional research can sufficiently reduce uncertainties about the benefit-risk balance to help inform a regulatory decision; if the results will be used to make a decision in a timely fashion; and if the rights and interests of the research participants can be adequately protected.
The report also recommended that the FDA ensure that required postmarket studies be conducted in an ethically and scientifically sound manner. Advances in electronic health record systems and analytic techniques are likely to increase the use of large datasets, an approach that could raise new ethical concerns. The FDA should seek additional guidance to ensure that postmarket research and surveillance are being properly overseen.

In addition, the FDA should periodically revisit its postmarketing safety decisions when those decisions are particularly controversial or difficult or when the FDA makes a major regulatory decision after approving a medicine. The FDA’s reviews should assess the decision-making process itself as well as gauge the public health effects of FDA decisions.

**Improving drug regulation**

To foster the safety and accessibility of drugs worldwide, international regulatory systems must communicate and cooperate. The IOM’s Forum on Drug Discovery, Development, and Translation, which convenes stakeholders from academia, government, industry, and the public to explore emerging topics of common concern, held a public workshop on regulatory harmonization—the method by which countries and organizations work to make their regulatory processes and standards more consistent.

Regulatory harmonization is complicated by the rapid globalization of commerce in the medical product and technology sectors. Companies developing products intended for the U.S. market increasingly conduct their investigational studies (including clinical trials) outside the United States, often in countries with limited regulatory capacity. In addition, companies seeking global markets may be required to replicate clinical trials or animal studies to meet multiple countries’ regulatory standards—increasing costs and delaying patients’ access to needed medicines, while also exposing more people (and test animals) to experimental materials. During workshop discussions, captured in *International Regulatory Harmonization Amid Globalization of Drug Development: Workshop Summary* (2013), participants examined principles and strategies for advancing the development of more harmonized regulatory standards and explored potential
benefits of harmonization, such as enhanced product development and improved public safety.

The forum also evaluated the FDA’s use of regulatory science in decision making. As defined by the FDA, regulatory science involves developing new tools, standards, and approaches to assess the safety, efficacy, quality, and performance of FDA-regulated products. Although the practice of basing regulatory decisions on the best available scientific evidence has clear benefits, the FDA lacked funds allocated to the development of a regulatory science infrastructure until 2011, when the federal government appropriated $25 million for this purpose. To explore various priorities and strategies for establishing the FDA’s regulatory science approach, the forum convened a workshop, summarized in Building a National Framework for the Establishment of Regulatory Science for Drug Development: Workshop Summary (2011).

In a follow-up workshop, participants surveyed the current regulatory science workforce and discussed current gaps and key needs in workforce development, examined professional training opportunities, and assessed the application and advantages of collaborative (multisector and multidisciplinary) approaches for strengthening the workforce. Participants also explored the resources and stakeholder engagement needed to build the discipline and establish career paths in regulatory science for therapeutics development, not only within the FDA and other federal agencies but also throughout the extramural sector. The workshop discussions are recapped in Strengthening a Workforce for Innovative Regulatory Science in Therapeutics Development: Workshop Summary (2012).

Protecting food safety

The IOM’s Forum on Microbial Threats explores policies and practices that can help to promote food safety in the United States and abroad. Recent outbreaks of Listeria in cantaloupe, Salmonella spp. in eggs and ground turkey, and E. coli in bean sprouts underscore the public health and economic impacts of an increasingly globalized food supply. In the United States, foodborne illnesses affect 1 out of 6 individuals, causing approximately
128,000 hospitalizations and 3,000 deaths each year, with wide-ranging repercussions for consumers, government, and the food industry domestically and internationally.

In a meeting summarized in *Improving Food Safety Through One Health: Workshop Summary* (2012), forum members examined areas critical to the protection of the nation’s food supply. Workshop presentations explored existing knowledge and unanswered questions on the nature and extent of foodborne threats to health. Participants discussed the globalization of the U.S. food supply and the burden of illness associated with foodborne threats to health; the spectrum of foodborne threats as well as illustrative case studies; and existing research, policies, and practices to prevent and mitigate foodborne threats. They also examined opportunities to reduce future threats to the food supply through the use of a “One Health” approach—involving collaboration among multiple disciplines and action on local, national, and global levels to attain optimal health for people, animals, and the environment. In conjunction with the workshop, the forum developed “The Well-Traveled Salad,” an infographic that illustrates the globalization of the food supply by tracing the origins of ingredients commonly used in a salad.
In the United States, 75 percent of all health care expenditures go toward the treatment of chronic diseases. These persistent conditions, which include cancer, diabetes, and obesity, are the nation’s leading causes of death and disability, despite being largely preventable. The incidence of chronic diseases is expected to rise along with the aging U.S. population, placing a complex and long-term demand on the health care system. Although advances in medical science have improved our ability to treat chronic illness, it is even better to prevent disease through improved behavioral patterns and social circumstances, increased understanding of underlying genetic factors, and reduced environmental exposure to harmful chemicals. Infectious, fungal, and newly emerging and reemerging diseases also remain a significant challenge to public and environmental health.

In combating the burden of disease, the Institute of Medicine (IOM) focuses not only on scientific matters but also on the policies and programs of government and other organizations to prevent and treat disease. The IOM, with support from public and private organizations, has continued to build on its decades of work to reduce the burden of disease by conducting consensus studies and convening workshops that bring together experts in the fields of disease control and prevention.

**Understanding breast cancer risk**

Breast cancer has long been the most common type of invasive cancer among U.S. women (aside from certain skin cancers that carry lower health risks), with approximately 230,480 new cases diagnosed in 2011. Some of
## Summary of Committee Assessment of Opportunities for Actions by Women That May Reduce Risk of Breast Cancer

<table>
<thead>
<tr>
<th>Opportunity for Action</th>
<th>Modification of Exposure</th>
<th>Personal Action Possible</th>
<th>Requires Action by Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid inappropriate medical radiation exposure&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Avoid combination menopausal hormone therapy, unless medically appropriate&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>Yes</td>
<td>Confer with physician</td>
</tr>
<tr>
<td>Avoid or end active smoking</td>
<td></td>
<td>Yes</td>
<td>Others can facilitate</td>
</tr>
<tr>
<td>Avoid passive smoking</td>
<td></td>
<td>Varies</td>
<td>Yes</td>
</tr>
<tr>
<td>Limit or eliminate alcohol consumption</td>
<td></td>
<td>Yes</td>
<td>Others can facilitate</td>
</tr>
<tr>
<td>Maintain or increase physical activity</td>
<td></td>
<td>Yes</td>
<td>Others can facilitate</td>
</tr>
<tr>
<td>Maintain healthy weight or reduce overweight or obesity to reduce postmenopausal risk</td>
<td></td>
<td>Yes</td>
<td>Others can facilitate</td>
</tr>
<tr>
<td>Limit or eliminate workplace, consumer, and environmental exposure to chemicals that are plausible contributors to breast cancer risk while considering risks of substitutes&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td>Varies by chemical</td>
<td>Varies</td>
</tr>
<tr>
<td>If at high risk for breast cancer, consider use of chemoprevention</td>
<td></td>
<td>Yes</td>
<td>Confer with physician</td>
</tr>
</tbody>
</table>

<sup>a</sup> Actions to address risk factors can take various forms, some of which may be more effective than others, and some of which may have to be taken at a specific time in life to be effective. For example, increasing physical activity might be based on the amount of time spent in any one exercise opportunity, on increasing specific types of exercise, or on increasing the frequency of exercise, or perhaps some combination of any of these. Studies have not been done that provide evidence that a specific form of physical activity is optimal for reducing breast cancer risk.

<sup>b</sup> The committee’s comments on other benefits or risks highlight major considerations, but they are not intended to be exhaustive.

<sup>c</sup> While recognizing the risks of ionizing radiation exposure, particularly for certain higher dose methods (e.g., computed tomography [CT] scans), it is not the committee’s intent to dissuade women from routine mammography screening, which aids in detecting early-stage tumors.
### Summary of Committee Assessment of Opportunities for Actions by Women That May Reduce Risk of Breast Cancer

<table>
<thead>
<tr>
<th>Opportunity for Action</th>
<th>Modification of Exposure</th>
<th>Action</th>
<th>Possible Requires Action by Others</th>
<th>Target Population Defined</th>
<th>Effective Form and Timing Established&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Other Prominent Known Risks or Benefits from Taking Action&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid inappropriate medical radiation exposure</td>
<td></td>
<td>Yes Yes All ages</td>
<td>Yes, especially at younger ages</td>
<td>May result in loss of clinically useful information in some instances</td>
<td>Likely to decrease risk for other cancers</td>
<td></td>
</tr>
<tr>
<td>Avoid combination menopausal hormone therapy, unless medically appropriate</td>
<td></td>
<td>Yes Postmenopausal women</td>
<td>Yes</td>
<td>May experience moderate to severe menopausal symptoms without hormone therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid or end active smoking</td>
<td></td>
<td>Yes Others can facilitate All ages, especially before first pregnancy</td>
<td>Yes (form) No (timing)</td>
<td>Likely to reduce risk for other cancers, heart disease, stroke</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid passive smoking</td>
<td></td>
<td>Yes Varies All ages</td>
<td>Yes</td>
<td>Likely to reduce risk for other cancers, heart disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit or eliminate alcohol consumption</td>
<td></td>
<td>Yes Others can facilitate All women</td>
<td>Yes (form) No (timing)</td>
<td>May increase risk for cardiovascular disease, diabetes</td>
<td>Likely to reduce risk for cardiovascular disease, diabetes, other cancers</td>
<td></td>
</tr>
<tr>
<td>Maintain or increase physical activity</td>
<td></td>
<td>Yes Others can facilitate All ages</td>
<td>No</td>
<td>Likely to reduce risk for cardiovascular disease, diabetes, other cancers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintain the healthy weight or reduce overweight or obesity to reduce postmenopausal risk</td>
<td></td>
<td>Unclear High-risk women</td>
<td>No</td>
<td>Likely to reduce risk for cardiovascular disease, diabetes, other cancers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit or eliminate workplace, consumer, and environmental exposure to chemicals that are plausible contributors to breast cancer risk while considering risks of substitutes</td>
<td></td>
<td>Varies by chemical Plausibility may be indicated by epidemiologic evidence, animal bioassays, or mechanistic studies</td>
<td>No</td>
<td>May reduce risk for other forms of cancer or other health problems May result in replacement with products that have health or other risks not yet identified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If at high risk for breast cancer, consider use of chemoprevention</td>
<td></td>
<td>Yes Confer with physician High-risk women</td>
<td>Yes Depending on the agent, increased risk of endometrial cancer, stroke, deep-vein thrombosis, among others</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> Combination hormone therapy with estrogen and progestin increases the risk of breast cancer, and the associated risk is reduced upon stopping therapy. Oral contraceptives are also associated with an increased risk of breast cancer while they are being used. This risk is superimposed on a low background risk for younger women, who are most likely to use oral contraceptives. Use of oral contraceptives is associated with long-term risk reduction for ovarian and endometrial cancer.

<sup>b</sup> Plausibility may be indicated by epidemiologic evidence, animal bioassays, or mechanistic studies.

the risk factors for breast cancer are known, such as increasing age and certain genetic traits, but opportunities for preventive actions are limited. Therefore, there is growing interest in whether women can reduce their risk of breast cancer by modifying the environment in which they live—what they eat and drink, their level of physical activity, the medical treatments they choose, or the chemicals they encounter, among other factors.

In a study supported by Susan G. Komen for the Cure®, an IOM committee reviewed current research on environmental contributions to breast cancer and looked for evidence-based actions that women might take to reduce their risk. In *Breast Cancer and the Environment: A Life Course Approach* (2011), the IOM committee found evidence to suggest that several actions may be beneficial, including avoiding unnecessary radiation in medical procedures, forgoing use of combination estrogen-progestin menopausal therapy if possible, limiting alcohol consumption, maintaining a healthy weight, exercising regularly, and avoiding tobacco use. Some evidence also suggests that women may benefit from minimizing their exposure to night shift work and to certain chemicals—benzene, 1,3-butadiene, and ethylene oxide—found in some workplace settings and in gasoline fumes. The IOM committee also found consistent evidence of a lack of risk from two environmental factors: personal use of hair dyes and exposure to non-ionizing radiation, such as that emitted by microwave ovens and other electrical devices.

The IOM committee acknowledged that many questions remain in understanding breast cancer risk. It remains unclear, for example, whether many common chemicals, including ingredients in dietary supplements and cosmetics, alter the risk for breast cancer. And more studies are needed to understand the potential effects of the timing of environmental exposures throughout the life span, including at specific stages of breast development, and the cumulative
effects of exposures at different life stages or multiple concurrent exposures.

When the report was published, Susan G. Komen for the Cure® issued the following statement: “We intend to use these findings to guide our decisions about research to fund, so that women and their families have the best science to guide them in making important lifestyle choices. We believe our efforts going forward will be made even more effective through the guidance provided by this study.”

To extend the reach of the consensus study, Susan G. Komen for the Cure® asked the IOM to produce a brief summary to educate the general public about the study’s findings. “Breast Cancer and the Environment: Questions and Answers” (available for free download from http://www.iom.edu/breastcancerenvironment) uses clear and concise language to communicate common concerns about breast cancer and the risk of environmental exposures and alert women to actions that may help with prevention.

**Combating cancer on many fronts**

In the national effort to fight cancer of all types, many stakeholders play major roles in conducting research, providing clinical care, implementing public health programs, and developing public policies. The IOM’s National Cancer Policy Forum (NCPF) provides a continuous focus across these broad areas, with an overall aim of identifying emerging high-priority policy concerns related to cancer and exploring potential opportunities for action. The forum hosts workshops to foster dialogue among representatives from government, industry, academia, and the public.

In 2012, the forum convened a workshop to examine challenges in the collection, organization, and analysis of data in cancer research. Drawing on a proposal put forth and discussed at the workshop, various stakeholders went on to form a new coalition to foster data sharing in cancer research. A steering committee for the Data Liquidity Coalition has been
established and includes representatives from cancer research centers, the pharmaceutical and information technology industries, and patient organizations. Major themes from the workshop are summarized in *Informatics Needs and Challenges in Cancer Research: Workshop Summary* (2012).

Another NCPF workshop focused on the link between tobacco use and cancer. Tobacco use is associated with the development of 18 different types of cancer and accounts for at least 30 percent of all cancer deaths and 80 percent of lung cancer deaths. In addition, patients who continue to smoke after a cancer diagnosis are more likely to have poor treatment outcomes. Although tobacco use has dropped significantly during the past half-century, the rate of decline has slowed in recent years, and the use of new tobacco and nicotine products is on the rise, with unclear health consequences.

Workshop participants examined current challenges in tobacco control and explored avenues for action. *Reducing Tobacco-Related Cancer Incidence and Mortality: Workshop Summary* (2012) captures their discussions, which explored policy, outreach, and treatment strategies that policymakers, community groups, and health care providers can use to reduce tobacco use and thus improve health.

The forum also explored the nation’s obesity epidemic and its possible impact on cancer. As the U.S. population ages and grows more susceptible to cancer, recent studies have raised concern that excess weight can play a role in cancer incidence, progression, recurrence, and survival rates. At a forum workshop, described in *The Role of Obesity in Cancer Survival and Recurrence: Workshop Summary* (2012), participants reviewed the latest laboratory and clinical evidence on the obesity–cancer link and the possible mechanisms underlying that link. Workshop participants also discussed potential interventions that could mitigate the effects of obesity on cancer, as well as research and policy measures needed to address the expected rise of cancer incidence and mortality due to an increasingly overweight population.
Improving management of chronic illnesses

Advanced treatments for cancer are allowing many people to live with the disease for years, making what may once have been an acute condition a chronic one. Other chronic illnesses (CIs) are becoming increasingly common, especially as the population ages. CIs progress slowly and require long-term medical treatment. They often limit the functional status, productivity, and quality of life of the people who live with them, and are major contributors to the cost of U.S. health care.

With support from the Centers for Disease Control and Prevention (CDC) and the Arthritis Foundation, the IOM took a wide-ranging look at CIs and the role that public health organizations can play in improving the lives of people who suffer from them. In *Living Well with Chronic Illness: A Call for Public Health Action* (2012), the IOM committee presented a comprehensive guide that government and private groups can use in developing and implementing cross-cutting strategies to benefit individuals and reduce health care costs for the nation.

The report identified nine “exemplar” conditions that may hold general lessons for addressing CIs: arthritis, cancer survivorship, chronic pain, dementia, depression, type 2 diabetes, post-traumatic disabling conditions, schizophrenia, and vision and hearing loss. All efforts directed at CI management should have a single aim: to help each person with a chronic illness—and, by extension, the general population—to live well, a goal that reflects the best achievable state of health and encompasses all dimensions of physical, mental, and social well-being.

Within this broad goal, the IOM committee outlined a number of specific actions. These include optimizing efforts to understand the burden and needs of people living with CIs; expanding surveillance systems to learn more about the number and distribution of people with CIs; promoting the creation and implementation of public health policies in emerging legislation; improving dissemination of effective community-based interventions; improving preventive clinical guidelines for people with CIs; and realigning the health system to make it better suited to helping people live well with CIs.
### Symptoms That Interfere with Living Well

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Examples of Illnesses</th>
</tr>
</thead>
</table>
| Fatigue                  | • Congestive heart failure  
• Chronic respiratory diseases (e.g., chronic obstructive pulmonary disease)  
• Arthritis  
• Depression  
• Sleep disorders  
• Posttraumatic injury/critical illness |
| Dyspnea                  | • Chronic respiratory diseases (e.g., chronic obstructive pulmonary disease)  
• Congestive heart failure  
• Cardiovascular diseases  
• Deconditioning |
| Pain                     | • Arthritis  
• Cardiovascular diseases |
| Distress                 | • Depression  
• Anxiety  
• Anger  
• Suffering |
| Cognitive impairment     | • Dementia  
• Posttraumatic injury/critical illness  
• Vision/hearing impairment  
• Cataracts  
• Macular degeneration  
• Noise-induced hearing loss |

**SOURCE:** Living Well with Chronic Illness: A Call for Public Health Action, p. 198,

When the report was published, the Arthritis Foundation released a statement applauding the IOM “for calling attention to the staggering toll of chronic diseases, like arthritis, and for developing a visionary blueprint that calls for a paradigm shift in the way our health system deals with this growing problem.”

Looking beyond the United States, there is increasing recognition that CIs represent a major health threat in the developing world and are accompanied by significant economic consequences. Yet, most governments, global health institutions, and development agencies have largely overlooked CIs when investing in health in developing countries. Cardiovascular disease (CVD), in particular, is a chronic illness with a growing
burden in low- and middle-income countries. In 2010, the IOM issued the report *Promoting Cardiovascular Health in the Developing World: A Critical Challenge to Achieve Global Health*. The IOM committee proposed improving control of CVD and other CIs through approaches led by in-country decision makers and stakeholders and informed by each country’s particular circumstances.

As part of a series of follow-up activities, the IOM held a workshop to further explore some of the report’s findings and recommendations. As described in *Country-Level Decision Making for Control of Chronic Diseases: Workshop Summary* (2012), participants explored how to identify tools countries can use in planning, implementing, and funding programs that are practical, effective, cost-efficient, and equitable.

**Advancing understanding of HIV/AIDS**

During the past two decades, improved medical care has transformed HIV/AIDS from an acute condition likely to be fatal into a chronic disease that can be effectively managed over many years. Approximately 1.1 million people in the United States currently live with HIV/AIDS, and the number increases each year.

In 2010, the Obama administration released the National HIV/AIDS Strategy (NHAS). The NHAS is intended to complement implementation of the Patient Protection and Affordable Care Act (ACA), which is poised to bring millions of uninsured people, including many with HIV/AIDS, into the health care system. To aid in NHAS’s implementation, the White House Office of National AIDS Policy, which coordinates federal programs targeting HIV/AIDS, asked the IOM to assess pressing issues in HIV/AIDS control and offer operational guidance. The Committee on HIV Screening and Access to Care issued three reports in 2010 and 2011.

The IOM next turned its attention to how the U.S. government can best monitor the availability and effectiveness of HIV/AIDS treatment and prevention programs by convening a new Committee on Data Systems for Monitoring HIV Care. As part of this broad-scope effort, the federal government will need to monitor the effects of the NHAS and the ACA on HIV/AIDS care.
In *Monitoring HIV Care in the United States: Indicators and Data Systems* (2012), the Committee on Data Systems identified a number of obstacles that prevent people with HIV/AIDS from achieving optimal health, including late diagnosis, delayed access to care, breaks in care, delayed prescription and intermittent use of life-saving antiretroviral therapy, untreated mental health and substance use disorders, and unmet basic needs.

The committee further identified a set of core indicators to measure the ability of current and future programs to overcome these obstacles and deliver continuous clinical care, access to mental health and substance abuse services, and access to supportive services such as housing, transportation, and food assistance—all of which are known to influence the overall health of people with HIV/AIDS. The committee also included the best sources of data to measure and document programs’ success in helping people with HIV/AIDS achieve optimal health, but cautioned that operators of data systems should evaluate the scope of their data and make any changes necessary to ensure accurate calculations of the core indicators.

The IOM report suggested that new information technologies can facilitate collection of health care data and directly improve patient care. But the institutional settings where people with HIV/AIDS often receive care are slow to adopt beneficial technologies such as electronic health records. The report concluded that it may prove helpful for the government to aid in educating care providers on the uses and benefits of these technologies for their own practices, provide them with technical assistance when needed, and perhaps offer financial incentives to foster this shift.

Federal officials quickly took note of the report. Kathleen Sebelius, Secretary of the Department of Health and Human Services (HHS), wrote in a memo to the department’s operating division directors and administrators that the core indicators recommended in the report merited careful consideration in HHS’s efforts to develop metrics for charting the progress
National HIV/AIDS Strategy Targets

Targets for Increasing Access to Care and Improving Health Outcomes for People Living with HIV

By 2015,
• increase the proportion of newly diagnosed patients linked to clinical care within 3 months of their HIV diagnosis from 65 to 85 percent.
• increase the proportion of Ryan White HIV/AIDS Program clients who are in care (at least two visits for routine HIV medical care in 12 months at least 3 months apart) from 73 to 80 percent.
• increase the percentage of Ryan White HIV/AIDS Program clients with permanent housing from 82 to 86 percent.

Targets for Reducing HIV-Related Health Disparities and Inequities

By 2015,
• increase the proportion of HIV diagnosed gay and bisexual men with undetectable viral load by 20 percent.
• increase the proportion of HIV-diagnosed Black Americans with undetectable viral load by 20 percent.
• increase the proportion of HIV diagnosed Latinos with undetectable viral load by 20 percent.

SOURCE: Monitoring HIV Care in the United States: Indicators and Data Systems, p. 5.

of the NHAS. Sebelius also requested that HHS operating divisions work with the Office of the Assistant Secretary for Health “to finalize a set of common, core HIV/AIDS indicators in a manner consistent with the proposed core indicator domains and the IOM’s recommendations.”

Later in 2012, the IOM committee on data systems issued a follow-up report, *Monitoring HIV Care in the United States: A Strategy for Generating National Estimates of HIV Care and Coverage*, which proposed a national system to track the government’s wide-ranging efforts to meet the health needs of

Looking forward to 2014, when the ACA is implemented fully, a more comprehensive system with a sharper focus will be needed.
people living with HIV/AIDS. The committee surveyed the data collection landscape and found that useful data were being collected by a number of public and private systems, providing a reasonably accurate baseline for health care coverage and utilization of HIV/AIDS care. But looking forward to 2014, when the ACA is implemented fully, a more comprehensive system with a sharper focus will be needed. The committee concluded that the Medical Monitoring Project (MMP), operated by the CDC, is a promising resource that, with recommended improvements, could serve as a valuable tool for monitoring the effect of the ACA on HIV/AIDS health care coverage and utilization.

The MMP collects data on care in both public and private settings, covered by a variety of payers, including Medicaid, Medicare, the Ryan White HIV/AIDS Program, and private insurers. The project also collects data on a range of elements central to HIV/AIDS care and support services that extend beyond health care, as well as the characteristics of people who receive HIV/AIDS care. Collectively, these factors make MMP data useful for tracking the distribution of HIV/AIDS care coverage; the quality of care across different organizational models; and any disparities that exist in coverage, utilization, and outcomes among people with HIV/AIDS.

Promoting health and understanding of epilepsy

Although epilepsy is fairly common worldwide, it remains poorly understood by both the scientific community and the public. An estimated 2.2 million people in the United States live with epilepsy, a complex neurological disorder characterized by sudden and often unpredictable seizures. People with epilepsy face an array of challenges in school, social, and employment settings, as well as limitations on driving and independent living. Further, epilepsy is associated with a host of coexisting conditions that can diminish quality of life and increase the burden of the disorder on individuals and their families. These individuals also are at increased risk of death and sudden unexpected death in epilepsy (SUDEP).
With support from 24 federal agencies and nonprofit organizations, the IOM comprehensively examined the public health dimensions of epilepsy. In its report, *Epilepsy Across the Spectrum: Promoting Health and Understanding* (2012), the IOM committee highlighted knowledge gaps in the study and treatment of epilepsy, and recommended actions that could improve the lives of people with epilepsy and promote understanding of the disorder.

Effective treatments for epilepsy, including medications, surgery, devices, and dietary or other therapies allow approximately two-thirds of individuals to remain seizure-free. However, many people with epilepsy lack access to available treatments and timely referrals to specialized care. The IOM report called for efforts to promote early identification and treatment of epilepsy and associated health conditions, to assess quality of care, and to improve knowledge and skillsets among the wide variety of health professionals who treat people with epilepsy.

People with epilepsy need improved access to a range of community services, including vocational and educational programs, transportation, transitional care, and independent living assistance, as well as support groups. The IOM committee urged collaboration among federal agencies, state health departments, and epilepsy organizations to improve and integrate these services and programs, particularly at state and local levels. The report also identified an important need for improved education and information resources for people with epilepsy and their families. Education plays an essential role in adapting to life with epilepsy, developing self-confidence, and becoming competent in self-management of the disorder.

To boost public understanding of epilepsy and spread the messages of the report, the IOM created a simple, online quiz that measures knowledge about the disorder. The five-question quiz, which is posted on the
FIGURE 4-5
Epilepsy care model.
IOM’s website (http://www.iom.edu/epilepsy) and on some of the websites of study sponsors, has drawn huge numbers of online visitors.

Following the publication of the IOM report, two sponsors of the study—the Epilepsy Foundation and the Epilepsy Therapy Project—decided to merge. In an editorial in the December 2012 issue of Epilepsy & Behavior, the joint foundation credited the merger to the IOM report’s call for increased collaboration across the epilepsy community. A coalition of public and private organizations with an interest in epilepsy that includes a number of sponsors from the IOM study—Vision 20/20—has also taken steps to implement the report’s recommendations. The coalition has surveyed the field to determine activities already under way and identify areas ripe for action, and has formed working groups to chart a path forward.

The emerging threat of fungal diseases

Fungal diseases of plants, animals, and humans have devastated agricultural crops, triggered global wildlife population declines and extinctions, altered tree population diversity and forest ecosystem dynamics, and contributed
to death and disability in humans. In one notable example, *Cryptococcus gattii* (*C. gattii*), a pathogenic fungus that emerged on Vancouver Island, British Columbia, Canada in 1999, is causing a growing outbreak of human and animal infections and deaths. Since its emergence, the pathogen has spread from Vancouver Island to mainland British Columbia and south into the Pacific Northwest of the United States, resulting in 338 confirmed human infections and 40 deaths.

Despite the risks they pose to public and ecosystem health, fungal pathogens are often poorly understood. The IOM's Forum on Microbial Threats sponsored a public workshop to explore the scientific and policy dimensions associated with the causes and consequences of emerging fungal diseases. Participants considered opportunities to improve surveillance, detection, and response strategies for identifying and mitigating the impacts of these diseases in order to better prepare for future outbreaks. The major themes of this public meeting are presented in *Fungal Diseases: An Emerging Threat to Human, Animal, and Plant Health: Workshop Summary* (2011).
The United States has ended combat operations in Iraq and plans to do so in Afghanistan in 2014, concluding the longest sustained U.S. military effort since the Vietnam era. As the troops have come home—most returning to civilian life, some to active duty—the challenges of protecting their health and well-being have taken on new dimensions. A major focus is on helping service members and veterans cope with an array of problems—physical, mental, behavioral, and social—that resulted from their combat experience.

The Institute of Medicine (IOM) has a long record of advising the federal government, particularly the Department of Defense (DoD) and the Department of Veterans Affairs (VA), on the safety and health needs of military personnel and their families. With the influx of troops returning from combat in Iraq and Afghanistan, the DoD and the VA have asked the IOM to study and recommend actions on a variety of health issues of pressing concern. The IOM also has continued studies of service-related health problems—some emerging long after active duty—among veterans of other wars.

**Challenges of returning home from Iraq and Afghanistan**

More than 2.2 million troops fought in Iraq and Afghanistan, often in multiple deployments. Upon returning home, many readjusted to life off the battlefield with few difficulties. A significant number, however, returned with various service-related health conditions and have struggled with
readjustment. In response to a congressional order, the DoD commissioned the IOM to study the physical and mental health, as well as other readjustment needs, of returning troops.

The IOM conducted the study in two phases. The first study, *Returning Home from Iraq and Afghanistan: Preliminary Assessment of Readjustment Needs of Veterans, Service Members, and Their Families* (2010), identified the most pressing needs of this population. While commending the DoD and the VA for their efforts to help returning troops and their families, the first report concluded that critical service gaps remained. Building on the first study, the committee’s report on the second phase, *Returning Home from Iraq and Afghanistan: Assessment of Readjustment Needs of Veterans, Service Members, and Their Families* (2013), presented the study committee’s comprehensive assessment and provided a detailed action plan that the DoD and the VA can follow to help troops transition to postdeployment life.

In the 2013 study, the IOM committee found that 44 percent of returning troops reported difficulties readjusting to postdeployment life. Significant numbers suffered traumatic brain injury (TBI), and many developed symptoms of posttraumatic stress disorder (PTSD), depression, and substance abuse. Female service members who were sexually assaulted or harassed during deployment—events occurring at increasing rates throughout the armed services—have suffered lingering adverse physical and mental effects as a result. Many returning troops have experienced difficulties beyond health consequences, including high rates of unemployment.

The IOM committee recommended that the DoD and the VA accelerate efforts to ensure that their systems have sufficient capacity to provide timely and adequate care to service members, veterans, and their family members, using diagnostic tools and therapies that are in line with the latest medical evidence. These efforts should include swift implementation of electronic health records that can help service members and veterans more easily navigate within and between DoD and VA programs. As a general matter, the DoD and the VA should acknowledge the increasing diversity of the military population as the number of female service members rises and nontraditional families become more common.
The 2013 report also identified a need to collect more data in a variety of areas—including the health, economic, and social impacts of combat deployment and the effectiveness of support programs to aid readjustment—and to develop better systems and procedures for sharing data among various stakeholders. As a particular focus, the VA should conduct forecasts of the amount and types of resources necessary to meet the needs of veterans and their families in the next 30 years or more, when demand for health care and disability compensation is likely to peak, based on trends from previous wars.

**Treating posttraumatic stress disorder**

As the *Returning Home* reports make clear, PTSD is common among service members who fought in Iraq and Afghanistan. An estimated 13 to 20 percent of returning troops may have PTSD, a condition triggered by a traumatic event or events. PTSD is characterized by a cluster of symptoms that include persistent re-experiencing of traumatic events, emotional numbing or avoidance of thoughts or feelings associated with the events, and exaggerated startle responses to sounds or sights that act as reminders of the events.
Concerned about the increasing numbers of soldiers who have or are at risk of developing PTSD, Congress asked the DoD, in consultation with the VA, to sponsor an IOM study of both departments’ PTSD treatment programs and services. The study is to be conducted in two phases. The IOM committee’s first report, issued in 2012, *Treatment for Posttraumatic Stress Disorder in Military and Veteran Populations: Initial Assessment*, found that the DoD and the VA provide an array of prevention, screening, diagnosis, treatment, and rehabilitation options, but the programs are not reaching everyone in need. For example, only about 40 percent of returning troops who screened positive for PTSD symptoms have been referred for additional evaluation, and only about 65 percent of that group has gone on to receive treatment.

The IOM report called on both departments to ensure that the largest possible number of service members and veterans have timely access to diagnosis for PTSD and to evidence-based care, including cognitive behavioral therapy. Treatment for PTSD should be integrated into programs to treat other physical and mental conditions affecting service members and veterans. The DoD and the VA also should explore ways to overcome barriers that keep some individuals from receiving care. For example, patients may be concerned that a diagnosis of PTSD will affect career advancement, or that they may have to travel long distances or take extended time away from work and other duties to reach a qualified health provider. A variety of emerging technologies, including telemedicine, Internet-based approaches, and virtual reality, offer promise for expanding the availability and accessibility of evidence-based care for PTSD, and could also promote adherence to treatment.

In addition to expanding access to care, the DoD and the VA should better track treatments given to patients, as well as their outcomes; currently, there are insufficient data to evaluate the efficacy of many PTSD-related services. The DoD and the VA also should assess the efficacy and costs of complementary and alternative therapies for PTSD, such as yoga, acupuncture, and animal therapy. As these data emerge, the DoD and the VA should disseminate their findings widely.
For the second phase of its PTSD treatment study, the IOM committee is collecting additional data from the DoD and the VA on the operation, effectiveness, and cost of their PTSD programs. Using this information, the committee plans to refine its findings and recommendations and issue a final report in the summer of 2014.

**Evaluating therapies for treating traumatic brain injury**

In the wars in Iraq and Afghanistan, TBI is considered the “signature wound,” because it is a common outcome of the improvised explosive device attacks prevalent in these conflicts. Estimates made in 2010 suggested that more than 30,000 soldiers had suffered TBI, which can cause cognitive and psychosocial problems in addition to physical damage. As increasingly effective methods to save the lives of service members with TBI are developed, improving their care during recovery and helping them to regain (or compensate for) their losses of function can enable them to adjust more smoothly to daily life post-injury.

![Incidence of TBI in the Military](chart)

Number of U.S. service members with TBI, by severity.

**DATA SOURCE:** Defense and Veterans Brain Injury Center, 2011.

**SOURCE:** *Cognitive Rehabilitation Therapy for Traumatic Brain Injury: Evaluating the Evidence*, p. 25.
One form of treatment for TBI is cognitive rehabilitation therapy (CRT), which encompasses a range of therapeutic approaches provided by health professionals in a variety of fields. CRT is often tailored to each patient’s needs and involves participation of the patient’s family or caregivers. But it is a relatively new method for treating TBI. So, to ensure that service members and veterans are receiving the best possible care, the DoD asked the IOM to conduct a study to determine CRT’s effectiveness in treating TBI.

In its report, *Cognitive Rehabilitation Therapy for Traumatic Brain Injury: Evaluating the Evidence* (2011), the IOM committee concluded that although there is some evidence about the value of CRT, it is not sufficient to develop definitive guidelines on how to apply the various therapies. Still, given the limited but potentially promising evidence for CRT’s effectiveness, the committee supported continued use of CRT for treating patients with TBI, and recommended research to fill remaining knowledge gaps.

Toward this end, the report recommended that the DoD support a number of lines of investigation to further define the types of therapies in use, standardize the terms used in each approach, and evaluate their outcomes among patients. This will require, among other things, conducting studies that have larger population samples and examine a more comprehensive set of variables regarding injuries, patient characteristics, and therapeutic outcomes. The DoD should follow this foundational work with rigorous clinical studies to help answer questions about which patients would benefit the most from specific CRT interventions.

As a follow-up to the report, the IOM conducted a workshop to explore how research can best advance the science of CRT and its value in treating service members and veterans with TBI. The workshop brought together experts in health services administration, research, and clinical practice from the civilian and military arenas. Their discussions are presented in *Cognitive Rehabilitation Therapy for Traumatic Brain Injury: Model Study Protocols and Frameworks to Advance the State of the Science: Workshop Summary* (2013).

The workshop participants examined what types of research will be needed to move the field toward evidence-based clinical guidelines; what the translational pipeline should look like and what its current deficiencies
are; and how decision makers, as they consider which research to support, might balance the urgency of the problem for affected populations with the evidence of CRT effectiveness and the costs of implementing interventions.

To help identify a path forward, participants examined three broad strategies that could guide research decisions. The first strategy would identify a method of CRT shown to have significant effects in patients’ daily lives, implement it, and then study the active and essential ingredients and mechanisms of action. The second approach would take a middle road that focuses less on the immediate need to implement interventions and more on establishing robust evidence of the effectiveness of a clinically important but less documented type of CRT intervention. The third strategy would take a more research-heavy approach that favors rigorously establishing the effectiveness of an intervention and moving conceptually sound and promising treatments along the translational pipeline into clinical practice.

**Assessing health effects of exposure to burn pits**

Many military personnel returning from Iraq and Afghanistan report health problems they attribute to exposure to emissions from the burning of waste in open-air “burn pits” on military bases. Particular controversy surrounds the burn pit used to dispose of solid waste at Joint Base Balad (JBB) near Baghdad, one of the largest military bases in Iraq and a central logistics hub for U.S. forces there. A previous study by the U.S. Army Center for Health Promotion and Preventive Medicine concluded that burn pits pose an acceptable or “safe” health risk to personnel stationed at JBB. Nevertheless, concerns have continued among military personnel and veterans, their families, and the public.

In response, the VA asked the IOM to conduct a study to determine the types of substances burned in the pits and the emissions released into the air, and to identify potential long-term health effects from exposure to the emissions. In *Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan* (2011), the IOM committee concluded that there are insufficient data to determine whether service members’ exposures...
to emissions are associated with cancer, respiratory disease, circulatory disease, or neurologic disease, or with adverse reproductive and developmental outcomes. The levels of most pollutants of concern at the JBB burn pit, for example, were not higher than levels measured at other polluted sites worldwide. Moreover, research on other populations exposed to complex mixtures of pollutants from burning substances, primarily firefighters and workers at municipal waste incineration plants, has not detected increased risk for these conditions.

The committee did find, however, that there is suggestive, though limited, evidence of an association between exposure to burn pit emissions and reduced pulmonary function among military personnel. The report concluded that given the variety of hazards and substances to which troops are exposed in the field, service in Iraq and Afghanistan in general—not exposure to burn pits alone—might be associated with long-term health effects. Of specific concern are the high ambient concentrations of particulate matter generated by both human activities and natural sources in the military zones.

The IOM committee pointed to shortcomings in research and gaps in evidence that prevented firmer conclusions, and it recommended a path to overcome these limitations. For example, the committee recommended that the DoD support a longitudinal study to evaluate the health status of service members, beginning with their time of deployment to JBB, to determine their incidence of chronic diseases, including cancers, that tend not to show up for decades. The committee also recommended a tiered approach to gathering data, with each step building on prior work, to better characterize exposures to the complex mixture of burn pit emissions.

In 2013, the VA announced plans to conduct a long-term study of the possible health effects of deployment to Iraq and Afghanistan, including exposure to open-air burn pits and other environmental hazards.
Combating substance use disorders

Like many sectors of society, the military has a long history of alcohol and other drug use—and recent trends are not encouraging. Since the start of the wars in Iraq and Afghanistan, alcohol abuse among service members has increased. More personnel than ever also take prescription painkillers, often to treat combat-related injuries and other physical strains from combat duty during multiple deployments; rates of prescription drug abuse have increased as well.

In light of these trends, the DoD asked the IOM to analyze policies and programs that pertain to prevention, screening, diagnosis, and treatment of substance use disorders (SUDs) for active-duty personnel, members of the National Guard and Reserve, as well as military families. In its report *Substance Use Disorders in the U.S. Armed Forces* (2013), the IOM committee concluded that outdated approaches to prevention and treatment, barriers to care, and other policy and structural problems hinder the DoD’s ability to curb SUDs among military populations. The report cited the DoD’s own *Clinical Practice Guideline for Management of Substance Use Disorders* as an excellent resource on effective approaches, although it is not consistently followed.

The IOM committee concluded that the highest levels of military leadership must acknowledge the alarming facts about substance use...
and address them using an arsenal of public health strategies, including proactive solutions such as limiting access to alcohol, enforcing underage drinking laws, and providing screening and brief interventions for unhealthy alcohol use. Military leaders should encourage service members to seek help. A number of barriers—including availability of care, gaps in insurance coverage, stigma related to substance abuse, fear of negative consequences, and lack of confidential services—now limit this strategy, and the IOM report recommends remedies for each.

In one example highlighted by the committee, the Army has implemented a promising pilot program of confidential alcohol treatment and education, demonstrating that service members will use confidential programs when given the opportunity. This program should be expanded across the Army and to the other military branches as well. The DoD also should modify TRICARE, the program that provides health insurance to service personnel and their families, to ensure that it covers the latest evidence-based methods in detecting and treating SUDs.

### Treating health effects in Gulf War veterans

Following the Persian Gulf War of 1991, the IOM conducted a series of studies, sponsored by the VA, to examine the scientific and medical literature on potential health effects of military personnel’s exposure to chemical and biological agents during this conflict. The IOM issued its first report in the Gulf War and Health series in 2000. In 2013, the IOM issued a stand-alone report, *Gulf War and Health: Treatment for Chronic Multisymptom Illness* (2013). In this report, the IOM study committee comprehensively reviewed treatments for this complex condition and recommended the best approaches to managing care for veterans. Although the report focuses on veterans of the 1991 Gulf War, its findings may have relevance for service members who fought in Iraq and Afghanistan and develop symptoms of chronic multisymptom illness (CMI).
CMI affects roughly one-third of Gulf War participants, and it imposes serious health burdens. Unlike most other postcombat illnesses, CMI does not have a unitary set of symptoms, and its symptoms can vary from person to person. In the IOM report, CMI is defined as the presence of a spectrum of chronic symptoms in at least two of six categories—fatigue, mood and cognition, musculoskeletal, gastrointestinal, respiratory, and neurologic—experienced for at least 6 months.

As a first step toward providing better care for veterans with CMI, the IOM committee recommended that the VA intensify its efforts to identify CMI patients and bring them into the health care system. To this end, the VA should ensure that its electronic health record for each veteran prompts clinicians to inquire about symptoms consistent with CMI.

Next, the VA should provide comprehensive care for the entire constellation of symptoms a veteran displays. In its review of treatment options, the IOM committee found that no single therapy or treatment approach can help all veterans. Each veteran needs his or her own personal care plan to manage CMI and other possible chronic ailments and to avoid the risk of under- or overtreatment.

On a broader level, the VA should implement a long-term integrated management approach throughout its health care system for veterans with CMI. The VA could leverage existing programs such as postdeployment patient-aligned care teams (PD-PACTs), a relatively recent model of care whose implementation is ongoing. As the name suggests, PD-PACTs rely on a team-based approach to provide veterans with comprehensive care, follow-up, and education. Teams may include a project manager, primary care physicians, nurses, mental health clinicians, social workers, and, as needs arise, other specialists. CMI patients should be active members of these teams, helping to ensure that the care they receive reflects their needs, opinions, and concerns.
The VA, as the nation’s largest health education and health professional training institution, also should play a key role in building a cadre of clinicians and other professionals skilled in caring for patients with CMI. Toward this goal, each VA medical center should appoint a “CMI champion” to serve as an internal resource of information and advice about how to best serve patients with the condition.

**Tracking the health effects of Agent Orange**

An ongoing series of IOM studies focuses on veterans of the Vietnam War. From 1962 to 1971, the U.S. military sprayed herbicides, including a mixture called Agent Orange, over large swathes of Vietnam and neighboring areas. Following the war, many veterans and their families began attributing a range of chronic and life-threatening diseases to exposure to Agent Orange or its toxic contaminant TCDD, known commonly as dioxin.

In 1991, Congress directed the IOM to study the veterans’ claims. The IOM’s first report, *Veterans and Agent Orange: Health Effects of Herbicides Used in Vietnam* (1994), provided a comprehensive review of the epidemiologic evidence regarding links between exposure to the chemicals and a spectrum of adverse health effects, including various cancers, reproductive and developmental problems, and neurological disorders. Since then, the IOM has published biennial updates. Collectively, the reports provide the scientific basis on which the VA awards disability compensation.

In the most recent report, *Veterans and Agent Orange: Update 2010*, the IOM study committee reviewed epidemiologic studies published since its 2008 update, along with other types of studies that might offer additional insight. For example, the results of controlled laboratory investigations may inform whether association between a chemical and a given effect is biologically plausible. Studies of various occupational groups exposed to the chemicals—chemical plant, agricultural, and forestry workers, for example—may provide another line of evidence, as may studies of world populations exposed via release of chemicals into the environment.
The new evidence reviewed in the 2010 update largely conformed with previous findings. In the report, the IOM committee rearranged some of the tables describing associations between various types of exposure and health outcomes to better reflect the accumulating body of research.

For a disease called early-onset transient peripheral neuropathy, the committee concluded that new evidence indicates that some individuals continue to manifest neuropathy symptoms long after exposure to the chemical agent. Therefore, the committee chose to remove the word *transient* from the name of the condition, to recognize that some patients may never fully recover from the symptoms. As a result, the VA has proposed replacing the outdated term and description of symptoms in its list of diseases presumed to be connected to service-related Agent Orange exposure. The change would eliminate the current requirement that symptoms must resolve themselves within 2 years for a veteran to qualify for compensation. The VA solicited public comments on this proposal, and a decision is pending.

Like other reports in the series, the 2010 update recommended a slate of additional scientific studies to resolve continuing uncertainties about the health effects of Agent Orange and its contaminants. For example, the VA should more actively query its own medical databases to identify potential associations between service in Vietnam and specific health outcomes, particularly those that are less common. New epidemiologic protocols also should be developed to address the logistical challenge of determining whether the adult children and grandchildren of Vietnam veterans can suffer adverse health effects as a result of paternal exposure.

**Extending medical follow-up efforts**

Several groups of veterans are being tracked by the IOM’s Medical Follow-Up Agency (MFUA). Founded shortly after World War II, the agency facilitates a variety of epidemiological research studies and collaborates with qualified researchers from diverse backgrounds to obtain, disseminate, and analyze records data.

In one effort, MFUA is studying military personnel who participated in Project SHAD (Shipboard Hazard and Defense), a series of tests of U.S.
warship vulnerability to biological and chemical warfare agents conducted between 1962 and 1973. More than 5,800 personnel, mostly in the Navy and the Marines, took part. Many of the tests used simulants, substances with the same physical properties as certain chemical and biological warfare agents that at the time were thought to be harmless. Decades later, concerns have been raised about possible adverse health effects from exposure to the test agents and simulants.

MFUA conducted an epidemiological study sponsored by the VA that compared the health of SHAD veterans with the health of similar veterans who did not participate. The report on the study, released in 2007, found no clear evidence that specific long-term health effects were associated with participation in the project. Because of limitations in the size of the study and in the number of personnel who chose to participate, however, the findings were not considered definitive.

In collaboration with an ad hoc committee of experts, MFUA is now conducting a more extensive epidemiological study comparing the health status of the SHAD veterans with the control group, using automated health records. In its planning, the study committee solicited input from SHAD veterans about their experiences to help inform study activities. Called SHAD II, the study is scheduled to conclude in 2014. If the results indicate a difference in health outcomes between the groups, or if they suggest new hypotheses about specific health problems that could be related to the agents used in the tests, MFUA will be prepared to conduct additional research.

MFUA also has a research program under way to extend the value of the original Air Force Health Study—also known as the Ranch Hand Study—conducted between 1982 and 2006 by the U.S. Air Force. This longitudinal epidemiologic investigation focused on Air Force personnel who participated in herbicide spray missions (including Agent Orange) used against enemy combatants during the Vietnam War. Over the course of the study, more than 86,000 biologic specimens, including blood, urine, semen, and fat tissue, were col-
lected from subjects, as well as detailed information that included medical histories of the veterans and their families, employment and leisure activities, exposure to toxic substances, and health habits.

The IOM published a detailed account of the data and biologic specimens in a report titled *Disposition of the Air Force Health Study* (2006). In recognition of the value of this resource, Congress directed the VA to provide MFUA with funds to implement a program to inform the research community about this trove of materials and to foster innovative use of the assets. Under the 4-year program, begun in 2012, qualified researchers are able to use the materials for studies of the long-term impact of Vietnam service and for broader purposes, such as investigating the determinants of health and wellness in veterans.

**Improving federal medical centers**

Active-duty personnel and veterans injured during service deserve high-quality health care. At the same time, the U.S. government needs to find the most cost-effective and efficient ways of providing care. One challenge is that the VA and the DoD often operate separate medical centers in close proximity, leaving them underutilized or providing duplicative services.

The situation in North Chicago provided a case in point, with the two departments operating separate facilities less than 2 miles apart. In an effort to increase efficiency, in October 2010 the VA and the DoD opened a new, jointly operated facility, the Captain James A. Lovell Federal Health Care Center, to serve all of their beneficiaries from northern Illinois to southern Wisconsin. The Lovell FHCC was envisioned as a state-of-the-art facility that would provide seamless access to an expanded array of medical services. Using an unprecedented, unified system, the center would integrate clinical and administrative services under a single authority and would showcase new software solutions, enhanced efficiency, and cost savings.
To help determine whether these goals were achieved, the DoD sponsored an IOM study of the center’s performance. In *Evaluation of the Lovell Federal Health Care Center Merger: Findings, Conclusions, and Recommendations* (2012), the IOM committee concluded that it was too early to evaluate the center’s success in delivering health care of the same or better quality and at lower cost—when compared with the old model of separate VA and DoD facilities—without eroding patient or provider satisfaction. The report called on the VA and the DoD to develop a comprehensive evaluation plan to judge the center’s successes and failures using objective, measurable criteria, in order to build an essential knowledge base that can improve the Lovell FHCC and inform future endeavors.

Although knowledge gaps remain, the report concluded that the initial implementation of the Lovell FHCC has provided important lessons about how to integrate VA and DoD health care services, as well as identified obstacles the departments could overcome to make such mergers more effective and less costly to implement. The IOM committee recommended that the VA and the DoD develop a joint or interoperable electronic health record system that can serve all patients to replace the separate—and incompatible—systems now used by the two organizations.

Efforts also are needed to standardize various policies, procedures, and business practices to overcome differing approaches to handling the same functions. Such standardized solutions could include a unified process for credentialing health care providers, as well as uniform cost accounting, performance, and quality measures, drug formularies, and mail-order drug refill programs. To foster these and other changes, Congress may need to pass new laws to permit transfer of employees, funding, and property between the departments.
Information Technology in Health Care

As the United States reforms its health care system, public and private sectors alike are investing heavily in development and implementation of health information technologies. Collectively referred to as “health IT,” these technologies are used to collect, transmit, store, and manage health data and to extend the reach of health care. Broader and more innovative uses of health IT can improve patient health and safety and reduce operational and administrative costs.

As with many revolutionary technologies, the introduction and advancement of health IT come with challenges. The government, as well as private groups, have asked the Institute of Medicine (IOM) to explore health IT’s potential benefits, identify possible hazards, pinpoint policy and practical obstacles, and explore ways to promote broad adoption of health IT.

Building safer systems for better care

As the use of health IT has spread, spurred by reports of the potential benefits, accounts have emerged that in some cases, patients have actually encountered increased safety risks as a result of health IT products. The Department of Health and Human Services (HHS) asked the IOM to assess the performance of these technologies and identify actions that government and private-sector organizations can take to alleviate potential safety problems.
The IOM study committee concluded that overall, scientific evidence is insufficient to make broad conclusions about health IT and safety. The committee called on both government and the private sector to coordinate and increase oversight of health IT to identify and mitigate problems that emerge, as well as to take measures to ensure that the technologies are created and used effectively. To aid in this effort, the committee recommended that HHS monitor and publicly report on the progress of health IT safety annually, beginning in 2012. If progress is not sufficient as determined by the Secretary, HHS should direct the Food and Drug Administration (FDA) to regulate health IT products.

In *Health IT and Patient Safety: Building Safer Systems for Better Care* (2011), the IOM committee concluded that certain types of health IT have demonstrated success in improving safety in some settings. For example, hospitals that use well-planned computerized prescribing mechanisms and barcoding systems are better positioned to correctly administer medications to patients. But evidence is lacking to generalize such results across the entire health care system. Some studies have found improvements in patient safety for technologies such as electronic health records (EHRs), while others have found no effect. Most worrisome, studies of some health IT applications have found that poor human–computer interactions or inability to access data have led to dosing errors, failure to detect life-threatening illnesses, delayed treatment, and even to serious injury and death.

The committee found that to make health IT-assisted care safer, stakeholders should recognize that these technologies are not used in isolation, but are part of a larger sociotechnical system involving a range of health professionals, organizational structures, and health care settings. Safety analyses, therefore, should not look for a single “root cause” of problems, but should consider the system as a whole. The
committee recommended that HHS establish quality-management principles and risk-management processes to be used in designing and implementing health IT products and systems. HHS should also expand efforts to gather data on risks associated with health IT. Under current regulations, many technology vendors discourage the free exchange of safety-related information in their contracts with health care providers. To counter this trend, HHS should establish a mandatory mechanism for health IT vendors to report health IT–related deaths, injuries, or unsafe conditions, as well as a voluntary mechanism for providers. In addition, Congress should establish an independent federal body to investigate problems associated with health IT and make nonbinding recommendations, allowing flexibility for HHS, health care organizations, vendors, and other experts to determine the best course forward.

Following the release of the IOM report, the PSO Group, a national patient safety organization affiliated with the federal Agency for Healthcare Research and Quality, established a National Medical Safety Board to conduct independent safety investigations. When invited by a health care provider, the board will establish a multidisciplinary team to visit the provider’s site and assess its operations (including the use of health IT). Then,
under the provisions of the Patient Safety and Quality Improvement Act of 2005, the board will submit its findings and recommendations to the provider without threat of punishment.

**Expanding the digital world of health**

EHRs, which are intended to replace written health records, comprise a key part of the health IT spectrum. EHRs may include a range of data, including a patient’s medical history, medications and allergies, laboratory test results, radiology images, vital signs, personal statistics such as age and weight, demographic information, and billing records. Because they are in digital format, EHRs can be easily shared across different health care settings.

As the use of EHRs has expanded, some stakeholders have expressed interest in incorporating occupational information. There are more than 4,000 occupational fatalities, 3 million occupational injuries, and 160,000 occupational illnesses every year in the United States, making occupational factors significant in health promotion and disease and injury prevention. At the request of the CDC’s National Institute for Occupational Safety and Health (NIOSH), the IOM appointed a committee to assess the feasibility and potential benefits of incorporating occupational data in EHRs, examine current systems for collecting such data, identify technical challenges, and recommend next steps for NIOSH and other partners.

In *Incorporating Occupational Information in Electronic Health Records: Letter Report* (2011), the committee concluded that adding occupational data to EHRs could lead to more informed clinical diagnosis and treatment plans as well as more effective policies, interventions, and prevention strategies to improve the overall health of the working population. The committee recommended that NIOSH focus first on incorporating data from three main categories—occupation, industry, and work-relatedness—and advised on other topics including the assessment of data collection and incorporation in EHRs, requirements for storing and communicating occupational information, development of metrics and performance measures, and assessment of privacy concerns.
Value of Occupational Information for Diagnosis and Clinical Care

Workshop participants provided examples of how knowing a person’s occupation and industry might assist health care professionals in identifying the cause of an illness and enabling more efficient and effective care. These examples fall into three main categories:

1. Inform diagnosis for
   • workers exposed to respiratory hazards (e.g., occupational asthma),
   • workers who handle chemicals (e.g., occupational dermatitis), and
   • older workers exposed to noise (e.g., hearing loss wrongly attributed to age).

2. Improve treatment and inform plans for return to work by understanding
   • the impact of shift work and irregular schedules (e.g., exacerbations of diabetes),
   • legal requirements for return to normal duties (e.g., commercial drivers who have had a heart attack),
   • choice of non-drowsy medications for people who work with heavy machinery,
   • the need to keep food handlers out of work until they are noninfectious, and
   • choice of high blood pressure medications (e.g., diuretics) for people working in hot environments.

3. Provide education opportunities and connections to wellness programs such as
   • links to websites, printouts, or other educational materials in multiple languages;
   • community (i.e., non-employer) resources for workers; and
   • integration of occupational and clinical health records and links to employer resources (e.g., employee assistance programs, health coaching, workability programs), community primary care, and other resources.

The CDC, NIOSH's parent agency, responded to the IOM report by issuing a request for public comments regarding the inclusion of occupational information in EHRs. NIOSH indicated that it will use these comments in formulating a plan to respond to the IOM's recommendations.

Efforts are also under way to expand the incorporation of data on sexual orientation and gender identity. In 2011, the IOM released a report called *The Health of Lesbian, Gay, Bisexual, and Transgender [LGBT] People: Building a Foundation for Better Understanding*, the first comprehensive compilation of what is known about the health of each of these groups at different stages of life. The report outlined an agenda for the research and data collection necessary to form a fuller understanding of LGBT health. One of the report's recommendations was that if privacy concerns could be met, information on patients' sexual orientation and gender identity should be collected in EHRs, just as information on race and ethnicity is routinely collected currently.

Following the report’s publication, the IOM sponsored a workshop to further explore the implications of this recommendation. As captured in the workshop summary *Collecting Sexual Orientation and Gender Identity Data in Electronic Health Records* (2012), participants examined

- clinical reasons to collect data on sexual orientation and gender identity, from both an individual health care and a population health perspective;
- current practices among health care providers and facilities with regard to the collection of these data in EHRs;
- development of standardized questions that can be used to collect these data;
- the applicability of collecting and sharing these data across different providers and systems;
- policy considerations related to the collection of data, including the “Meaningful Use” process overseen by HHS;
- mechanisms for supporting providers and patients in the collection of these data; and
- development of appropriate privacy protections.
The broader use of digital health data can also support real-time knowledge generation to improve health and health care. Since its inception in 2006, the IOM Roundtable on Value & Science-Driven Health Care has focused on realizing such a “learning health system,” in which medical evidence is continuously generated and applied to improve care practices. With support from the HHS Office of the National Coordinator for Health Information Technology, the roundtable held a workshop to explore data quality issues and improvement strategies relevant to the use of digital health data for learning. The workshop, as reported in *Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary* (2012), examined current deficiencies in the reliability, availability, and usability of digital health data; explored strategies, priorities, and responsibilities to address such deficiencies; and considered the potential for applying information gained from large-scale health datasets to building a health care system geared to continuous learning.

Tools emerging from health IT are also being blended into an emerging field called “telehealth,” the delivery of health-related services and information via telecommunications technologies. In 1996, the IOM released a report called *Telemedicine: A Guide to Assessing Telecommunications for Health Care*, which helped bring telehealth’s potential benefits to public attention. Over the past two decades, the use of telehealth has grown, supported by federal funding and spurred by the private development of new technologies.

But many stakeholders feel that the use of telehealth has not yet realized its fullest potential benefits. With support from the Health Resources and Services Administration, the IOM convened a workshop to examine the future of telehealth technology and barriers to its expansion. As reported in *The Role of Telehealth in an Evolving Health Care Environment: Workshop Summary* (2012), participants discussed developments in telehealth, including the increasing role of the private sector; policies that have promoted or delayed the use of telehealth; and consumer acceptance of telehealth. They also examined how technological developments such as social networking are combining with EHRs to change the delivery of
health care in rural and urban environments, and explored actions the federal government can take to further the use of telehealth and improve health care outcomes while controlling costs.

**Sharing data and optimizing data use**

To be useful, data must be accessible to those who can use it to improve health outcomes by identifying emerging health problems and designing targeted individual and community-level responses. The IOM is giving this challenge increasing attention.

Together with HHS, the IOM in early 2010 launched the Community Health Data Initiative, a public–private collaboration with the goal of encouraging innovators to develop data-derived applications to raise awareness of health and health system performance and spark community action to improve health. In June 2010, the IOM and HHS held the Community Health Data Forum: Harnessing the Power of Information to Improve Health, which promoted the use of community-level health data to empower individuals and communities to make informed choices about their health.

In June 2011, the Health Data Initiative Forum focused on the wealth of data becoming available on health care coverage, access, cost, quality, products and recalls, benefits, and more. The meeting drew 550 attendees and featured more than 50 applications that harnessed data from HHS and other sources. Community leaders, consumers, employers, providers, and others showcased ways data could be used to spur health assessment, planning, and action.

The Health Data Initiative Forum III: The Health Datapalooza, held in June 2012, drew 1,450 participants and featured demonstrations of more than 100 technology solutions or applications intended to serve the needs of consumers, health care providers, employers, public health leaders, and policy makers. “The innovators present today are a great example of how data and technology can be used in powerful ways to help consumers and providers improve health,” HHS Secretary Kathleen Sebelius told the
attendees. “We’re not just creating new technology, but we’re empowering Americans to make better decisions about health and health care by putting information at their fingertips.”

The series continued in 2013 with the largest Health Datapalooza yet (1,900 attendees), co-sponsored by the IOM as a member of the Health Data Consortium. This event once again brought the value of health data to life by showcasing innovative applications, discussing data needs and uses, and promoting innovation in health, government, business, and technology.
Public health can take many forms: conducting community programs that foster healthful behaviors and reduce potential risks, distributing protective vaccines, responding to major disasters, monitoring health indicators to assess community health and well-being, and identifying and mitigating environmental hazards. Uniting constituents across diverse sectors, the field of public health endeavors to protect people where they live, work, and play.

Given its broad reach, public health features an array of government organizations and private groups that design and implement health-promoting policies and programs. The Institute of Medicine (IOM) often serves as an advisor in these efforts; indeed, public health has long been one of the IOM’s most concerted areas of inquiry.

Promoting a healthy future

Investing in public health

The United States spends more on health than other developed nations, yet it consistently scores lower on a number of important indicators of population health. The Robert Wood Johnson Foundation (RWJF) asked the IOM to convene a committee to consider three topics of relevance to population health: data and measurement, law and policy, and funding. The committee released its report on data and measurement in 2010 and its report on law and policy in 2011. Both reports concluded that the nation focuses too many resources on delivering medical services to individual patients with
immediate health needs while overlooking strategies that could more efficiently and effectively improve population health.

In its final report on funding, For the Public’s Health: Investing in a Healthier Future (2012), the committee reaffirmed the imbalance between the health system’s costs and benefits and called for more investment in the nation’s chronically underfunded public health system. The committee noted that only a small fraction of federal health spending goes to public health—just 3.1 percent in 2009—amounting to $251 per person in public health spending compared with $8,086 per person in spending on clinical care.

To guide allocation of public health dollars, the committee recommended that expert panels convened by the National Prevention Council, established by the Patient Protection and Affordable Care Act (ACA) under the leadership of the Surgeon General, should oversee the development of a minimum package of public health services to be provided by state and local health departments. As a starting point to meet the needs of public health departments, the committee suggested that federal spending on public health should be increased from its current level of about $11.6 billion per year to approximately $24 billion. There is solid evidence, the committee added, that this investment will be highly effective in building a healthier population—thus limiting future costs of clinical care.

Of the many potential ways to raise the additional funds, modestly taxing medical care services seems most promising, the committee concluded. The funds could be used to alter the environmental and social conditions that shape the health of communities but are largely beyond the traditional medical system’s ability to influence. Minnesota and Vermont have successfully used this form of tax to expand access to medical care. The committee noted that a tax on medical services is unlikely to have a substantial negative economic effect and would give governmental public health infrastructure the resources necessary to help
reign in preventable diseases, injuries, and their associated costs. Provisions of the ACA offer another funding route, the committee said. Roughly half of local public health departments (particularly those that serve large populations of low-income, uninsured residents) provide basic medical care as part of their services. As the ACA takes effect, Medicaid and new state health insurance markets will begin reimbursing clinical care for the individuals public health departments currently serve. State and local governments can allocate the funds freed up by this shift in coverage to support public health department activities that promote health and prevent illness and injuries.

The IOM report received widespread attention. For example, participants at the 2012 Annual Conference of Mayors developed a resolution to support the ACA’s Prevention and Public Health Fund, citing the report’s findings as evidence of the importance of investing in health promotion and disease prevention. In addition, Trust for America’s Health, a nonprofit public advocacy organization, published a report titled *A Healthier America 2013: Strategies to Move from Sick Care to Health Care in Four Years*, which endorsed the IOM’s recommendations and called for a national effort to “define, prioritize, and fully fund a set of foundational capabilities for public health departments at all levels of government.”

**Integrating public health and primary care**

The interplay between public health and primary care is the focus of another IOM study. Although they share common goals, public health and primary care have historically operated independently. The Centers for Disease Control and Prevention (CDC) and the Health Resources and Services Administration (HRSA), with additional support from the United Health Foundation, asked the IOM to examine past and current efforts to integrate primary care and public health and identify ways to foster closer collaboration.

In *Primary Care and Public Health: Exploring Integration to Improve Population Health* (2012), the IOM committee concluded that interac-
tions between the two sectors are so varied and dependent on local circumstances (such as demographics and resource availability) that it could not prescribe a specific model or template for integration. Instead, the committee presented a set of core principles derived from successful integration efforts. Effective integration, the committee noted, requires community engagement to define and tackle local population health needs, leadership to bridge disciplines and jurisdictions and provide support and accountability, sharing of data and analyses among partners, and sustained focus.

Using these principles as a framework, the committee offered a set of recommendations whose implementation would assist the federal government to create an environment that fosters broader integration of primary care and public health. The committee recommended that the CDC and HRSA connect staff, funding, and data at the regional, state, and local levels; inventory health and health care databases in order to create a consolidated platform for sharing and displaying local population health data; create research and learning networks that disseminate best practices; and develop the workforce needed to support the integration of primary care and public health.

To reach a range of audiences and spur action within communities and across the nation, the IOM produced a 13-minute video to highlight the report’s recommendations. The video featured descriptions of four regions—New York City; San Francisco; Durham, North Carolina; and several counties in eastern Colorado—where efforts to integrate public health and primary care have succeeded in improving the health

 Degrees of integration.

of the local populations. The video can be viewed at http://www.iom.edu/primarycarepublichealthvideo. In another outreach effort, the IOM held a meeting with the Association of State and Territorial Health Officials in July 2012 to explore practical ways to move the report’s recommendations into practice.

Other groups stepped forward in support of the report’s recommendations. In June 2012, the American Journal of Preventive Medicine and the American Journal of Public Health published a supplement titled “Integration of Primary Care and Public Health,” which highlighted intersections between the sectors and identified work that remains to realize integration. The supplement was sponsored by two sponsors of the IOM report (CDC and HRSA), the Agency for Healthcare Research and Quality (Department of Health and Human Services [HHS]), and the National Institute on Minority Health and Health Disparities (National Institutes of Health [NIH]).

Community-based prevention efforts
To achieve the full potential of community-based efforts to protect population health, leaders need to know which strategies are most effective, in terms of both benefits and costs. But making these determinations has often
proved challenging. Preventing illness requires immediate investments, but the benefits might not be realized for many years. Moreover, even people who would remain healthy in the absence of an intervention would share in its cost. The IOM examined this complex topic in a study sponsored by four private foundations—The California Endowment, the de Beaumont Foundation, RWJF, and the W.K. Kellogg Foundation. The IOM committee presented its findings and recommendations in An Integrated Framework for Assessing the Value of Community-Based Prevention (2012).

The committee concluded that a comprehensive framework for valuing community-based prevention programs and policies should meet three major criteria. First, it should account for benefits and harms in health, community well-being, and community process. Specifically, the committee defined health as reductions in the incidence and prevalence of physical and mental disease, declines in mortality, and increases in health-related quality of life; community well-being as social norms, how people relate to each other and their surroundings, and people’s willingness to invest in themselves and the people around them; and community process as elements that influence community participation in decision making, such as civic engagement, development of local leaders, social support, and social networks. Second, the framework should weigh benefits and harms associated with resources used in community-based prevention efforts. Third, it should take into account differences among communities that can affect the link between interventions and outcomes.

Across all areas, assessing equity will be important. For example, an intervention that improves the overall health of a community may achieve more strikingly positive results among citizens with a certain income level or occupation, thereby exacerbating health disparities. If achieving health equity is at odds with improving overall community health, priorities will have to be determined. Decision makers should consult with the community and other stakeholders to ensure that the value of community-based prevention policies and wellness strategies reflects their preferences. Open and transparent assessments of the value of a given intervention can enhance its legitimacy among community members.
The committee emphasized that the proposed framework is in its early stages and must be validated over time by demonstrating that it correctly distinguishes between interventions that improve health, community well-being, and community process and those that do not. This process will almost certainly entail refinement of the framework as well as expansion of the underlying evidence base. Finally, the comprehensive data necessary to measure tangible benefits are often not available, and methods for measuring intangible benefits are not yet well developed; the committee proposed a number of steps to help fill these gaps.

**Roundtable on Population Health Improvement**

The IOM formed the Roundtable on Population Health Improvement in 2012 to bring together diverse public health stakeholders to discuss topics of common interest. The roundtable focuses on three core concepts:
supporting fruitful interaction between primary care and public health, strengthening governmental public health, and exploring community action in transforming the social, environmental, and economic conditions that influence population health.

At the roundtable’s first workshop in April 2013, officials from the fields of public health, health care delivery, and academia shared their perspectives on the path forward in improving population health. A second workshop, held in June 2013, focused on exploring opportunities in public health and community-based interventions emerging in the implementation of the ACA. Such opportunities go beyond what can be done in a doctor’s office, including new ways of communicating about health, paying for care, and shaping what the 1998 IOM report *The Future of Public Health* called “the conditions in which people can be healthy.”

**A global look at U.S. health**

The United States is among the wealthiest nations in the world, but it is far from the healthiest. For many years, Americans have been dying at younger ages than people in almost all other high-income countries. This health disadvantage prevails even though the United States spends far more per person on health care than any other nation. To gain a better understanding of this phenomenon, NIH and HHS asked the National Research Council (NRC) and the IOM to investigate potential reasons for the U.S. health disadvantage and assess its larger implications.

The NRC/IOM committee’s report, *U.S. Health in International Perspective: Shorter Lives, Poorer Health* (2013) compared the United States with 16 other affluent nations, including Australia, Canada, Japan, and many Western European countries, providing the first comprehensive survey of multiple diseases, injuries, and behaviors across the life span. The United States scores poorly in nine key areas of health: infant mortality and low birth weight, injuries and homicides, teenage pregnancies and sexually transmitted infections, prevalence of HIV and AIDS, drug-related deaths, obesity and diabetes, heart disease, chronic lung disease, and disability.
Many of these health conditions disproportionately affect children and adolescents. The committee also found that the United States outperforms its peers in some areas of health and health-related behavior, including lower death rates from stroke and cancer, better control of blood pressure and cholesterol levels, lower rates of smoking, and life expectancy past age 75.

Although flaws in the U.S. health care system may contribute to Americans’ poorer relative health, the committee concluded that many
factors could be responsible, including individual behaviors, underlying social values and public policies. For example, Americans are more likely to engage in certain unhealthy behaviors, such as heavy caloric intake and actions that increase the risk of fatal injuries. The United States also has relatively high rates of poverty and income inequality and lags behind other developed countries in spending on family and children’s services and youth education.

To improve U.S. health standings, the report recommended a dedicated effort to pursue established national health objectives. The study committee called for a comprehensive outreach campaign to alert the American public about the nation’s health disadvantage and start a national discussion about its implications. The U.S. government should expand data collection and research to better understand the factors responsible for Americans’ comparative poor health and pursue potential solutions, including lessons learned from other countries.

### Measuring progress in health

How can we measure the progress of efforts to improve Americans’ health? For three decades, HHS has produced a series of benchmark Healthy People reports. The most recent of these is *Healthy People 2020*, released in 2010 to set health objectives for the next decade. *Healthy People 2020* uses a set of 26 Leading Health Indicators (LHIs) to communicate high-priority health challenges and actions that can be taken to mitigate them.

In *Toward Quality Measures for Population Health and the Leading Health Indicators* (2013), the IOM committee made six recommendations about using the LHIs from *Healthy People 2020* as a starting point for quality measures that can be used not only to improve clinical care, but also to foster a multisectoral health system. The committee recommended that HHS and its partners in population health improvement (e.g., public health agencies, health care organizations, and communities) should also adopt a portfolio of measures of the quality of the multisectoral health system. This portfolio should include summary scores reflecting population-level
health outcomes and healthy conditions; balance parsimony with sufficient breadth; and inform assessment, improvement, and accountability across the multisectoral health system. The committee identified a set of criteria to be used for measure selection, and also called on HHS to establish or designate a nongovernmental, appropriately equipped entity to endorse measures of quality for the multisectoral health system. Another recommendation called on HHS to convene stakeholders to facilitate the integration of quality measures into all activities under the Three-Part Aim, with a special focus on social and environmental determinants, equity, and the concept of total population health. Finally, the report recommended that HHS develop, implement, and support data collection, analysis, and dissemination mechanisms for the portfolio of quality measures so that they are usable at the national, state, and local levels.

**Assessing vaccine safety**

Immunizations are a cornerstone of public health efforts to protect people from a host of infectious diseases. Still, vaccines are not free from adverse effects, although most are very rare or very mild. Under the National Childhood Vaccine Injury Act of 1986, Congress established the National Vaccine Injury Compensation Program to compensate people who have been injured by vaccines. HHS, which administers the compensation program, asked the IOM to review eight key vaccines and evaluate the scientific evidence for a number of suggested links with adverse events.

After reviewing more than 1,000 research articles, the IOM committee concluded that few health problems are caused by or clearly associated with
vaccines. In its report, *Adverse Effects of Vaccines: Evidence and Causality* (2011), the committee reported that it found convincing evidence of only 14 adverse outcomes—including seizures, inflammation of the brain, and fainting—that can be caused by certain vaccines, although these outcomes occur rarely. The committee also found indicative, though less clear, data on associations between specific vaccines and four other effects, including allergic reactions and temporary joint pain. The evidence shows no links between vaccines and certain serious conditions that have been issues of public concern, including type 1 diabetes and autism.

Convincing evidence shows that the measles-mumps-rubella (MMR) vaccine can lead to fever-triggered seizures in some individuals, although these effects are almost always without long-term consequences, the committee concluded. The MMR vaccine can also produce a rare form of brain inflammation in some people with severe immune system deficiencies. In a minority of patients, the varicella vaccine against chickenpox can induce brain swelling, pneumonia, hepatitis, meningitis, shingles, or chickenpox. The majority of these effects, the committee found, have occurred in individuals with immunodeficiencies that increase their susceptibility to the live viruses used in the MMR and varicella vaccines. Furthermore, six vaccines (MMR, varicella, influenza, hepatitis B, meningococcal, and the tetanus-containing vaccines) can trigger anaphylaxis, an allergic reaction that occurs shortly after injection. More generally, the injection of any vaccine can trigger fainting and inflammation of the shoulder in some individuals.

The committee’s review also concluded that evidence supports rejecting a causal link between certain vaccines and four specific conditions. The MMR vaccine and diphtheria-tetanus-acellular pertussis (DTaP) vaccine do not cause type 1 diabetes, and the MMR vaccine does not cause autism, according to the results of several studies. Finally, the evidence shows that the inactivated flu shot does not cause Bell’s palsy or exacerbate asthma or reactive airway disease episodes in children and adults.
Mitigating environmental hazards

The Environmental Protection Agency (EPA) is dedicated to protecting the environment and minimizing health risks to humans. In meeting this charge, the agency estimates the nature, magnitude, and likelihood of risks and identifies regulatory actions to mitigate those risks and protect public and environmental health. However, the EPA often encounters uncertainties in the information it uses for its decision-making process. The agency asked the IOM to provide guidance for decision makers and their partners in states and localities to better manage risk when uncertainty is present.

In *Environmental Decisions in the Face of Uncertainty* (2013), the IOM study committee reviewed the EPA’s decision-making procedures and noted areas for improvement. The EPA has a long record of producing risk assessments and guidance documents relating to the analysis of uncertainty in estimating human health risks. But, for a number of reasons, the agency has paid less attention to the uncertainties in a variety of other factors (economic, technological, and social) that may also be important in environmental decisions. The committee recommended that the EPA develop methods to systematically describe and account for these non-health-related uncertainties in its decision-making process.

The EPA also should ensure that its decision-making documents and communications to the public and other stakeholders include information about uncertainties encountered in the decision-making process, how those uncertainties affected the decision at hand, and what uncertainties remain. The IOM committee noted that EPA communications should make clear that uncertainty is inherent in science, including the science that informs its decisions. The committee suggested that in addition to contributing to full transparency, providing information about and fostering discussion of uncertainties, including unresolved uncertainties, could eventually lead to greater public understanding and appreciation of uncertainty in decision making.

The EPA should also continue to work with stakeholders, particularly the general public, to better incorporate their values and concerns in its determination of which uncertainties should be analyzed, factored into
Implications of Uncertainty Analysis for Decision Making

Health Uncertainties
Uncertainty analyses in human health risk estimates can help decision makers to

• evaluate alternative regulatory options;
• assess how credible extreme risk estimates are and how much to rely on them in decision making;
• weigh the marginal decrease in risk against the effort made to reduce it;
• clarify issues within a decision by using scenarios to characterize very different worlds; and
• in the case of scenario analyses for deep uncertainty, identify regulatory solutions that are effective over a broad spectrum of scenarios.

Uncertainties About Technology Availability
Uncertainty analyses in technology availability can help decision makers to

• differentiate between well-established technologies with reasonably well-known costs, and those that have not been used for the purposes at hand; and
• consider which technology may be considered “best practicable” or “best available” by providing information about both the likelihood of success of the unproven technologies, the time frame for success, and the effectiveness if successful.

Uncertainties About Cost and Benefits
Given the highly uncertain estimates of both health benefits and costs, uncertainty analyses in cost–benefit analyses can inform decision makers about

• how difficult it is to differentiate among different potential decisions;
• the disagreement among experts about the way regulation affects the economy, even when using similar models; and
• the ranges and sensitivity of estimates to different variables.

the decision-making process, and communicated. This collaboration could allow EPA decision makers to systematically assess and better explain the role that public sentiment plays in the decision-making process, as well as other factors that are difficult to quantify, the committee noted.

**Roundtable on Environmental Health Sciences, Research, and Medicine**

The IOM’s Roundtable on Environmental Health Sciences, Research, and Medicine provides another mechanism for examining a variety of environmental health topics—some of them sensitive and difficult. The roundtable currently focuses on areas such as sustainable development, climate change, drinking water needs and challenges, energy development and use, and environmental health decision making, and in recent years it has adopted an increasingly global perspective.

The roundtable hosts a series of webinars that can be accessed online by a broad range of audiences. In 2012, the roundtable’s Global Environmental Health and Sustainable Development Innovation Collaborative conducted three webinars focused on how the United Nations is planning its post-2015 development agenda for its Millennium Development Goals (MDGs). Organized with support from the National Institute of Environmental Health Sciences and the Pan American Health Organization, the webinars included discussions of lessons learned in developing the MDGs and potential goals for development frameworks being debated and negotiated at the global level. The IOM collected highlights of the presentations and discussions in *Global Development Goals and Linkages to Health and Sustainability: Workshop Summary* (2013).

The roundtable also held a workshop to explore the health impacts of shale gas extraction technologies and discuss ways to mitigate potential adverse effects on the public. Natural gas extraction from shale rock formations—which often uses a method called hydraulic fracturing, sometimes referred to as “fracking”—has received considerable attention in the media for its regulatory complexities and impact on rural communities. But the environmental public health impacts of shale gas extraction have received less attention.
ties. But the environmental public health impacts of shale gas extraction have received less attention. At the workshop, described in *Health Impact Assessment of Shale Gas Extraction: Workshop Summary* (2013), participants examined the state of the science on shale gas extraction, the direct and indirect environmental health impacts of shale gas extraction, and the use of health impact assessments to help decision makers identify the public health consequences of hydraulic fracturing.

**Preparing for disasters**

Health care and public health systems must be capable not only of handling the everyday needs of the populations they serve, but also of continuing to operate during and after major disasters, whether these disasters are natural or manmade incidents. At the request of HHS, the IOM formed a committee to help state and local officials develop effective means of meeting health needs during disasters, which can stress health systems to the breaking point and disrupt delivery of vital medical services. In its report, issued in 2009, the committee offered guidance on how to establish and implement “crisis standards of care” (CSC) plans that would direct providers in allocating limited resources in a way that is fair and equitable and benefits the population as a whole.

The implementation of CSC involves a substantial shift in normal health care activities and the reallocation of staff, facilities, and resources. In order to make this transition quickly and effectively, each organization needs to identify in advance the core functions it must perform in a crisis and the persons or sectors responsible for each task. In its report, the IOM committee provided tools and templates to help different stakeholders involved in disaster planning and response identify these core responsibilities.

Following the release of the 2009 report, the Department of Veterans Affairs, the National Highway Transportation Safety Administration, and HHS asked the IOM to reconvene the committee to evaluate progress and provide additional guidance on developing and implementing CSC. In *Crisis Standards of Care: A Systems Framework for Catastrophic Disaster Response* (2012), the IOM committee concluded that although most areas of the country have systems in place to handle relatively conventional
emergencies, such as an airplane crash or building collapse, systems for delivering health care in catastrophic situations, such as a pandemic or a devastating earthquake, remain rudimentary at best. The report further emphasized that integrated planning for a coordinated response by state and local governments, emergency medical services, health care organizations, and health care providers in the community is critical to successfully responding to disasters. In addition, the report provided a foundation of underlying principles, steps needed to achieve implementation, and pillars of the emergency response system—separate factors that together uphold the jurisdictions responsible for ensuring that CSC planning and response occurs.

The committee recommended that health care organizations adopt a system-based framework to guide the allocation of resources and delivery of care during crises. A systems approach emphasizes the importance of coordination and integration across the full spectrum of stakeholder groups to guarantee a unified, effective response and ensures that all stakeholders follow consistent protocols that take into account legal and ethical considerations for CSC.

Because public engagement is crucial to the development and use of CSC, the report also provided a model process and set of tools to facilitate public sessions on crisis planning and disaster response. These public engagement sessions will help community members and other stakeholders understand why CSC are necessary and how they will be applied.

Following the release of the report, the study sponsors asked the IOM to convene a committee to build on the foundation established in previous reports. In Crisis Standards of Care: A Toolkit for Indicators and Triggers (2013), the IOM committee examined indicators and triggers that guide transitions from pre-disaster standards to CSC and ultimately back to conventional standards. Indicators are measurements or predictors that can be used to identify when proactive steps should be taken to prevent overload and when strains on a health system’s capacity make
The development of indicators and triggers was identified as a key step in the development of CSC plans (IOM, 2012). Following the release of the 2012 report, the development of indicators and triggers was specifically noted in the Hospital Preparedness Program and Public Health Emergency Preparedness cooperative agreements (ASPR, 2012a; CDC, 2011). The 2012 report contains extensive details about the roles and responsibilities for each component of the emergency response system, along with templates that identify core functions and tasks in both the planning and implementation of CSC. These templates use the same structure as the PHEP and HPP capabilities.

The emergency response system framework described above is consistent with the approach being used to develop CSC plans. The report contains a practical discussion toolkit to help stakeholders customize indicators and triggers for their own organizations, agencies, and jurisdictions.
Forum on Medical and Public Health Preparedness for Catastrophic Events

The IOM’s Forum on Medical and Public Health Preparedness for Catastrophic Events aims to catalyze public–private collaboration where there is synergy among potential partners; define the scope of the field and thus set the stage for future policy action; bring ongoing attention and visibility to important preparedness topics; explore new approaches to resolve controversial areas; and elevate the general understanding and visibility of medical and public health preparedness in the broader research and public policy communities.

The forum casts a broad net, covering areas such as disaster preparedness training, medical surge capacity, psychological and community resilience, research and evaluation, and response and recovery, among others. The forum’s recent efforts include joining with the New York Academy of Medicine to convene a meeting of experts just 2 weeks after Hurricane Sandy hit the Eastern seaboard to identify key research questions emerging from the disaster, with a particular focus on those that required immediate attention to ensure that relevant data were not lost.

At the request of the CDC, the forum held a series of workshops to explore the potential outcomes of an influenza pandemic. Public Engagement on Facilitating Access to Antiviral Medications and Information in an Influenza Pandemic: Workshop Series Summary (2012) captures participants’ discussions. Influenza pandemics can overwhelm health care systems with large numbers of sick patients, as well as people who are worried they may be sick. In such a scenario, the distribution and dispensing of antiviral medications will need to begin as early as possible and persist long enough to treat multiple waves of the pandemic. At the forum’s workshops—which took place in Los Angeles, California; Fort Benton, Montana; and Chattanooga, Tennessee—participants discussed several antiviral distribution strategies the CDC was considering to ensure quick, safe, and equitable access to potentially life-saving drugs and critical information about risks and treatment options.

At another Forum workshop, participants focused on the possible impact for neighboring communities of the denotation of an improvised nuclear device (IND) in a major U.S. city. Such an incident would result
in tens of thousands to hundreds of thousands of victims—overwhelming public health, emergency response, and health care systems in surrounding regions and impacting systems nationwide. As presented in Nationwide Response Issues After an Improvised Nuclear Device Attack: Medical and Public Health Considerations for Neighboring Jurisdictions: Workshop Summary (2013), participants explored key response requirements for local and regional public health and health care systems after an IND detonation. Discussions included understanding the differences between types of radiation incidents, the implications of an IND attack for outlying communities, and the roles of regional health care coalitions in coordinating
response efforts. After the workshop, the IOM produced an infographic, available at www.iom.edu/INDresponse, to engage the public in IND preparedness planning.

**Reducing the toll of violence**

Firearm-related incidents injure or kill more than 100,000 people in the United States each year. In January 2013, President Barack Obama issued 23 executive orders directing federal agencies to find ways to reduce the toll of firearm-related violence. One of these orders directed the CDC to join with other federal agencies in identifying the most pressing problems in firearm violence research. In response, the CDC and the CDC Foundation asked the IOM, in collaboration with the NRC, to develop a potential research agenda.

In *Priorities for Research to Reduce the Threat of Firearm-Related Violence* (2013), the IOM/NRC committee proposed a framework for research to improve understanding of the public health aspects of gun-related violence, including its causes, the overall health burden, and possible interventions. The committee suggested that significant progress can be achieved in 3 to 5 years through a research program that focuses on five high-priority areas: (1) the characteristics of gun violence, (2) risk and protective factors, (3) prevention and other interventions, (4) gun safety technology, and (5) the influence of video games and other media. In addition, the committee noted that focusing on three specific populations—the general population, the youth population, and the offender population—should help in obtaining actionable information that can be used to develop interventions.

The public health research program recommended by the IOM and the NRC should be integrated with research conducted from criminal justice and other perspectives to provide a complete knowledge base, as no single agency or research strategy can provide all of the answers, the committee cautioned. This coordinated research agenda is expected to generate evidence that will enable the development of sound policies that protect the public’s well-being while respecting the rights and responsibilit
ties central to gun ownership in the United States. In the absence of this research, the committee noted, policy makers will be left to debate controversial policies without scientifically sound evidence about their potential effects.

**Forum on Global Violence Prevention**

Violence—including child abuse, intimate partner violence, elder abuse, sexual violence, gang violence, and suicide—is a major public health problem worldwide, with many low- and middle-income countries experiencing the greatest burdens. The IOM’s Forum on Global Violence Prevention, established in 2010, is committed to helping find ways to reduce violence worldwide by fostering dialogue across various sectors, promoting research on risk and protective factors related to violence, and encouraging evidence-based prevention efforts.

During the past 25 years, there has been a shift in the field of violence prevention—previously seen as inevitable, violence is now understood to be preventable. In exploring the occurrence of violence, researchers have recognized the tendency for violent acts to occur in clusters, to spread from place to place, and to develop cyclically or mutate, much like disease epidemics. At a workshop convened by the forum, as reported in *Contagion of Violence: Workshop Summary* (2012), participants explored the epidemiology of violence, possible processes and mechanisms by which violence is transmitted, how contextual factors mitigate or exacerbate the occurrence or spread of violence, and ways in which the contagion of violence might be interrupted.

As practitioners in the field of violence prevention have gained further insight into successful avenues of research and intervention, developing effective ways to share this information is crucial. How can traditional tools of dissemination be used more effectively? How can newer tools, such as Internet and mobile technologies, be incorporated? How can what works in one setting be optimized for other settings? These questions were discussed at a forum workshop recapped in *Communications and Technology for Violence Prevention: Workshop Summary* (2012). Participants explored the use of traditional and new media to communicate evidence-based information for violence prevention, as well as new applications of...
social media and communications technologies. Workshop discussions also highlighted evidence-based best practices from other arenas of global health where such tools show potential for success.

Promoting equity, reducing disparities

In 2000, the U.S. Surgeon General released several reports that showed dramatic disparities in health and health care by race and ethnicity. People of color were found to experience worse health outcomes than whites; they also experienced both higher levels of tobacco use and lower levels of access to necessary mental health services compared with the majority white population. In response, Congress and President Bill Clinton ushered in the first legislation directly focused on the reduction of health disparities. Among other actions, the law created the National Center for Minority Health and Health Disparities within NIH and authorized the HHS Agency for Healthcare Research and Quality to measure progress on the reduction of disparities on an ongoing basis.

The IOM also contributed to efforts to reduce health disparities. In 2001, it released Crossing the Quality Chasm: A New Health System for the 21st Century, a landmark report that highlighted the importance of focusing on the quality of health care, rather than simply on access and cost. Two years later, the IOM released Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care, a report that constituted the first comprehensive evidence that racial and ethnic minorities have less access to health care, and that the care these groups receive is often of poor quality.

Amid this growing awareness of fundamental disparities in health and health care, the IOM formed the Roundtable on the Promotion of Health Equity and the Elimination of Health Disparities in 2007. The roundtable focuses attention on racial and ethnic disparities in health and health care as a national problem; encourages the development of programs and strategies to reduce disparities; and promotes the emergence of new leadership.

Recently, the roundtable convened a workshop to examine ways to ensure the promotion of health equity in the implementation of the ACA.
The roundtable also convened a workshop in November 2012 that focused on the role of culture as a social determinant of health, with a particular focus on Native American/First Nation/Native Hawaiian/Alaska Native communities.

**Meeting the challenges of aging and disability**

The number of adults aged 65 years and older in the United States, as well as the number of people living with disabilities, is expected to increase significantly in the coming decades. Therefore, the need to examine topics associated with aging and disability is of critical importance for health stakeholders. The Forum on Aging, Disability, and Independence was established jointly in 2012 by the IOM and the NRC’s Division of Behavioral and Social Sciences and Education. The forum works to highlight areas in which aging and disability network coordination is strong; examine historic challenges faced in aligning the aging and disability networks; explore new approaches for resolving problem areas; and set the stage for future policy actions.

In one of its early ventures, the forum held a workshop to examine how technology might be harnessed to benefit people with disabilities. As the IOM's 1991 report *Disability in America* observed, individuals with “functional limitations are not inherently disabled, that is, incapable of carrying out their personal, familial, and social responsibilities. It is the interaction of their physical or mental limitations with social and environmental factors that determines whether they have a disability.” Recent advances, including technology-driven assistive and adaptive products, have improved functioning and quality of life for people of all ages. Furthermore, there is great potential for technology to increase a person’s disability-free years. At the workshop, as presented in *Fostering Independence, Participation, and Healthy Aging Through Technology: Workshop Summary* (2013), participants explored the ways in which technology can support independence and healthy aging among working-age individuals with disabilities and among individuals who are developing disabilities as they age.
Most recently, the forum organized a workshop to explore the scope and trends of current sources of financing for long-term services and supports (LTSS) for working-age individuals with disabilities and older adults aging into disability, including income supports and personal savings. Participants considered the role of families, the government, and the private sector in financing LTSS and discussed the implications of and opportunities for innovative approaches to this financing challenge.

**Health literacy and oral health**

Many people have difficulty achieving optimal health because they lack health literacy. Put simply, health literacy is the ability to obtain, process, and understand basic health information. Once overlooked and poorly understood, health literacy is increasingly recognized as a foundational element for patient-centered, high-quality health care and public health services. In a 2012 article in *Health Affairs*, the U.S. Assistant Secretary for Health, Howard Koh, and his co-authors wrote that health literacy is now at a tipping point, “poised to make the transition from the margins to the mainstream.” Furthermore, it is now understood that, as outlined in the IOM’s landmark 2004 report *Health Literacy: A Prescription to End Confusion*, health literacy is not just a function of individual skills and abilities, but also includes the demands and complexities of the systems with which individuals interact.

The IOM’s Roundtable on Health Literacy explores challenges facing health literacy practice and research and identifies approaches to promote health literacy through mechanisms and partnerships in both the public and private sectors. As one example of the roundtable’s success in communicating the importance of health literacy, the U.S. Pharmacopeial Convention cited its participation in a 2007 roundtable workshop as the impetus for its release of universal standards for simplifying the content and appearance of prescription labels in October 2012.

Recently, the roundtable focused on the links between health literacy and oral health. Reports by the IOM and other groups have found that limited oral health is associated with inaccurate knowledge about preventive
measures such as water fluoridation, dental care visits, and oral health–related quality of life. Many members of the public, along with many health care providers, are largely unaware of the basic risk factors and preventive regimens for oral diseases. At a roundtable workshop summarized in *Oral Health Literacy: Workshop Summary* (2013), participants discussed how findings from oral health literacy research are being translated into oral health practice.
Promoting and Sustaining Health Around the World

In an age of easy and affordable international travel, diseases that were once relatively localized can spread quickly, making prevention and containment more challenging. A recent outbreak of Middle East respiratory syndrome coronavirus demonstrates the ability of novel disease strains to appear and spread rapidly. In addition to emerging threats, diseases that have long had significant burdens in the developing world, including tuberculosis and HIV/AIDS, continue to kill millions of people every year.

The Institute of Medicine (IOM) examines efforts to reduce the global disease burden and offers guidance to enhance the U.S. role in global health; improve the performance of efforts that focus on helping countries with limited resources tackle public health challenges; and solve global health challenges that have implications for U.S. domestic health policy. Together with the National Research Council, the IOM also manages the African Science Academy Development Initiative, an effort to strengthen the capacity of African science academies to inform policy making and public discourse related to improving health.

Guiding global HIV/AIDS efforts

For decades, the United States has been at the forefront of global efforts to improve treatment of HIV/AIDS and limit its spread. In 2003, Congress enacted the President’s Emergency Plan for AIDS Relief (PEPFAR) to help national treatment and prevention programs in partner countries deliver HIV services and implement policies and systems to address HIV/AIDS.
When PEPFAR was reauthorized in 2008, Congress asked the IOM to appoint a study committee to review the initiative’s performance and its impact on health in PEPFAR partner countries and to recommend strategies to improve the U.S. government’s response to global HIV/AIDS.

During the 4-year study, which was sponsored by the U.S. Department of State, the committee drew upon a variety of data sources, including program and financial data, extensive document review, and more than 400 interviews with diverse stakeholders in PEPFAR partner countries, at PEPFAR’s headquarters, and at other institutions and agencies involved in the global HIV response. Committee members visited 13 countries to conduct interviews and visit PEPFAR-supported programs and facilities. In Evaluation of PEPFAR (2013), the committee concluded that the initiative has met or surpassed many of its ambitious goals, resulting in a tremendous increase in the availability and use of HIV programs and services. Most importantly, PEPFAR has saved and improved millions of lives—and in the process has demonstrated that HIV/AIDS services can be effectively delivered on a large scale even in countries with high rates of disease, resource constraints, and limited health and other related infrastructure.

The IOM report outlines PEPFAR’s aims: working with a range of international and local partners, to expand HIV testing and clinical services, including highly effective antiretroviral therapy; to provide additional nonclinical support services for people living with HIV; to train hundreds of thousands of service providers; to invest in programs for orphans and vulnerable children who are living with or affected by HIV; and to help participating countries strengthen their health systems.

The committee found that PEPFAR has made great strides in fostering prevention efforts, which ultimately will be key to altering the course of the HIV/AIDS epidemic. For example, PEPFAR support has made a major contribution to preventing mother-to-child transmission of HIV. PEPFAR also has become increasingly flexible in its approach to other prevention strategies and has supported data collection to better understand factors driving the epidemic in each country and scaling up prevention programs for both the general population and populations at elevated risk. However,
greater attention to a range of prevention strategies is needed, especially for preventing sexual transmission, which is responsible for the majority of new infections.

The committee also recommended that PEPFAR shift its approach from prescribing specific activities to outlining key outcomes and working with partner countries to determine how to prioritize their efforts to achieve those outcomes. Partner countries should define goals and priorities, assume increased responsibility for funding, and make strategic decisions about efficient use of finite resources. To facilitate this transition, future U.S. assistance should focus less on direct service delivery and more on technical assistance and support for services and programs implemented through local government and nongovernment partners. Capacity building should include a stronger emphasis on financial and program management and long-term infrastructure development. The evolution toward increased leadership by partner countries is vital to achieve sustainable management of HIV programs, equitable access to services for the populations most in need, and long-term control of the HIV epidemic.

To help share some of the key messages from *Evaluation of PEPFAR* with a wider audience, the committee and IOM staff created an online “interactive experience” (IE). The IE demonstrates the challenges and complex choices faced by people across the world as they navigate the continuum of HIV-related services in PEPFAR-funded countries. Users of

![Screen from PEPFAR interactive Web experience (available at http://www.iom.edu/evaluation-of-PEPFAR-aspx).](image)
the IE select a character and are presented with a variety of scenarios and decisions to make about accessing HIV/AIDS-related services, as well as pertinent information about PEPFAR.

**Challenges of drug-resistant tuberculosis**

The threat of tuberculosis (TB), already considerable in some countries, is exacerbated by the spread of drug-resistant strains of the disease. The IOM’s Forum on Drug Discovery, Development, and Translation, which convenes stakeholders to discuss issues of common interest and explore possible courses of action, launched a series of workshops focused on drug-resistant TB. At the initial workshop in 2008, participants defined and assessed the challenges and set the stage for four additional workshops to be held in countries heavily burdened by drug-resistant TB.

The international workshops were intended to help participants learn from experiences of each nation’s scientific, policy, and public health community in combating the spread of drug-resistant TB, and to identify best practices and novel approaches that can be applied around the globe. Workshop presentations and discussions were also intended to help forge new linkages and collaborations across multiple disciplines and countries and to facilitate the sharing of knowledge and information to benefit efforts to control the spread of drug-resistant TB. The multidisciplinary workshops spanned the entire spectrum of drug-resistant TB science and policy issues—biology, epidemiology, and surveillance; diagnosis, treatment, and infection control; and issues pertaining to the drug supply chain, laboratory capacity, and needs of vulnerable populations. In order to forge connections between the scientific research and TB policy communities, the international workshops were coordinated with scientific meetings hosted by the National Institute of Allergy and Infectious Diseases (NIAID) of the National Institutes of Health.

The first in-country workshop took place in South Africa, co-hosted by the Academy of Science of South Africa, and the second took place in Russia, in collaboration with the Russian Academy of Medical Sciences. Participants’ discussions were captured in summary reports issued in 2011. The third workshop took place in New Delhi, India, and was co-hosted by
two leading Indian science and medical organizations, the Indian National Science Academy, and the Indian Council of Medical Research (ICMR). As with the first two workshops, participants discussed the current burden of drug-resistant TB in India and explored options for improving treatment and controlling the spread of resistant strains. They also considered the global context, including innovative strategies for advancing local and international efforts to prevent and treat drug-resistant TB on a broad scale. The associated NIAID meeting was held following the workshop in India co-sponsored by the Indian government and ICMR to explore opportunities for collaboration in TB drug discovery research. The meeting was attended by participants in the IOM workshop and built on topics discussed at the workshop, creating synergies and connections for future collaborations in the areas of TB research and policy. The discussions were captured in Facing the Reality of Drug-Resistant Tuberculosis: Challenges and Potential Solutions in India: Summary of a Joint Workshop by the Institute of Medicine, the Indian National Science Academy, and the Indian Council of Medical Research (2012).

Beijing, China, was the site of the fourth workshop, co-hosted by the Institute of Microbiology of the Chinese Academy of Sciences. The workshop brought together participants not only from China but also from Brazil, Russia, India, and South Africa—often referred to as the “BRICS” countries. Participants discussed the current status of drug-resistant TB globally and in China, taking into consideration lessons learned from the other high-burden countries. Building on content from the earlier workshops in the series, discussions explored the problem of multidrug-resistant and extensively drug-resistant TB (in which strains resist most current drugs) and emergent TB strains that are potentially untreatable by any current drugs. They also explored the critical leadership role of the BRICS countries in global efforts to combat drug-resistant tuberculosis. The workshop discussions will be summarized in an IOM workshop summary report and released publicly.

In 2012, the forum held a workshop to consider the supply chain for quality-assured drugs to treat drug-resistant TB (known as “second-line drugs”), a complex issue with global causes and implications. To effectively treat patients and protect the population from further transmission of drug-resistant strains, health providers need an uninterrupted supply of second-line drugs.
resistant strains, health providers need an uninterrupted supply of second-line drugs. Although these drugs may be less potent, more toxic, and more expensive than common first-line drugs, they represent the best alternative treatment options for strains resistant to the first-line drugs. However, ensuring a reliable and affordable supply of high-quality second-line drugs is a complex public health intervention, and the global community has not been able to organize an effective supply chain for delivering the drugs to all providers and patients, especially in resource-constrained countries. The workshop convened high-level international experts to explore innovative solutions to provide the right second-line drugs to people who critically need them, including examination of potential opportunities for coordinated international efforts to ensure a reliable and affordable supply of second-line drugs. Their discussions are reported in Developing and Strengthening the Global Supply Chain for Second-Line Drugs for Multidrug-Resistant Tuberculosis: Workshop Summary (2012).

**Combating microbial threats**

Pathogenic microbes have threatened human health for centuries. Microbial threats regularly emerge or reemerge, often in the developing world, and can spread across broad areas, even globally. This potential danger has been magnified by the volume and speed of international travel and global shipments of animals and animal products. Both routes can serve to spread pathogenic microbes and lead to disease outbreaks that can have devastating health, economic, environmental, agricultural, and sociopolitical consequences.

One key means by which the IOM responds to such concerns is through its Forum on Microbial Threats. The forum provides opportunities for stakeholder discussion and scrutiny of critical—and possibly contentious—scientific and policy issues related to basic and applied research on the detection, surveillance, prevention, and management of naturally occurring, reemerging, and novel communicable diseases in humans, plants, and animals.

In 2012, the forum convened a workshop to examine the environments that sustain microbes. The vast majority of microorganisms live in stable communities and lead intensely interactive lives—competing,
cooperating, and forming associations among themselves and with their living and nonliving host environments. As presented in *The Social Biology of Microbial Communities: Workshop Summary* (2012), participants examined a spectrum of topics, experimental systems, and theoretical perspectives representing the current multidimensional understanding of this new frontier. Among other topics, they discussed the ecological, evolutionary, and genetic factors contributing to the assembly, function, and stability of microbial communities; how microbial communities adapt and respond to environmental stimuli; and potential applications of knowledge gained from the study of microbial communities to improve human, animal, plant, and ecosystem health.

Another forum workshop focused on the scientific tools and approaches, especially genomic approaches researchers are using to study the vast array of microorganisms that share the world with humans. Up to 99 percent of microbial life cannot be characterized by standard laboratory cultivation techniques. The ability to “read” the nucleic acid sequence of microbial genomes has provided important insights into this previously hidden world by revealing the vast complexity of microbial life. In discussions at the workshop, reported in *The Science and Applications of Microbial Genomics: Workshop Summary* (2013), participants examined the use of microbial genomics to explore the diversity, evolution, and adaptation of microorganisms in a wide variety of environments; the molecular mechanisms that microbes employ as they emerge to cause disease; and how genomic technologies are being applied for microbial surveillance and for tracing disease outbreaks back to their microbial sources.

**Anniversary Symposium of the Forum on Microbial Threats**

In its 1992 report *Emerging Infections: Microbial Threats to Health in the United States*, the IOM outlined major challenges for the public health and medical care communities in detecting and managing infectious disease outbreaks and monitoring the prevalence of endemic diseases. In response to the report, the Centers for Disease Control and Prevention and the
NIAID urged the IOM to create the Forum on Emerging Infections (now the Forum on Microbial Threats) in 1996.

In December 2012, the forum held a retrospective Anniversary Symposium to review and assess progress made on the recommendations of the 1992 report and other key publications since the forum’s founding. Among the topics discussed at the symposium were the following:

- Where are we (as a community and as a forum) now versus 20 years ago?
- What progress has been made in surveillance, detection, and responses to emerging, reemerging, and novel infectious diseases in humans, plants, and animals?
- How has our appreciation of the microbiome and microbial ecology changed since the publication of the 1992 IOM report?

As one measure of the forum’s first 15 years, Margaret Hamburg, Commissioner of the U.S. Food and Drug Administration, called its accomplishments “quite remarkable,” and reflected that “from the very beginning, it has made a real difference . . . bringing together experts from a wide range of disciplines, organizations, and sectors . . . identifying and highlighting key topics for research, for policy making, and for medical care and public health preparedness. . . . The forum has helped set forth strategies to improve infectious disease surveillance, identify critical research needs, and develop more effective strategies for response to microbial threats.”

The forum’s role in advancing the study of microbes and microbial diseases was also recognized by the *Lancet*, which published a special issue on zoonoses—diseases that pass from animals to humans—timed to coincide with the anniversary symposium. Peter Daszak, a member of the forum, edited the *Lancet* issue, which contained a number of papers prepared by researchers who also spoke at the symposium. According to Dennis Carroll, director of the Pandemic Influenza and Other Emerging Threats program at
the U.S. Agency for International Development, “These papers underscore the importance of emerging infectious diseases. But more importantly, they highlight the opportunities to build on the recent advances in science and technology to enable the global community to identify potential future threats earlier and respond more quickly before they are fully constituted.”

**Blueprint for prioritizing new vaccine development**

Developing and effectively delivering vaccines to prevent infectious and other diseases is a priority for global health, especially in countries where these diseases frequently emerge or reemerge and where health care resources are often limited. But health leaders need guidance about which vaccines to develop first and how to allot resources to achieve the greatest possible health and other benefits. Decision makers currently lack effective tools and models in this area. To help bridge the gap, the National Vaccine Program Office of the U.S. Department of Health and Human Services turned to the IOM for guidance.

The IOM study committee was asked to proceed in two phases. In its first report, *Ranking Vaccines: A Prioritization Framework* (2012), the committee presented the foundation for a software application called a Strategic Multi-Attribute Ranking Tool for Vaccines, or SMART Vaccines Beta. The tool is not meant to produce a unique list of priorities among vaccine candidates; instead, it allows users to specify attributes of desired vaccines and rank their order of importance based on specific circumstances.

SMART Vaccines offers users a choice of 29 attributes drawn from broad categories that include health burden considerations, economic considerations, demographic considerations, public concerns, scientific and business considerations, programmatic considerations, and policy considerations. If the tool produces different results when different values are entered, it can motivate discussions among users about individual or institutional priorities that can inform the decision-making process.

In its current form, SMART Vaccines is for demonstration purposes only and is not available for public use. The committee intended its report
to introduce potential users to the concept of SMART Vaccines and to encourage stakeholders to inform the next phase of its study, which will focus on developing an advanced version of the tool—called SMART Vaccines 1.0—and on improving the tool’s user interface. Potential users of the tool include not only decision makers in various countries, but also public and private groups that fund research on vaccines and companies that develop and manufacture vaccines. In the long term, the committee added, continued refinement of the SMART Vaccines concept will require participation of an active community of users and increased data collection as vaccine candidates evolve and disease epidemiology becomes better
characterized in different parts of the world. The second report, *Ranking Vaccines: A Prioritization Software Tool*, was released in fall 2013 along with the SMART Vaccines 1.0 software, which contains prepopulated, editable data for a handful of key vaccine candidates.

### Preparing for health emergencies

As the global health community becomes more adept in preventing diseases, it must also prepare to cope with public health emergencies, such as a pandemic of influenza or a major earthquake, in which health systems are destroyed or stressed to their limits. To prepare for such events, it is important to anticipate how standards of care might change due to shortages of critical resources. “Crisis standards of care” (CSC) reflect the altered levels of health and medical care that can be delivered during a catastrophic event. To ensure that high-quality care is provided during public health emergencies, nations and regions need a robust system to guide health care professionals and institutions, governmental entities at all levels, and the public.

To explore this issue, the IOM’s Forum on Medical and Public Health Preparedness for Catastrophic Events held a workshop at the 17th World Congress on Disaster and Emergency Medicine in Beijing, China. As reported in *Barriers to Integrating Crisis Standards of Care Principles into International Disaster Response Plans: Workshop Summary* (2012), participants from many countries examined the challenges in providing fair and equitable care in mass-casualty incidents and explored how international disaster responses can change the standard of care. They also discussed a potential framework for delivering equitable care in situations where resources are scarce, as well as strategies for operationalizing CSC during catastrophic events. Finally, they examined ways to integrate CSC principles into national disaster response plans.
Filling health resource gaps

Many countries in the developing world struggle with a dearth of vital health resources. The countries of sub-Saharan Africa face one of the largest treatment gaps for mental, neurological, and substance use (MNS) disorders in the world. The ability to provide adequate human resources for delivery of essential interventions in MNS disorders has been identified as a critical barrier to bridging this treatment gap.

To aid in this effort, the IOM Forum on Neuroscience and Nervous System Disorders convened a workshop in Kampala, Uganda. Participants’ discussions, reported in Strengthening Human Resources Through Development of Candidate Core Competencies for Mental, Neurological, and Substance Use Disorders in Sub-Saharan Africa: Workshop Summary (2013), centered on the four MNS disorders with the greatest burdens in this region: depression, psychosis, epilepsy, and alcohol use. Workshop participants examined personnel needs for effective delivery of treatments in a typical health care system in sub-Saharan Africa; candidate core competencies for MNS care providers (such as diagnosing disease, prescribing medicines, and monitoring patients); mechanisms such as task shifting and task sharing across treatment locations to make maximum use of available human resources; and the future needs of MNS health care workers based on provider type, treatment environment, and MNS disorder. Participants also explored how to develop and implement education and training programs to help current and new providers reach core competencies; and how to disseminate information among various regional, country, and local stakeholders about the importance of building a cadre of health providers trained in MNS core competencies.

Advancing health literacy around the world

In every country, improving health requires not only equitable access to high-quality care but also adequate levels of health literacy. Health literacy includes a person’s ability to understand health information and use that information to make good decisions about health and medical care. Yet, health literacy is not only a function of individual skills and abilities,
but also includes the demands and complexities of the systems with which individuals interact. The IOM's Roundtable on Health Literacy convenes stakeholders from a variety of sectors to explore challenges facing health literacy practice and research and to identify mechanisms and partnerships to promote health literacy in both the public and private sectors.

Health literacy challenges are especially great in developing countries. At a roundtable workshop, participants offered a global perspective on policies and programs for promoting health literacy. Representatives from Australia, Canada, Ireland, Italy, and the United States, among other countries, reported on their respective health literacy policies and programs. Participants also examined innovative approaches being used by governments in Israel and Europe and by private corporations and nonprofit groups. Finally, they explored options to build on and expand efforts to promote global health literacy in the future. Workshop discussions are captured in *Health Literacy: Improving Health, Health Systems, and Health Policy Around the World* (2013).
Research Strategies, Priorities, and Methods

Research is crucial to progress in medical science and public health. When funding is limited, which research questions should be given priority? And how should research be conducted to ensure safe, scientific, and ethical studies, valid and reproducible results, and equitable access to studies and their results? To answer such questions, the federal government and other leading research organizations frequently turn to the Institute of Medicine (IOM) for advice and guidance.

Assessing government research plans and programs

Clinical and Translational Science Awards

The National Institutes of Health (NIH) designed its Clinical and Translational Science Awards (CTSA) Program to speed the transfer of basic and clinical research findings into clinical and community practice. Under the CTSA Program, which began in 2006, NIH provides the infrastructure, collaborative tools, and resources to support translational research at academic health centers and other institutions nationwide. Now established at 61 sites, the CTSA Program also provides extensive training and education focused on team science and moving promising therapeutics and interventions along the developmental pathway. The CTSA Program is overseen by NIH’s National Center for Advancing Translational Sciences (NCATS).

In 2012, NIH asked the IOM to review the CTSA Program’s mission and strategic goals, evaluate its performance, and assess the effectiveness of NCATS in managing this program. In The CTSA Program at NIH:
Opportunities for Advancing Clinical and Translational Research (2013), the IOM study committee concluded that the CTSA Program is contributing significantly to the advancement of clinical and translational research—and that with a variety of revisions, it can become even more effective and efficient.

The committee recommended that the CTSA Program capitalize on collaborations developed within and among individual CTSA sites and strengthen partnerships with other NIH institutes and centers and outside parties, including patient groups, communities, health care providers, industry, and regulatory organizations. In addition, the CTSA Program should expand its role as facilitator and accelerator of clinical and translational research, build on its efforts to train a robust and diverse workforce skilled at working in teams, and extend its community engagement efforts to ensure
community input in all phases of research and foster increased public support for research.

The committee also called for NCATS to increase its leadership presence in the program. A centralized leadership model—including participation by NCATS, leaders of individual CTSA sites, community partners, and other stakeholders—will increase overall program efficiency, enable mechanisms for maximizing accountability, and provide the direction needed to develop and nurture substantive partnerships.

On the day of the report’s release, NCATS Director, Christopher Austin, released a statement indicating plans to immediately implement the IOM report’s recommendations to make the CTSA Program more efficient and effective. NCATS will begin by convening a working group of key stakeholders to advise the center during the implementation process.

**Joint Pathology Center**

The Department of Defense’s (DoD’s) Joint Pathology Center (JPC) houses the world’s largest collection of human pathologic specimens. Originally called the Army Medical Museum, the facility was established during the Civil War to collect, catalog, and make available for study specimens obtained from medical and surgical procedures performed on combatants. Later renamed the Armed Forces Institute of Pathology, the facility evolved over time, adding samples collected during other wars, including those in Iraq and Afghanistan, and establishing registries for specific organs and medical conditions.

In 2005, the DoD transferred responsibility for all of its materials—approximately 74 million tissue specimens and associated medical information derived from about 3.2 million people—to the newly created Joint Pathology Center. The department then turned to the IOM for advice on the management and long-term goals of the facility. In *Future Uses of the Department of Defense Joint Pathology Center Biorepository* (2012), the IOM proposed a series of protocols, standards, safeguards, and guidelines on operating the facility, managing its collection, and determining appropriate use of specimens for consultation, education, and research.
The IOM study committee concluded that permitting wider access to JPC repository materials for research purposes will promote the public good—by advancing medical and scientific knowledge generally and improving understanding of health problems in service members and veterans specifically. Before granting broader access to its specimens, however, the JPC should establish new ethical and legal guidelines for research and education, given that the individuals from whom the materials were gathered often did not explicitly consent to their use for such purposes. These guidelines should value transparency and respect the individuals who provided the samples, and they should be flexible enough to adapt to changing legal, regulatory, and ethical requirements.

The Department of Labor’s Site Exposure Matrix Database

The Department of Labor (DOL) maintains the Site Exposure Matrix (SEM) database, a tool designed to assist in managing compensation claims for workers who have experienced health problems as a result of exposure to toxic materials during employment associated with nuclear weapons. In response to public concern about such exposures in recent years, the DOL asked the IOM to review the scientific rigor and organization of the SEM and the links it identifies between exposure to a toxic substance and occupational diseases.

Beginning in World War II and continuing through the Cold War, thousands of people mined and milled uranium, worked in nuclear munitions factories, and conducted research on nuclear warfare. The materials used at these sites and facilities, which are now managed by the Department of Energy (DOE), ranged from benign to highly toxic. In 2000, Congress authorized compensation for employees and contractors who claim that they have a disease linked to their occupational exposure to these materials. Initially, workers filed compensation claims with their state worker compensation offices, but in 2005 the federal government transferred the compensation process to the DOL.

The SEM database is an important tool for the DOL in evaluating claims and determining compensation. The database collects, organizes, and displays information on substances used at the DOE sites and possible health effects associated with exposure to them.
health effects associated with exposure to them. The SEM database incorporates another database, called Haz-Map, that contains links between toxic substances and the occurrence of occupational diseases. Haz-Map was initially developed and maintained privately, but since 2002 has been published by the National Library of Medicine, with periodic revisions provided by the Haz-Map developer. Some workers and their advocates have criticized the DOL's reliance on Haz-Map's assessment of toxic substance–occupational disease links.

In Review of the Department of Labor’s Site Exposure Matrix Database (2013), the IOM study committee described strengths and shortcomings of both databases and offered recommendations for improvement. The committee recommended that the DOL add more data to SEM on worker exposures and supplement Haz-Map’s data on substance–disease links with health effects information drawn from other sources to obtain a more comprehensive picture of adverse effects that may be associated with target substances. Also, the DOL should establish an independent, expert advisory panel to ensure that the SEM database undergoes peer review and to assess whether other changes are needed in the future.

NASA’s Human Research Program
Most research supported by federal agencies is awarded on a competitive basis, as with the CTSA Program, but circumstances sometimes lead agencies to fund research noncompetitively. The National Aeronautics and Space Administration’s (NASA’s) Human Research Program (HRP), for example, funds directed research that is commissioned or awarded noncompetitively due to time limitations, highly focused or constrained research topics, and certain other reasons. NASA asked the IOM to review the procedures and performance of the HRP.

The IOM study committee concluded that the HRP’s merit assessment process for directed research is scientifically rigorous and similar to processes used by many other federal agencies and organizations. In A Review of NASA Human Research Program’s Scientific Merit Assessment Processes: Letter Report (2012), the committee also noted that the HRP
uses a variety of assessment pathways that, although generally effective, should be streamlined into one common pathway that requires all directed research proposals to undergo independent peer review by a panel consisting of external reviewers or a mix of internal and external reviewers.

The committee also recommended that NASA develop and apply a set of quantitative and qualitative metrics to actively monitor the effectiveness of the HRP’s merit assessment process and ensure that directed research will provide the highest possible value in a timely manner. In addition, NASA should improve communication about its directed research to ensure that the research community is informed about funding opportunities and understands why specific tasks meet the criteria for directed research.

California Institute for Regenerative Medicine
In 2005, Californians voted to establish the California Institute for Regenerative Medicine (CIRM) to investigate the use of human embryonic stem cells to regenerate tissues and organs, and to provide it with up to $3 billion in state funds allocated for stem cell research. Seven years after its creation, CIRM asked the IOM to review the institute’s management, operations, and strategies and to recommend ways to improve its performance.

The IOM study committee found that CIRM has achieved many notable results (including 40 patent applications and three license agreements for stem cell technologies) and has helped to establish California as an international hub of stem cell research and development. In its report, *The California Institute for Regenerative Medicine: Science, Governance, and the Pursuit of Cures* (2012), the study committee recommended that CIRM’s leadership and California legislators consider changes in the institute’s governance and operations, given the rapid progress being made in the field, the institute’s need for independent oversight, and the
The institute’s stated desire to steer its efforts from basic research toward clinical application. The IOM committee found that CIRM could further advance its mission by creating an external scientific advisory board to provide continuing and consistent strategic advice; dealing more effectively with potential conflicts of interest on its governing board; and restructur-
ing its governance to ensure that the governing board is able to provide independent oversight.

The IOM report noted that CIRM should also develop a funding platform that can sustain it if its support from the state is not renewed. In addition, CIRM should increase industry representation on its governing board and in its advisory groups in order to leverage corporate expertise and resources and encourage companies to make the large investments needed to develop new therapies.

Following the release of the IOM report, CIRM’s governing board voted to endorse an organizational framework that incorporates many of the committee’s recommendations, especially in the area of reducing potential conflicts of interest. For example, under the new framework, board members from institutions eligible for CIRM funding can no longer vote on grants brought before the board. The board will also give CIRM staff more authority to evaluate grant applications before they are brought to the board and increase the transparency of its grant application review process.

Clinical trials: Putting potential into practice

The route from scientific discovery to useful medical products, including drugs, is long and complex, and in recent years the nation’s research and medical communities have faced many difficulties in navigating this path. The IOM’s Forum on Drug Discovery, Development, and Translation regularly convenes stakeholders in government, industry, academia, and the public to discuss areas of mutual interest in a neutral setting. The forum brings ongoing attention and visibility to important topics in drug development; explores new approaches for resolving problem areas; helps define the scope of the field and sets the stage for future policy action; fosters col-

The IOM study committee found that CIRM has achieved many notable results (including 40 patent applications and three license agreements for stem cell technologies) and has helped to establish California as an international hub of stem cell research and development.
laboration on topics where there is synergy among potential partners; and elevates the general understanding of drug discovery, development, and translation among the research, public policy, and broader communities.

Clinical trials, a crucial—and extremely complex—step in the drug development pathway, are a priority area for the forum. Clinical trials conducted in humans are key in evaluating the safety and efficacy of new or existing drugs and other interventions. The forum has established a multiyear initiative to examine the current state of clinical trials, identify areas of strength and weakness in the U.S. clinical trials enterprise, and consider transformative strategies for enhancing the ways in which clinical trials are organized and conducted.

As part of this initiative, the forum convened a workshop to take a broad look at the clinical trials enterprise. The workshop highlighted a growing gap between what is desired—medical care based solely on high-quality evidence—and the current state of the drug development pathway, in which there is limited capacity to generate timely and practical evidence for drug development and treatment decisions. Workshop participants explored potential approaches to fundamentally reshape the enterprise—in a short but realistic time frame—to be more efficient, effective, and fully integrated into the health care system. Participants focused in particular on randomized controlled trials (RCTs), which are pivotal studies for drug development and often costly and challenging to conduct. A core premise of the workshop was that RCTs serve as the foundation of the clinical trials enterprise.

*Envisioning a Transformed Clinical Trials Enterprise in the United States: Establishing an Agenda for 2020: Workshop Summary* (2012) captures the themes of the meeting, including the development of a robust clinical trials workforce, the alignment of cultural and financial incentives for clinical trials, and the creation of a sustainable infrastructure to support a transformed clinical trials enterprise.

Another forum workshop focused on the vital role of public engagement in clinical trials. New therapeutics should be studied in large numbers of people to determine whether they...
are effective and to assess any harm they may cause. There is growing recognition, however, that the clinical trials enterprise is unable to keep pace with the national demand for research results. Many clinical trials never meet their recruitment goals and others accrue patients far too slowly.

At the workshop, held in collaboration with the Mount Sinai School of Medicine, participants discussed possible reasons for the lack of participation in clinical trials and what might be done to encourage participation. Participants identified a lack of support for clinical trials among patients and families, community leaders, academic medical centers, and even practicing physicians, who may not always seek out trials for patients or encourage them to participate. Successfully engaging these diverse groups in the clinical trials enterprise is a substantial challenge, but not impossible, participants noted. Approaches such as partnering with community representatives and patients early in the clinical trial process could make the patient experience a valued component of research. In addition, targeting communications toward motivating patient participation, rather than around researchers’ goals, may be beneficial. Community physician engagement in clinical trials may also be enhanced by simple, user-friendly tools that identify patients who might be eligible for a trial and enrolled at the point of care. The participants’ discussions are reported in *Public Engagement and Clinical Trials: New Models and Disruptive Technologies: Workshop Summary* (2012).

The sharing of clinical data among researchers is another critical part of drug development. Improving the transparency and accessibility of data collected by pharmaceutical companies, academics, and government agencies could enhance patient safety, spur drug development, and increase public trust in clinical trials and the treatment decisions derived from them. But data sharing is hampered by a variety of obstacles and challenges. The forum joined with three other groups within the IOM—the Forum on Neuroscience and Nervous System Disorders, the National Cancer Policy Forum, and the Roundtable on Translating Genomic-Based Research for Health—to convene a workshop to explore these challenges and discuss solutions.
As described in *Sharing Clinical Research Data: Workshop Summary* (2013), participants examined the barriers to data sharing, which include concerns about data mining, infringements on intellectual property rights, erroneous analyses of data by groups not involved in the collection of those data, and litigation based on misrepresentations or misinterpretations of data, as well as concerns among academic investigators that data sharing could impede career advancement. Participants explored strategies to overcome these challenges and identified priority areas that offer opportunities for action in the near term. They also discussed strategies for using the large datasets likely to be generated through data sharing to facilitate scientific and public health advances.

As a follow-up to this workshop, the IOM is developing a consensus study that will focus on strategies for the responsible sharing of clinical trial data.

**Role of animals in research**

Animal models have long been used to study the effects of therapeutics before they are tested in humans. Although there are strict regulations within the research community to ensure the ethical treatment of animals, public concern about the use of animals as research subjects persists. The IOM has evaluated the use of animal subjects from a number of perspectives.

**Use of chimpanzees in biomedical and behavioral research**

Chimpanzees, given their similarities to humans genetically and behaviorally, have historically been a subject of medical research. During the past decade, NIH has financed more research involving chimpanzees than any other federal agency. In 2010, NIH announced that it planned to consolidate its chimpanzee colonies in order to save an estimated $2 million annually. The announcement generated significant feedback from the public, state officials, and members of Congress, and raised questions about the necessity of continued use of chimpanzees in research. In response, Congress mandated that NIH support a study by the IOM and the National Research...
Chimpanzee research supported by NIH: 2001-2010. 
SOURCE: Chimpanzees in Biomedical and Behavioral Research: Assessing the Necessity, p. 22.

Council (NRC) to examine chimpanzees’ unique attributes and determine when it is appropriate to use them in NIH-funded research.

In Chimpanzees in Biomedical and Behavioral Research: Assessing the Necessity (2011), the IOM committee did not endorse an outright ban on research using chimpanzees. Rather, it established a set of uniform criteria for determining when the use of chimpanzees is necessary to prevent or ameliorate threats to human health. The criteria are restrictive, allowing the use of chimpanzees as subjects in biomedical research only when other models are unavailable and the research cannot be ethically performed in humans. Chimpanzee use in comparative genomics and behavioral research is limited to studies that provide otherwise unattainable insight into comparative genomics, normal and abnormal behavior, mental health, emotion, or cognition, as well as experiments performed on acquiescent animals causing minimal pain and distress. In addition, the use of chimpanzees is permissible only if forgoing the research will significantly hinder advances
necessary to prevent or treat life-threatening or debilitating conditions. Based on these criteria, the committee concluded, chimpanzees are not necessary for most biomedical and behavioral research. However, the committee acknowledged that chimpanzees may be needed for future research on new, emerging, or re-emerging diseases.

The committee noted that a number of alternative research methods are available for examining the types of scientific questions for which chimpanzees have been used in the past. These alternatives include using genetically modified mice, employing an artificial environment outside of the living body, and leveraging computer software or computer simulations.

While industry and academic laboratories continue to adopt such new approaches, there may be a few therapies in development that require continued use of chimpanzees to keep progress from stalling and slowing patients’ access to needed new treatments, the committee noted. These cases should be assessed to ensure that they meet the criteria outlined in the report, and NIH should continue to support the development of and access to alternative test methods to make the future use of chimpanzees unnecessary.

The day the IOM/NRC report was released, NIH director Francis Collins announced that the agency would not issue “any new awards for research involving chimpanzees until processes for implementing the recommendations are in place.” He also voiced full support for the report and said that he would convene “a working group within the NIH Council of Councils to provide advice on the implementation of the recommendations, and to consider the size and placement of the active and inactive populations of NIH-owned or -supported chimpanzees.”

Following the recommendations of the NIH Working Group on the Use of Chimpanzees in NIH-Supported Research, on June 26, 2013, NIH announced plans to retain only 50 or fewer chimpanzees (a small fraction of the previous population) for future research. The remaining chimpanzees will not be bred and will be selected only for research projects that meet the criteria laid out in the IOM/NRC report. The retired NIH chimpanzee population will likely enter the Federal Sanctuary System.
Groups outside the federal government also responded to the report. The New Iberia Research Center Chimpanzee Advisory Committee, which conducts chimpanzee research supported by industry at the University of Louisiana at Lafayette, drafted a policy with de-selection criteria for chimpanzees that reflect the recommendations of the IOM/NRC report.

**Animal models for nervous system disorders**
The IOM has also explored the use of animals in research on nervous system diseases and disorders. These conditions are highly prevalent in the world population and contribute significantly to overall disease burden. Animal models have provided valuable information about the biology of nervous system disorders and have helped to develop therapeutics. But treatment options that are high in efficacy and low in side effects are still lacking for many of these conditions, and for some conditions there is no treatment of any kind.

The IOM’s Forum on Neuroscience and Nervous System Disorders held a workshop to discuss opportunities for maximizing the translation of new therapies from animal models to clinical practice. Participants considered key factors that contribute to poor translation of results from animal models to clinical studies and ultimately to practical interventions; analyzed case studies that highlight successes and failures in the development and application of animal models; and explored possible next steps that will be critical in improving the development and testing of animal models of nervous system disorders. Workshop discussions are captured in *Improving the Utility and Translation of Animal Models for Nervous System Disorders: Workshop Summary* (2013).

**International animal research regulations**
Another workshop held by the IOM’s Forum on Neuroscience and Nervous System Disorders (co-sponsored by the NRC and the Institute for Laboratory Animal Research) explored the regulatory environment for the use of animals in neuroscience research in the United States and other nations. Animals are widely used to explore biological mechanisms of nervous system function, to identify the genetic basis of disease states, and to pro-
provide models of human disorders and diseases to aid the development of new treatments. To ensure the humane care and ethical use of animals in research, numerous laws, policies, and regulations are in place—often differing among countries—and some of these regulations have implications specific to neuroscience research. As summarized in International Animal Research Regulations: Impact on Neuroscience Research: Workshop Summary (2012), discussions covered areas such as current international animal use regulations; implications of current policies on the research enterprise, including the impact of disparate policies; developments in law school regulatory curricula and animal law practice; legislation that may affect the use of animals in research; and reasons for the establishment of specific regulations. Participants also explored opportunities for harmonization of regulations among nations and the possible development of global core principles for regulating use of animals in neuroscience research.

**Omics: Advancing new technologies for biomedical tests**

Technologies collectively called “omics” have made it possible to measure an enormous number of molecules within a tissue or cell. For example, genomics examines thousands of DNA sequences, and proteomics examines large numbers of proteins. Innovative omics-based tests could in principle detect disease more reliably and predict patients’ likelihood of responding to specific drugs. However, the translation of these new technologies into clinical laboratory tests that can help patients directly has progressed more slowly than anticipated.

Following a recent case involving improper use of omics-based tests in cancer clinical trials at Duke University, the National Cancer Institute (NCI) requested
that an IOM committee recommend ways to strengthen omics-based test development and evaluation. The IOM’s recommendations, presented in *Evolution of Translational Omics: Lessons Learned and the Path Forward* (2012), apply to many parties responsible for discovery and development of omics-based tests, including investigators, their institutions, sponsors of research, the Food and Drug Administration (FDA), and scientific journals. The report identifies best practices to enhance development, evaluation, and translation of omics-based tests and recommends policies to ensure that tests are appropriately assessed for scientific validity before they are used to guide patient treatment in clinical trials. The IOM’s recommendations aim to ensure that omics test development is grounded in sound scientific practice in order to advance patient care while maintaining public trust.

Following release of the IOM report, Duke University released a statement of support in which the chancellor for health affairs, the vice chancellor for clinical and translational research, and the dean of the School of Medicine pledged to incorporate the report’s recommendations into their “ongoing efforts to strengthen the rigor of our research enterprise.” In addition, NCI responded to the report by publishing a 30-point checklist to evaluate proposed clinical studies that rely on genomics and proteomics to determine patients’ treatment.

**Regulating new tobacco products**

Tobacco use is the leading cause of preventable death and disease in the United States. Smoking leads to approximately 443,000 premature deaths each year, and smoking-related diseases kill more people than alcohol, illegal drugs, murder, and suicide combined. The passage of the Family Smoking Prevention and Tobacco Control Act of 2009 granted the FDA broad authority to regulate the manufacturing, distribution, and marketing of tobacco products. It also gave the FDA authority to regulate “modified risk tobacco products” (MRTPs) that purport to reduce risk of harm relative to conventional tobacco products. In order to market an MRTP, manu-
Manufacturers must submit to the FDA scientific evidence demonstrating that the product has the potential to reduce tobacco-related harms.

At the request of the FDA, the IOM formed a committee to identify minimum standards for scientific studies needed to obtain FDA approval to market an MRTP. In *Scientific Standards for Studies on Modified Risk Tobacco Products* (2011), the IOM committee concluded that the public health standard in the new tobacco control act requires submission of a wide range of scientific evidence, including data on the composition and performance of the product, addiction potential and likelihood for initiating use or continuing use, exposure to harmful or potentially harmful constituents, public perceptions about the product’s effects, and health effects of the product.

---

**Some Examples of Short-Term Health Outcomes for Which MRTPs Might Be Evaluated**

1. Short-term vascular phenomena, such as intermittent claudication or Raynaud’s disease, which may be responsive over a short term Ankle-Brachial index
2. Mitigation of tobacco-related skin conditions, such as psoriasis or hyperhidrosis
3. Alterations in surgical wound healing, which are known to be tobacco sensitive
4. Variation in the progression and impact of periodontal disease, which is sensitive to tobacco use
5. Alteration in the progression or regression of precancerous mucosal lesions in the oral cavity, where frequent evaluation is feasible
6. Time required for a fracture to heal, also related to tobacco exposure
7. Alteration in the rates of tobacco-related outcomes of pregnancy associated with MRTP use, including fetal death, premature labor and delivery, and low birth weight infants, could be assessed in a relatively short period of time
8. Lung function, pulmonary function testing
9. Blood pressure

The IOM committee noted that the FDA will need to issue guidance and regulations on the types, design, conduct, analysis, reporting, and governance of studies on MRTPs. The IOM’s recommendations are designed to help the FDA ensure that its evaluations of MRTPs are systematic and founded on evidence, and that the process will ensure that approved products will not only reduce risk compared with conventional tobacco products, but also reduce the rates of tobacco-related harm across the country.

In March 2012, the FDA issued draft guidance related to evaluating and marketing MRTPs that drew on the IOM report’s recommendations. The FDA stated that it will consider the IOM report, public comments on the proposed guidance, and additional feedback from a public workshop before issuing its final guidance on these products.
In addition to providing guidance on a range of health and health policy topics, the Institute of Medicine (IOM) offers a number of fellowship opportunities for health professionals, behavioral and social scientists, communications specialists, lawyers, and other professionals. The fellowships provide exposure to the health policy and regulatory processes of Congress and the executive branch and opportunities to actively participate in the development of science-based public health strategies, as well as opportunities to engage with the IOM’s committees, boards, and roundtables.

**Robert Wood Johnson Foundation Health Policy Fellows**

The Robert Wood Johnson Foundation Health Policy Fellows program is now in its 40th year of operation. The fellowship has enhanced the careers of outstanding midcareer academic health professionals, community health leaders, and behavioral and social scientists. Through a unique and comprehensive orientation program designed and administered by the IOM, followed by high-level work assignments in Congress and the administration, more than 245 fellows have participated in shaping federal health policy. Strategically positioned at the nexus of health care, policy, and politics, fellows have frontline responsibilities in shaping the nation’s legislation and regulations governing health and health care. Fellows frequently have been cited by members of Congress, the administration, and
the health policy community as significantly improving the outcomes of the health policy–making process.

The fellows’ scientific and clinical expertise enriches the deliberations of federal policy makers. Consequently, fellows are in great demand during their year in Washington, DC, and beyond. Following their fellowships, many take on leadership roles in federal and state government, and some have taken assignments in the administration, including in the Office of the Secretary of Health and Human Services, the Department of Defense, the Department of Labor, the Office of Management and Budget, and the White House Office of Domestic Policy. At the state level, alumni of the fellowship program have received Center for Medicaid and Medicare Innovation grants to create partnerships to develop programs and systems to improve health care delivery that will be shared regionally or nationally. Alumni also have assumed leadership roles in professional associations and voluntary health organizations, such as the American Diabetes Association, the American Psychological Society, and the American Public Health Association. In the academic field, alumni serve as university presidents, vice chancellors, deans, and department chairs of schools of medicine, nursing, and public health. Many of them enthusiastically maintain their connections to the workings of government, and some have become official liaisons in government relations for their universities and professional societies.

**IOM Anniversary Fellows Program**

To celebrate its 35th anniversary in 2005, the IOM created a new fellowship program to enable talented health science scholars early in their careers to participate in the work of the IOM and further their careers as future leaders in the health field. IOM boards, committees, and roundtables provide exceptional and, in many ways, unique learning environments that can offer early-career scholars extensive opportunities to interact with eminent researchers, policy experts, and clinicians from across the country on a range of important health challenges. Since the initiation of the program, a total of nine fellows have received the award.

The 2-year program is open to individuals who hold nontenured faculty positions in any university. It especially invites nominations of underrepresented minority candidates. Fellows continue their primary academic responsibilities while engaging part-time in various IOM activities. A
1-week immersion in the health policy arena in Washington, DC, a mentoring relationship with a senior IOM member, and a flexible research stipend enhance the value of the program. The IOM anticipates that the benefits of gaining new knowledge, professional connections, and broad exposure to policy leaders will attract an outstanding pool of applicants from a range of health-related disciplines.

The IOM Anniversary Fellowships are individually endowed or sponsored. An endowment from the American Board of Obstetrics and Gynecology (ABOG) created the Norman F. Gant/American Board of Obstetrics and Gynecology Fellowship. The fellowship, which honors Norman F. Gant, M.D., a member of the IOM and the executive director of ABOG, is targeted at obstetricians and gynecologists early in their academic careers. Similarly, the American Board of Family Medicine established the James C. Puffer, M.D./American Board of Family Medicine Fellowship, designed for early-career health policy and science scholars in family medicine. And through an endowment from Gilbert S. Omenn, M.D., Ph.D., and Martha Darling, the Gilbert S. Omenn Anniversary Fellowship was established. This fellowship aims to foster a cadre of physician-scientists early in their careers who will integrate biomedical research, population health, and health policy and will expand the nation’s capacity for research, leadership, and policy development that advances health. The American Board of Internal Medicine Foundation sponsored an IOM Anniversary Fellowship in honor of John Benson, M.D., an IOM member and past president and chief executive officer of the American Board of Internal Medicine. Finally, the American Association of Colleges of Pharmacy and the American College of Clinical Pharmacy sponsored an IOM Anniversary Fellowship in Pharmacy.

**IOM/ANF/AAN/ANA Distinguished Nurse Scholar-in-Residence**

The IOM/American Nurses Foundation/American Academy of Nursing/American Nurses Association Distinguished Nurse Scholar-in-Residence program is designed to assist outstanding nurse leaders in playing a more prominent role in health policy development at the national level. The program seeks individuals who have the capacity and skills to help increase policy makers’ awareness and understanding of critical issues related to nursing. As part of the program, the nurse scholar is asked to produce a
policy-oriented paper or become actively involved in an IOM study related to his or her area of expertise.

The program, initiated in 1992, is based at the IOM. Each year, one senior nurse scholar is selected from an eligible institution or organization to come to Washington, DC, to participate in a 1-year program of study at the IOM.

**FDA Tobacco Regulatory Science Fellowship**

Launched in 2012, the Food and Drug Administration (FDA) Tobacco Regulatory Science Fellowship is a collaborative program between the FDA Center for Tobacco Products (CTP) and the IOM. It is designed for mid-career professionals to gain experience and expertise to further define and develop the field of regulatory science as it relates to tobacco products and the FDA’s authorities under the Family Smoking Prevention and Tobacco Control Act. This program provides an opportunity for exceptional, highly competitive health professionals, scientists, and communication specialists, as well as lawyers and law enforcement professionals, to actively participate in the development of science-based public health strategies, serve as leads for defined projects, meet with policy leaders, and develop new competencies, including knowledge, skills, and experiences related to tobacco products and their use.

The fellowship is a 1-year, multidisciplinary residential program based primarily at the FDA. Fellows are placed in one of six offices within the CTP: Compliance and Enforcement, Health Communication and Education, Management, Policy, Regulations, or Science.
Increasing Collaboration Through Forums and Roundtables

In the role of partner and convener, the Institute of Medicine (IOM) serves as a neutral meeting place where diverse groups of people can come together to share information and advance knowledge on an ongoing basis. The IOM’s forums, roundtables, and workshops provide opportunities for serendipitous discovery, mutual exchange, and critical, cross-disciplinary thinking. Forums and roundtables bring together an array of stakeholders interested in specific areas of health science or public policy for dialogue and active collaboration. Members of the 15 forums and roundtables typically include experts from the scientific and practice communities; leaders from government, academia, and industry; and representatives of consumer and public interest groups, among others. Forum and roundtable meetings are intended to illuminate areas of interest through discussion and debate across sectors and institutions rather than resolve a particular challenge or make specific recommendations. Convening these individuals can create the shared knowledge, trust, and understanding necessary to foster progress in the most contentious areas of health and science policy. They may stimulate individuals to share their ideas in individually authored discussion papers and commentaries made available by the IOM, and they can prompt groups to innovate and take action in areas of their shared interest. In addition to forum and roundtable meetings, the IOM holds workshops on important topics, many of which relate to the interests of a forum, roundtable, or consensus committee.
Food Forum

Since 1993, the Food Forum of the Food and Nutrition Board has engaged scientists, administrators, and policy makers from academia, government, industry, and public sectors on an ongoing basis to discuss areas of concern related to food, food safety, and regulation, as well as identifying possible approaches for working to solve those problems. The dialogue established during meetings deals with emerging challenges in the broad areas of food science, food safety, and nutrition, including technologies and regulations. Most recently, the forum has held workshops on diverse topics such as the relationship between the human microbiome, diet, and health, and the importance of incorporating environmental sustainability into dietary guidance policies.

Forum on Aging, Disability, and Independence

The number of adults age 65 or older is expected to increase significantly in the coming decades, and so is the number of individuals living with disabilities. Therefore, the need to understand the challenges and opportunities associated with aging and disability continues to grow. The IOM and the National Research Council created the Forum on Aging, Disability, and Independence in 2012 as a neutral venue for discussions among stakeholders in the fields of aging and disability. The forum seeks to improve the health, independence, and well-being of adults aging with or aging into disability. The forum has held workshops on financing for long-term services and supports and ways to foster independence through technology.
Forum on Drug Discovery, Development, and Translation

The Forum on Drug Discovery, Development, and Translation, created in 2005, provides an opportunity for stakeholders to identify and discuss key problems and strategies in the discovery, development, and translation of drugs. Forum members include leaders from private-sector sponsors of biomedical and clinical research; federal agencies sponsoring and regulating biomedical and clinical research; foundations; the academic community; and patients. The range of topics the forum examines includes the full drug development pipeline—from drug discovery and regulatory approval to translation of research into clinical practice. The forum recently held a workshop on the international harmonization of regulatory standards for drug development and completed a multiyear series of international meetings on multidrug-resistant tuberculosis in collaboration with the National Institute of Allergy and Infectious Diseases of the National Institutes of Health. The forum has hosted a workshop series on the drug development clinical trials enterprise and convened two action collaboratives to examine strategies for the establishment of accreditation for clinical trial sites and enhancement of career development opportunities for academic clinical trialists. The forum also expects to convene a public workshop informing the development of an improved approach to evaluating and communicating the benefits and risks associated with pharmaceutical products.

Forum on Global Violence Prevention

Violence—including child abuse, intimate partner violence, elder abuse, sexual violence, gang violence, and suicide—is a major public health and safety problem worldwide. Each year, more than 1.5 million people worldwide lose their lives to violence, with low- and middle-income countries bearing the greatest burden. Many more are injured and suffer from a range of physical, sexual, reproductive, and mental health problems as a result of violence and exposure to violence. But violence can be prevented. The IOM’s Forum on
Global Violence Prevention, established in 2010, works to reduce violence worldwide by promoting research on both protective and risk factors and encouraging evidence-based prevention efforts. The forum aims to facilitate dialogue and exchange by bringing together experts from all areas in the field of violence prevention, including behavioral scientists, policy makers, criminal justice professionals, social service providers, economists, legal experts, journalists, philanthropists, faith-based organizations, and corporate social responsibility officers. Recent workshops have explored the contagious nature of violence and the prevention of violence and abuse against elders, and the 2013 IOM Annual Meeting focused on the science of violence, including its causation, mitigation, and prevention.

Forum on Medical and Public Health Preparedness for Catastrophic Events

The Forum on Medical and Public Health Preparedness for Catastrophic Events, established in 2007, focuses on strengthening the preparedness and resilience of the nation’s medical and public health systems to respond to natural disasters or acts of terrorism by improving communication and coordination of activities among federal, state, and local government agencies, as well as private-sector groups. Most recently, the forum held workshops about medical and public health preparedness, response, and recovery considerations for children and families and ways to improve the national response to an improvised nuclear device attack. The forum also convened a series of workshops across the country to gauge the public’s perception of strategies for the distribution and dispensing of medications during a pandemic.
Forum on Microbial Threats

The Forum on Microbial Threats was created in 1996 to provide a structured opportunity for stakeholder discussion and scrutiny of critical—and possibly contentious—scientific and policy issues of shared concern related to basic and applied research on the detection, surveillance, prevention, and management of naturally occurring, reemerging, and novel communicable diseases in humans, plants, and animals. The forum’s membership includes individuals from a range of disciplines and organizations in the public and private sectors, including the public health, medical, pharmaceutical, veterinary, plant pathology, academic science, agricultural, national security, and environmental communities. In recent years, forum dialogues have illuminated priorities in infectious disease research and public health policy; the use of new scientific and policy tools; and opportunities for more effective collaboration between the private and the public sectors. Recent workshops have focused on microbial ecology, the microbiome, microbial genomics, and funding challenges for public health preparedness and response in an age of shrinking budgets at all levels of government.

Forum on Neuroscience and Nervous System Disorders

Created in 2006, the Forum on Neuroscience and Nervous System Disorders brings together leaders from the private sector and users of biomedical and clinical research, federal agencies sponsoring and regulating research, private foundations, the academic community, and public and consumer groups. The forum focuses on building partnerships to understand the brain and nervous system and disorders in their structure and function, as well as on developing effective clinical prevention and treatment strategies. The forum concentrates
on six main areas: nervous system disorders, mental illness and addiction, the genetics of nervous system disorders, cognition and behavior, modeling and imaging, and ethical and social concerns. Recent workshops have focused on an array of topics, including ways to speed therapeutic development for nervous system disorders by moving directly from cellular models to first-in-human trials; opportunities to maximize the translation of effective treatments from animal models to clinical practice; and strategies to ensure the adequate training of human resources to recognize and treat neurological disorders in Africa.

**Global Forum on Innovation in Health Professional Education**

Established in 2012, the Global Forum on Innovation in Health Professional Education was inspired by the 2010 IOM report *The Future of Nursing* and the 2010 Lancet Commission report on interdependent health professional education for the 21st century. The forum aims to apply an ongoing, multinational, multidisciplinary approach to exploring promising innovations in health education by bringing together diverse stakeholders in the area of health professional education. Further, the forum strives to provide an ongoing, innovative mechanism to cultivate new ideas through global, multidisciplinary collaboratives, which represent formal partnerships among university-based health institutions undertaking recommendations put forward in either the 2010 Lancet Commission report or *The Future of Nursing* report. The four current innovation collaboratives are located in Canada, India, South Africa, and Uganda. Recent meetings have focused on the topics of transdisciplinary professionalism and innovations in health professional education.

**National Cancer Policy Forum**

The National Cancer Policy Forum was established in 2005 to succeed the National Cancer Policy Board, which was formed in 1997. The forum
Increasing Collaboration Through Forums and Roundtables

considers a range of topics in science, clinical medicine, public health, and public policy relevant to the goals of preventing cancer and caring for patients diagnosed with cancer. Its objectives are to identify emerging high-priority policy areas in the nation’s effort to combat cancer and to examine those areas through convening activities that promote discussion about potential opportunities for action. These activities inform stakeholders about critical topics through published reports, and they often provide input for planning formal IOM consensus studies. Recently, the forum has held workshops to examine ways to better meet the needs of adolescents and young adults with cancer and to review progress made in implementing a national cancer clinical trials system. Coming up, the forum will host a second National Cancer Policy Summit, where leaders in the cancer research and care communities will share their perspectives on the emerging high-priority needs and opportunities in cancer policy that could benefit from further analysis.

Roundtable on Environmental Health Sciences, Research, and Medicine

Established in 1998, the Roundtable on Environmental Health Sciences, Research, and Medicine brings together stakeholders from government, academia, industry, and consumer groups to discuss difficult and sensitive topics related to environmental health. Since its inception, the roundtable has focused on the state of environmental health science, identification of populations vulnerable to environmental hazards, and translation of environmental health research into public health practice. The roundtable has moved toward an increasingly global perspective in its discussions on nanotechnology, the interrelationship between trade and health, and corporate social responsibility in environmental health. Recent workshops have examined the impact of shale gas
extraction on human health, the relationship between coastal water ecosystems and health, and the intersection of biofuels, climate change, and human health. The roundtable also recently completed a series of webinars on health indicators for sustainable development to help inform the post-2015 development agenda process that is being led by the United Nations.

Roundtable on Health Literacy

The Roundtable on Health Literacy was created in 2004 in response to the IOM report *Health Literacy: A Prescription to End Confusion*, which found that almost half of all American adults—90 million people—have difficulty understanding and using health information. The roundtable’s mission is to support the evolution of the field of health literacy by translating research findings to practical strategies that can be implemented. To achieve this mission, the roundtable brings together leaders from academia, industry, government, foundations, and patient and consumer groups who have an interest and role in improving health literacy. Roundtable members discuss challenges facing health literacy practice and research and identify approaches to promote health literacy through mechanisms and partnerships in both the public and private sectors. Recent workshops have focused on topics such as the relationship between numeracy skills and health, oral health literacy, and ways to implement attributes of health literacy. In the near future, the roundtable will convene a workshop in California to discuss health literacy efforts under way in public health organizations.

Roundtable on Population Health Improvement

Launched in February 2013, the new Roundtable on Population Health Improvement brings together key stakeholders in conversation about what is needed to catalyze improvement in the wide range of social, environmental, and economic conditions that shape population health outcomes. The roundtable engages its members, outside experts, practitioners, and other stakeholders in three core areas: supporting fruitful interaction between
primary care and public health; strengthening governmental public health; and exploring community action in transforming the conditions that influence the public’s health. After an initial workshop setting the stage for its work, the roundtable held a workshop on opportunities to improve population health created by the Patient Protection and Affordable Care Act (ACA). The roundtable will also tackle strategies for applying a health lens to different types of policies in sectors ranging from housing to education, followed by a broad dialogue on reconfiguring our national and sectoral investments to support population health improvement.

**Roundtable on the Promotion of Health Equity and the Elimination of Health Disparities**

The Roundtable on the Promotion of Health Equity and the Elimination of Health Disparities, created in 2007, focuses on topics related to the visibility of racial and ethnic disparities in health and health care as a national problem, the development of programs and strategies to reduce disparities, and the need to encourage new leadership in a variety of fields. Roundtable members include experts from the health and social sciences, industry, and the community. Recent roundtable workshops included a discussion of ways to achieve health equity via the ACA and a workshop on leveraging culture to overcome health inequalities, looking specifically at examples from native communities. The roundtable also recently co-sponsored the Conference on the History of African Americans in the Medical Professions.

**Roundtable on Translating Genomic-Based Research for Health**

The Roundtable on Translating Genomic-Based Research for Health brings together leaders from academia, industry, government, foundations, and associations who have a mutual interest in the translation of genomic-based research. Launched in 2007, the mission of the roundtable is to advance
the field of genomics and improve the translation of research findings to health care, education, and policy. Translating genomic innovations involves many disciplines, and it takes place within different economic, social, and cultural contexts, necessitating a need for increased communication and understanding across these fields. The ramifications of genomic innovations extend to clinical utility, economic implications, equal access, and public perspectives. The roundtable fosters dialogue across sectors and institutions and facilitates collaboration among stakeholders. Recent workshops have focused on drug repurposing, improving the efficiency and effectiveness of genomic science translation, and ways to refine processes for the co-development of genome-based therapeutics and companion diagnostic tests.

**Roundtable on Value & Science-Driven Health Care**

The Roundtable on Value & Science-Driven Health Care, established in 2006 as the Roundtable on Evidence-Based Medicine, provides a trusted venue for national leaders in health care to work cooperatively toward their common commitment to effective, innovative health care that consistently adds value to patients and society. Members include clinicians, patients, health care organizations, employers, manufacturers, insurers, health information technologists, researchers, and policy makers. As leaders in their fields, roundtable members work with their colleagues to identify and engage the key challenges and opportunities for achieving better outcomes and greater value in health care. They then marshal the energy and resources of their respective sectors to work for sustained public–private cooperation. The work of the roundtable is conducted through two types of activities. The first is accelerating understanding and progress toward the roundtable’s vision of a continuously learning health system, in which
science, informatics, incentives, and culture are aligned for continuous improvement and innovation—with best practices seamlessly embedded in the delivery process and new knowledge captured as an integral byproduct of the delivery experience. The second type of activity is the fostering of more than two dozen cooperative projects through the work of six stakeholder innovation collaboratives focused on (1) best clinical practices, (2) communication of medical evidence, (3) clinical effectiveness research, (4) health information technology, (5) systems approaches for health, and (6) incentives for value in health care.
Recent and Upcoming Reports

This chapter lists reports released by the Institute of Medicine (IOM) from 2011 through 2013 as well as select older reports, grouped by subject area and listed in more than one subject area where appropriate. Some reports are joint products of the IOM and units of the National Research Council. Each report title is followed by the responsible IOM board and the year the report was released. Following the recently released reports are upcoming reports expected to be released through 2014. A “G” denotes a congressionally mandated study.

Recent reports

Aging
- Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis, Health Care Services, 2013.

* The Board on Children, Youth, and Families is a joint Board of the IOM and the National Research Council. The Board on Select Populations was previously known as the Board on Military and Veterans Health and Medical Follow-Up Agency; the Board on Global Health was previously known as the Board on International Health; the Board on Population Health and Public Health Practice was previously known as the Board on Health Promotion and Disease Prevention; and the Roundtable on Value & Science-Driven Health Care was previously known as the Roundtable on Evidence-Based Medicine.

Improving the Quality of Long-Term Care, Health Care Services, 2000.


Retooling for an Aging America: Building the Health Care Workforce, Health Care Services, 2008.


The Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?, Health Care Services, 2012.


Biomedical and health research


Advancing Regulatory Science for Medical Countermeasure Development: Workshop Summary, Health Sciences Policy, 2011.


Barriers to Integrating Crisis Standards of Care Principles into International Disaster Response Plans: Workshop Summary, Health Sciences Policy, 2012.

Beyond the HIPAA Privacy Rule: Enhancing Privacy, Improving Health Through Research, Health Sciences Policy, 2009.


Chimpanzees in Biomedical and Behavioral Research: Assessing the Necessity, Health Sciences Policy, 2011.

Clinical Data as the Basic Staple for Health Learning: Workshop Summary, Value & Science-Driven Health Care, 2011.


Conflict of Interest in Medical Research, Education, and Practice, Health Sciences Policy, 2009.


Crisis Standards of Care: A Toolkit for Indicators and Triggers, Health Sciences Policy, 2013.


Developing and Strengthening the Global Supply Chain for Second-Line Drugs for Multidrug-Resistant Tuberculosis: Workshop Summary, Health Sciences Policy, 2013.

Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary, Value & Science-Driven Health Care, 2013.


Engaging the Public in Critical Disaster Planning and Decision Making: Workshop Summary, Health Sciences Policy, 2013.


Evaluation of Biomarkers and Surrogate Endpoints in Chronic Disease, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.

Evolution of Translational Omics: Lessons Learned and the Path Forward, Health Care Services, 2012.


Facing the Reality of Drug-Resistant Tuberculosis in India: Challenges and Potential Solutions: Summary of a Joint Workshop by the Institute of Medicine, the Indian National Science Academy, and the Indian Council of Medical Research, Health Sciences Policy, 2012.


Genome-Based Diagnostics: Clarifying Pathways to Clinical Use: Workshop Summary, Health Sciences Policy, 2012.


Improving the Quality of Health Care for Mental and Substance-Use Conditions: Quality Chasm Series, Health Care Services, 2006.


Integrating Large-Scale Genomic Information into Clinical Practice: Workshop Summary, Health Sciences Policy, 2012.


Nanotechnology and Oncology: Workshop Summary, Health Care Services, 2011.


Organ Donation: Opportunities for Action, Health Sciences Policy, 2006.


Patient-Centered Cancer Treatment Planning: Improving the Quality of Oncology Care: Workshop Summary, Health Care Services, 2011.

Patients Charting the Course: Citizen Engagement in the Learning Health System: Workshop Summary, Value & Science-Driven Health Care, 2011.

Perspectives on Biomarker and Surrogate Endpoint Evaluation: Workshop Summary, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.


Preparedness and Response to a Rural Mass Casualty Incident: Workshop Summary, Health Sciences Policy, 2011.

Prepositioning Antibiotics for Anthrax, Health Sciences Policy, 2012.


Safe and Effective Medicines for Children: Pediatric Studies Conducted Under the Best Pharmaceuticals for Children Act and the Pediatric Research Equity Act, Health Sciences Policy, 2012.
Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem, Health Sciences Policy, 2006.
Technologies to Enable Autonomous Detection for BioWatch: Ensuring Timely and Accurate Information for Public Health Officials: Workshop Summary, Health Sciences Policy; Board on Life Sciences (NRC), 2013.
The 2009 H1N1 Influenza Vaccination Campaign: Summary of a Workshop Series, Health Sciences Policy, 2010.
The CTSA Program at NIH: Opportunities for Advancing Clinical and Translational Research, Health Sciences Policy, 2013.

Children, youth, and families
Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation, Food and Nutrition, 2012.
Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.
Evaluation of PEPFAR, Global Health; Children, Youth, and Families, 2013.
Fitness Measures and Health Outcomes in Youth, Food and Nutrition, 2012.
Improving the Health, Safety, and Well-Being of Young Adults: Workshop Summary, Children, Youth, and Families, 2013.

Research Methods to Assess Dietary Intake and Program Participation in Child Day Care: Application to the Child and Adult Care Food Program: Workshop Summary, Food and Nutrition, 2012.


Safe and Effective Medicines for Children: Pediatric Studies Conducted Under the Best Pharmaceuticals for Children Act and the Pediatric Research Equity Act, Health Sciences Policy, 2012.


Diseases


Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.


Enhancing Food Safety: The Role of the Food and Drug Administration, Food and Nutrition; Board on Agriculture and Natural Resources (NRC), 2010.

Epilepsy Across the Spectrum: Promoting Health and Understanding, Health Sciences Policy, 2012.

Evaluation of Biomarkers and Surrogate Endpoints in Chronic Disease, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.

Evaluation of PEPFAR, Global Health; Children, Youth, and Families, 2013.


Nanotechnology and Oncology: Workshop Summary, Health Care Services, 2011.

Patient-Centered Cancer Treatment Planning: Improving the Quality of Oncology Care: Workshop Summary, Health Care Services, 2011.

Perspectives on Biomarker and Surrogate Endpoint Evaluation: Workshop Summary, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.

Preventing Childhood Obesity: Health in the Balance, Food and Nutrition; Health Promotion and Disease Prevention, 2005.


Education

Educating the Student Body: Taking Physical Activity and Physical Education to School, Food and Nutrition, 2013.

Fitness Measures and Health Outcomes in Youth, Food and Nutrition, 2012.


Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research, Health Sciences Policy, 2011.

Environmental health

Blue Water Navy Vietnam Veterans and Agent Orange Exposure, Health of Select Populations, 2011.
Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.
Climate Change, the Indoor Environment, and Health, Population Health and Public Health Practice, 2011.


Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan, Health of Select Populations, 2011.


Review of the Department of Labor’s Site Exposure Matrix Database, Health of Select Populations, 2013.


Technologies to Enable Autonomous Detection for BioWatch: Ensuring Timely and Accurate Information for Public Health Officials: Workshop Summary, Health Sciences Policy; Board on Life Sciences (NRC), 2013.


Food and nutrition


Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation, Food and Nutrition, 2012.


Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.


Dietary Reference Intakes for Calcium and Vitamin D, Food and Nutrition, 2010.


Educating the Student Body: Taking Physical Activity and Physical Education to School, Food and Nutrition, 2013.

Enhancing Food Safety: The Role of the Food and Drug Administration, Food and Nutrition; Board on Agriculture and Natural Resources (NRC), 2010.


Fitness Measures and Health Outcomes in Youth, Food and Nutrition, 2012.


Managing Food Safety Practices from Farm to Table: Workshop Summary, Food and Nutrition, 2009.


Preventing Childhood Obesity: Health in the Balance, Food and Nutrition; Health Promotion and Disease Prevention, 2005.

Progress in Preventing Childhood Obesity: How Do We Measure Up?, Food and Nutrition, 2007.


Research Methods to Assess Dietary Intake and Program Participation in Child Day Care: Application to the Child and Adult Care Food Program: Workshop Summary, Food and Nutrition, 2012.


The Human Microbiome, Diet, and Health: Workshop Summary, Food and Nutrition, 2013.


Global health


Cancer Control Opportunities in Low- and Middle-Income Countries, Global Health, 2007.


Countering the Problem of Falsified and Substandard Drugs, Global Health, 2013.


Crisis Standards of Care: A Toolkit for Indicators and Triggers, Health Sciences Policy, 2013.


Evaluation of PEPFAR, Global Health; Children, Youth, and Families, 2013.


Sustaining Global Surveillance and Response to Emerging Zoonotic Diseases, Global Health; Board on Agriculture and Natural Resources (NRC), 2009.


Health care workforce

Allied Health Workforce and Services: Workshop Summary, Health Care Services, 2011.

Conflict of Interest in Medical Research, Education, and Practice, Health Sciences Policy, 2009.


Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary, Value & Science-Driven Health Care, 2013.


Geographic Adjustment in Medicare Payment: Phase II: Implications for Access, Quality, and Efficiency, Health Care Services, 2012.


Partnersing with Patients to Drive Shared Decisions, Better Value, and Care Improvement: Workshop Proceedings, Value & Science-Driven Health Care, 2013.

Patient-Centered Cancer Treatment Planning: Improving the Quality of Oncology Care: Workshop Summary, Health Care Services, 2011.

Patients Charting the Course: Citizen Engagement in the Learning Health System: Workshop Summary, Value & Science-Driven Health Care, 2011.


Retooling for an Aging America: Building the Health Care Workforce, Health Care Services, 2008.


The Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?, Health Care Services, 2012.

Health services, coverage, and access

Allied Health Workforce and Services: Workshop Summary, Health Care Services, 2011.
America’s Uninsured Crisis: Consequences for Health and Health Care, Health Care Services, 2009.
Best Care at Lower Cost: The Path to Continuously Learning Health Care in America, 2013.
Clinical Data as the Basic Staple for Health Learning: Workshop Summary, Value & Science-Driven Health Care, 2011.
Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis, Health Care Services, 2013.
Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary, Value & Science-Driven Health Care, 2013.


Evolution of Translational Omics: Lessons Learned and the Path Forward, Health Care Services, 2012.


Geographic Adjustment in Medicare Payment: Phase I: Improving Accuracy, Health Care Services, 2011.


Geographic Adjustment in Medicare Payment: Phase II: Implications for Access, Quality, and Efficiency, Health Care Services, 2012.

Geographic Variation in Health Care Spending and Promotion of High-Value Care: Interim Report, Health Care Services, 2013.


Improving the Health, Safety, and Well-Being of Young Adults: Workshop Summary, Children, Youth, and Families, 2013.


Knowing What Works in Health Care: A Roadmap for the Nation, Health Care Services, 2008.


Patient-Centered Cancer Treatment Planning: Improving the Quality of Oncology Care: Workshop Summary, Health Care Services, 2011.

Patients Charting the Course: Citizen Engagement in the Learning Health System: Workshop Summary, Value & Science-Driven Health Care, 2011.


Substance Use Disorders in the U.S. Armed Forces, Health of Select Populations, 2013.


Variation in Health Care Spending: Target Decision Making, Not Geography, Health Care Services, 2013.
Public health

Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation, Food and Nutrition, 2012.

Advancing Oral Health in America, Health Care Services; Children, Youth, and Families, 2011.


Barriers to Integrating Crisis Standards of Care Principles into International Disaster Response Plans: Workshop Summary, Health Sciences Policy, 2012.

BioWatch and Public Health Surveillance: Evaluating Systems for the Early Detection of Biological Threats, Health Sciences Policy; Board on Life Sciences (NRC); Chemical Sciences and Technology (NRC), 2010.


Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.


Climate Change, the Indoor Environment, and Health, Population Health and Public Health Practice, 2011.


Crisis Standards of Care: A Toolkit for Indicators and Triggers, Health Sciences Policy, 2013.


Dietary Reference Intakes for Calcium and Vitamin D, Food and Nutrition, 2010.

Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary, Value & Science-Driven Health Care, 2013.


Engaging the Public in Critical Disaster Planning and Decision Making: Workshop Summary, Health Sciences Policy, 2013.


Enhancing Food Safety: The Role of the Food and Drug Administration, Food and Nutrition; Board on Agriculture and Natural Resources (NRC), 2010.

Epilepsy Across the Spectrum: Promoting Health and Understanding, Health Sciences Policy, 2012.


Fitness Measures and Health Outcomes in Youth, Food and Nutrition, 2012.

Genome-Based Diagnostics: Clarifying Pathways to Clinical Use: Workshop Summary, Health Sciences Policy, 2012.


Incorporating Occupational Information in Electronic Health Records, Health Sciences Policy, 2011.


Integrating Large-Scale Genomic Information into Clinical Practice: Workshop Summary, Health Sciences Policy, 2012.


Patients Charting the Course: Citizen Engagement in the Learning Health System: Workshop Summary, Value & Science-Driven Health Care, 2011.


Preparedness and Response to a Rural Mass Casualty Incident: Workshop Summary, Health Sciences Policy, 2011.

Prepositioning Antibiotics for Anthrax, Health Sciences Policy, 2012.


Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research, Health Sciences Policy, 2011.

Review of the Department of Labor’s Site Exposure Matrix Database, Health of Select Populations, 2013.


Technologies to Enable Autonomous Detection for BioWatch: Ensuring Timely and Accurate Information for Public Health Officials: Workshop Summary, Health Sciences Policy; Board on Life Sciences (NRC), 2013.


Quality and patient safety
Best Care at Lower Cost: The Path to Continuously Learning Health Care in America, 2013.

Clinical Data as the Basic Staple for Health Learning: Workshop Summary, Value & Science-Driven Health Care, 2011.
Clinical Practice Guidelines We Can Trust, Health Care Services, 2011.


Delivering High-Quality Cancer Care: Charting a New Course for a System in Crisis, Health Care Services, 2013.

Digital Data Improvement Priorities for Continuous Learning in Health and Health Care: Workshop Summary, Value & Science-Driven Health Care, 2013.


Evaluation of Biomarkers and Surrogate Endpoints in Chronic Disease, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.


Future Directions for the National Healthcare Quality and Disparities Reports, Health Care Services, 2010.

Geographic Variation in Health Care Spending and Promotion of High-Value Care: Interim Report, Health Care Services, 2013.


Nanotechnology and Oncology: Workshop Summary, Health Care Services, 2011.


Patient-Centered Cancer Treatment Planning: Improving the Quality of Oncology Care: Workshop Summary, Health Care Services, 2011.

Patients Charting the Course: Citizen Engagement in the Learning Health System: Workshop Summary, Value & Science-Driven Health Care, 2011.

Perspectives on Biomarker and Surrogate Endpoint Evaluation: Workshop Summary, Food and Nutrition; Health Care Services; Health Sciences Policy, 2011.


Variation in Health Care Spending: Target Decision Making, Not Geography, Health Care Services, 2013.

Select populations and health disparities


Challenges and Opportunities for Change in Food Marketing to Children and Youth: Workshop Summary, Food and Nutrition, 2013.


Future Directions for the National Healthcare Quality and Disparities Reports, Health Care Services, 2010.


Improving the Health, Safety, and Well-Being of Young Adults: Workshop Summary, Children, Youth, and Families, 2013.


Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan, Health of Select Populations, 2011.


Race, Ethnicity, and Language Data: Standardization for Health Care Quality Improvement, Health Care Services, 2009.

Retooling for an Aging America: Building the Health Care Workforce, Health Care Services, 2008.
Review of the Department of Labor’s Site Exposure Matrix Database, Health of Select Populations, 2013.


**Substance abuse and mental health**


Sex Differences and Implications for Translational Neuroscience Research: Workshop Summary, Health Sciences Policy, 2010.
Substance Use Disorders in the U.S. Armed Forces, Health of Select Populations, 2013.
The Mental Health and Substance Use Workforce for Older Adults: In Whose Hands?, Health Care Services, 2012.

Veterans’ health
Blue Water Navy Vietnam Veterans and Agent Orange Exposure, Health of Select Populations, 2011.

Gulf War and Health: Treatment for Chronic Multisymptom Illness, Health of Select Populations, 2013.


Long-Term Health Consequences of Exposure to Burn Pits in Iraq and Afghanistan, Health of Select Populations, 2011.


**Women's health**


Weight Gain During Pregnancy: Reexamining the Guidelines, Food and Nutrition; Children, Youth, and Family, 2009.


**Upcoming reports**

**Aging**

Approaching Death: Addressing Key End of Life Issues, Executive Office.

Workshop: Elder Abuse and Its Prevention, Global Health.

**Biomedical and health research**

Confronting Multidrug-Resistant Tuberculosis in China and the BRICS: Workshop Summary, Health Sciences Policy.

Ethics Principles and Guidelines for Health Standards for Long Duration and Exploration Spaceflights, Health Sciences Policy.

Independent Review and Assessment of the Activities of the NIH Recombinant DNA Advisory Committee, Health Sciences Policy.

Research Directions in Human Biological Effects of Low Level Ionizing Radiation, Health of Select Populations.

Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.


**Children, youth, and families**

Sports-Related Concussions in Youth, Children, Youth, and Families.

The Science of Children Birth to Age 8: Deepening and Broadening the Foundation for Success, Children, Youth, and Families.

Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.

Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.

Workshop: Elder Abuse and Its Prevention, Global Health.


Workshop on Potential Health Hazards Associated with Consumption of Caffeine in Food and Dietary Supplements, Food and Nutrition.

Diseases

Confronting Multidrug-Resistant Tuberculosis in China and the BRICS: Workshop Summary, Health Sciences Policy.

Independent Review and Assessment of the Activities of the NIH Recombinant DNA Advisory Committee, Health Sciences Policy.

Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.


Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.

Education

Assessing Health Professional Education: A Workshop, Global Health.

Establishing Transdisciplinary Professionalism for Health: A Workshop, Global Health.

Governance and Financing of Graduate Medical Education, Health Care Services.

Sports-Related Concussions in Youth, Children, Youth, and Families.

The Science of Children Birth to Age 8: Deepening and Broadening the Foundation for Success, Children, Youth, and Families.
Environmental health

Department of Homeland Security Occupational Health and Operational Medicine Infrastructure, Health Sciences Policy.
Research Directions in Human Biological Effects of Low Level Ionizing Radiation, Health of Select Populations.
Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.

Food and nutrition

Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.
Workshop: Sustainable Diets: Food for Healthy People and a Healthy Planet, Food and Nutrition.
Workshop on Potential Health Hazards Associated with Consumption of Caffeine in Food and Dietary Supplements, Food and Nutrition.

Global health

Assessing Health Professional Education: A Workshop, Global Health.
Establishing Transdisciplinary Professionalism for Health: A Workshop, Global Health.
The Illicit Tobacco Market: Collection and Analysis of the International Experience, Population Health and Public Health Practice; Division of Behavioral and Social Sciences Education (NRC).
Workshop: Elder Abuse and Its Prevention, Global Health.

Health care workforce

Approaching Death: Addressing Key End of Life Issues, Executive Office.
Assessing Health Professional Education: A Workshop, Global Health.
Department of Homeland Security Occupational Health and Operational Medicine Infrastructure, Health Sciences Policy.
Establishing Transdisciplinary Professionalism for Health: A Workshop, Global Health.
Governance and Financing of Graduate Medical Education, Health Care Services.
The Science of Children Birth to Age 8: Deepening and Broadening the Foundation for Success, Children, Youth, and Families.
Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.

Health services, coverage, and access
Approaching Death: Addressing Key End of Life Issues, Executive Office.
Department of Homeland Security Occupational Health and Operational Medicine Infrastructure, Health Sciences Policy.
Governance and Financing of Graduate Medical Education, Health Care Services.
Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.

Public health
Approaching Death: Addressing Key End of Life Issues, Executive Office.
Assessment of Models Used to Predict the Effect of Policies Related to Tobacco Regulation, Population Health and Public Health Practice.
Health Implications of Raising the Minimum Age for Purchasing Tobacco Products, Population Health and Public Health Practice.
Sports-Related Concussions in Youth, Children, Youth, and Families.
Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.

Workshop on Potential Health Hazards Associated with Consumption of Caffeine in Food and Dietary Supplements, Food and Nutrition.

Quality and patient safety

Approaching Death: Addressing Key End of Life Issues, Executive Office.

Ethics Principles and Guidelines for Health Standards for Long Duration and Exploration Spaceflights, Health Sciences Policy.

Workshop: Addressing the Needs of Adolescents and Young Adults with Cancer, Health Care Services.


Select populations and health disparities

Ethics Principles and Guidelines for Health Standards for Long Duration and Exploration Spaceflights, Health Sciences Policy.

Governance and Financing of Graduate Medical Education, Health Care Services.

Workshop: Creating Equal Opportunities for a Healthy Weight, Food and Nutrition.

Substance abuse and mental health

Assessment of Resiliency and Prevention Programs for Mental and Behavioral Health in Service Members and Their Families, Health of Select Populations.

The Assessment of Ongoing Efforts in the Treatment of PTSD, Health of Select Populations.

Workshop: Elder Abuse and Its Prevention, Global Health.

Veterans’ health

Assessment of Resiliency and Prevention Programs for Mental and Behavioral Health in Service Members and Their Families, Health of Select Populations.

Gulf War and Health: Long-Term Effects of Blast Exposure, Health of Select Populations.

Research Directions in Human Biological Effects of Low Level Ionizing Radiation, Health of Select Populations.

Shipboard Hazard and Defense II, Medical Follow-Up Agency.

The Assessment of Ongoing Efforts in the Treatment of PTSD, Health of Select Populations.

The Update of the Warren Air Force Recruit Cohort, Medical Follow-Up Agency.

Veterans and Agent Orange: Update 2012, Health of Select Populations.
Contact Us

INSTITUTE OF MEDICINE
500 Fifth Street, NW
Washington, DC 20001
(202) 334-2659
www.iom.edu

Executive Office
President: Harvey V. Fineberg, NAS-323, (202) 334-3300
Interim Leonard D. Schaeffer Executive Officer: Clyde J. Behney,
Keck-838, (202) 334-2356; cbehney@nas.edu
Deputy Executive Officer: Clyde J. Behney, Keck-838, (202) 334-2356;
cbehney@nas.edu
Foreign Secretary: Jo Ivey Boufford, NAS-315, (202) 334-3366
Interim Home Secretary: Harold J. Fallon, NAS-316, (202) 334 2174

Office of Communications
Interim Director: Abbey Meltzer, Keck-840, (202) 334-1716;
ameltzer@nas.edu

Office of Council and Membership Services
Director: Judith Shamir, NAS-319, (202) 334-2175; jshamir@nas.edu

Office of Development
Director: Clare Flanagan, NAS-035, (202) 334-1546;
cflanagan@nas.edu

Office of Finance and Administration
Director: Janet A. Stoll, Keck-845, (202) 334-2374; jstoll@nas.edu

Health Policy Educational Programs and Fellowships
Director: Marie Michnich, Keck-870, (202) 334-1296;
mmichnich@nas.edu
Board on African Science Academy Development  
Director: Patrick Kelley, Keck-850, (202) 334-2650; pkelley@nas.edu

Board on Children, Youth, and Families  
Director: Kimber Bogard, Keck-731, (202) 334-1230; kbogard@nas.edu

Food and Nutrition Board  
Acting Director: Clyde J. Behney, Keck-838, (202) 334-2356; cbehney@nas.edu

Board on Global Health  
Director: Patrick Kelley, Keck-850, (202) 334-2650; pkelley@nas.edu

Board on Health Care Services  
Director: Roger Herdman, Keck-758a, (202) 334-1302; rherdman@nas.edu

Board on Health Sciences Policy  
Director: Andrew Pope, Keck-829, (202) 334-1739; apope@nas.edu

Board on Population Health and Public Health Practice  
Director: Rose Marie Martinez, Keck-855, (202) 334-2655; rmartinez@nas.edu

Board on the Health of Select Populations  
Director: Rick Erdtmann, Keck-773, (202) 334-1925; rerdtmann@nas.edu

The Institute of Medicine’s (IOM’s) ability to respond quickly and independently to emerging health issues depends in part on private financial resources provided through the philanthropy of individuals, foundations, and for-profit organizations. For information about opportunities to provide philanthropic support for the IOM, please contact:

Clare Flanagan, Director of Development, NAS-035, (202) 334-1546; cflanagan@nas.edu

giving@nationalacademies.org
www.iom.edu/About-IOM/Support-IOM.aspx