Annual Report 2011

Smart People. Smart Solutions.

RTI INTERNATIONAL

Smart People. Smart Solutions.

In an increasingly complex world, it's all too common to think that complicated solutions are needed to address the research and societal challenges we face. At RTI, we take a different approach. Our people look for smart solutions—solutions that are science-based, multidisciplinary, practical, cost-effective, and designed specifically to address the need at hand. For more than 53 years, our smart people have been developing smart solutions for clients in governments, businesses, and private foundations. We welcome the opportunity to do the same for you.

President's Message

turning knowledge into practice

As my tenure at RTI International nears its conclusion, I feel a great sense of pride in the progress we have made in the 12 years I've been here, and in the many exciting opportunities we are exploring as we look to the future.

Fiscal year 2011 was the most successful business year in our 53-year history, as we continued to strengthen our core research business and invest in new growth areas. Among the key highlights this year was the creation of a new Global Health Group, which provides science-based interventions in many parts of the developing world. For example, researchers are working to expand the benefits of health services to the most vulnerable and remote communities of Madagascar.

We also concluded our support of the USAID-funded Iraq Local Governance Program, which, since 2003, has worked to create the foundation of democratic local governance systems in post-war Iraq. We continue to apply this expertise in other emerging democracies, as exemplified by the Kinerja Program in Indonesia and its accomplishments this year toward strengthening civil society and citizen involvement.

Closer to home, RTI researchers developed new graphic cigarette warning labels for the U.S. Food and Drug Administration as part of a major effort to lower the incidence of lung cancer and other diseases caused by smoking. We also began a project funded by the U.S. Centers for Disease Control and Prevention to redesign the surveillance system that tracks health problems as they evolve, which will safeguard the health of American citizens.

In each of these projects and many more, RTI's *smart people* have developed *smart solutions* to meet the evolving needs of our clients and the society we serve. We look forward to a year filled with challenges and opportunities in 2012. As always, we will rely on the dedication of our people and the value of our multidisciplinary research approach.

Victoria Franchetti Haynes

Victoria Franchetti Haynes
President and Chief Executive Officer

Health Research

Justin Trogdon, PhD, a health economist, found that states spend up to $15 billion a year in medical expenses related to obesity.

making the world a healthier place to live

Health Policy

Assessing Obesity Costs on Health Care

In recent years, researchers at RTI have been documenting the impact of obesity on U.S. health care costs. During FY2011, a study published by researchers at RTI, Duke University, and the federal Agency for Healthcare Research and Quality assessed medical expenses related to obesity by state.

We found that states spend up to $15 billion a year in medical expenses related to obesity.

The research provides rough estimates of the share of obesity expenditures in each state that are funded by taxpayers through Medicare and Medicaid.

Total state-level estimates in 2009 dollars range from $203 million in Wyoming to $15.2 billion in California. Obesity-attributable Medicaid expenditures range from $38 million in Wyoming to $4 billion in New York, and Medicare expenditures range from $35 million in Wyoming to $3.4 billion in California.

The figures confirm earlier findings that obesity accounts for a significant, and preventable, portion of the nation's medical bill, and they highlight the role of the states in financing these costs.

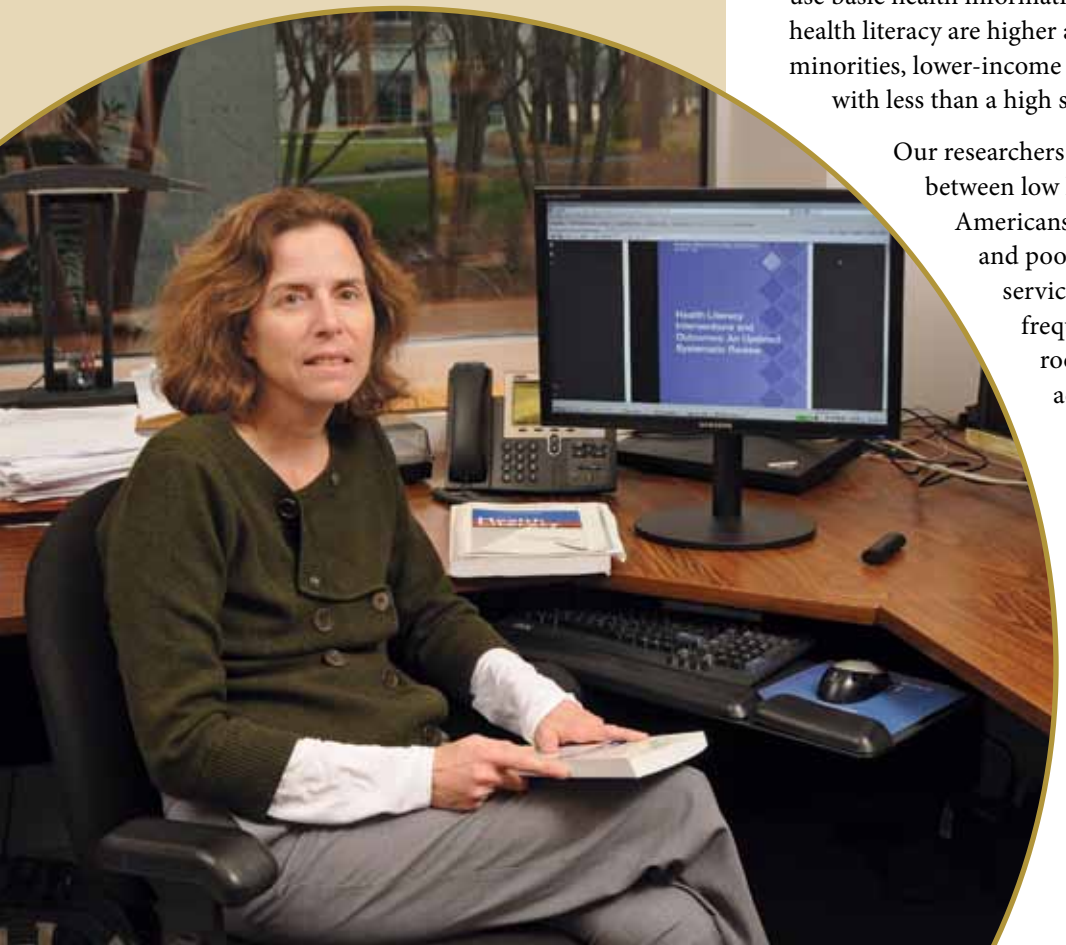
"This evidence clearly indicates that obesity imposes high annual total and public-sector medical costs on state budgets," said Justin Trogdon, PhD, a health economist at RTI and the paper's lead author. "The high costs emphasize the need to prevent and control obesity as a way to manage those costs."

Our research showed that total annual medical cost estimates attributable to obesity are 10 percent or higher in Alabama, Alaska, Indiana, Louisiana, Michigan, Mississippi, Ohio, South Carolina, and Tennessee. Colorado had the lowest percentage of annual medical estimates attributable to obesity, at 7 percent, followed by Hawaii, at 7.2 percent.

The research also showed between 25 and 64 percent of state-level obesity costs are financed by the public sector via Medicare and Medicaid.

"Policymakers can use this information to inform decisions about where to implement policies and programs designed to reduce obesity and related illnesses and costs," Trogdon said.

Nancy Berkman, PhD, a senior research analyst, led an evidence review that found that low health literacy is linked to poorer use of health care services and health outcomes.



Educating Americans on Health Information

During FY2011, our research showed that Americans' ability to understand and follow written information about their health is critical to care. A new evidence review by researchers at the RTI International–University of North Carolina at Chapel Hill Evidence-Based Practice Center found that low health literacy is linked to poorer use of health care services and health outcomes.

Seventy-seven million English-speaking adults in the United States have limited health literacy, making it difficult for them to understand and use basic health information. Rates of limited health literacy are higher among seniors, minorities, lower-income Americans, and those with less than a high school education.

Our researchers found an association between low health literacy in Americans aged 18 and older and poorer use of health care services, including more frequent use of emergency rooms and more hospital admissions, a lower likelihood of getting flu shots and of understanding medical labels and instructions, and a greater likelihood of taking medications incorrectly compared with adults who have higher health literacy. Additionally, the review found evidence linking low health literacy among adult women and underuse of mammograms.

"Our review should enhance the public's awareness that low health literacy can play a substantial role in the interrelationship among patient characteristics, use of health care services, and resulting health outcomes," said Nancy Berkman, PhD, a senior research analyst at RTI and the study's lead author.

The review also showed a link between low health literacy and poorer health outcomes, including poorer health status and higher mortality rates among elderly persons.

Furthermore, evidence from a small but growing body of studies suggests that racial and ethnic disparities in some health outcomes may at least partially be explained by differences in health literacy level, such as health status and flu shot rates among seniors, enrollment of children in health insurance programs, and taking medications as instructed by a health care professional.

"Finding ways to reduce the effects of low health literacy on health outcomes warrants the attention of policymakers, clinicians, and other stakeholders," Berkman said.

The evidence review, published in the July 19, 2011, *Annals of Internal Medicine*, was supported by the U.S. Department of Health and Human Services' Agency for Healthcare Research and Quality.

Reforming Health Care

Rising health care costs, inconsistent quality of care, and lack of coordination of care across the health care system—for example, among Medicare beneficiaries—has led to the need for a better solution.

Accountable care organizations (ACOs) are a new movement designed to address those issues. ACOs are intended to create incentives for health care providers to work together to treat individuals across care settings—including doctor's offices, hospitals, and post-acute care settings.

"The idea is that health care practitioners will deliver more coordinated, efficient care because they will be accountable for the total cost and quality of their patients' care," said Gregory Pope, director of RTI's Health Care Financing and Payment Program.

ACOs give physician practices incentives to consider the quality, value, and cost of the health care delivered, shifting away from the traditional fee-for-service model, which gives providers incentives to increase the volume of profitable services.

RTI researchers began working with the Centers for Medicare & Medicaid Services (CMS) in 2002 to design and implement the ACO idea in 10 large physician group practices in the United States. For almost the entire past decade, we've been working to refine ACO design and evaluate the program's effect on cost, efficiency, and quality of care.

The initial results based on the first two years of the demonstration showed modest cost savings and quality improvements.

"Essentially, the results show that the program has promise, but it's not a slam dunk yet," Pope said.

Based in part on our research, the Affordable Care Act, signed into law in 2010, requires CMS to establish a shared savings program to facilitate coordination and cooperation among providers in hopes that it will improve the quality of care for Medicare fee-for-service beneficiaries and reduce unnecessary costs. Eligible providers, hospitals, and suppliers may participate in the shared savings program by creating or joining an ACO.

During 2012, we will work closely with CMS to implement the new Medicare ACO program, including providing technical assistance to the ACOs themselves.

"ACOs represent the first step of an attempt to organize the fragmented U.S. health care system and lay the groundwork for improvements in the quality, efficiency, and coordination of medical care," Pope said.

RTI researchers have been working with CMS since 2002 to design, implement, and evaluate accountable care organizations and determine their effect on cost, efficiency, and quality of care. Initial results show modest cost savings and quality improvements.

Pablo Destefanis led an effort to test a new SMS text messaging system in Uganda and Argentina to improve reporting of clinical data about medicine stocks and number of patients treated.

Health IT

Implementing a Text Messaging System to Improve Quality of Health Care

In an effort to save health clinics time and money and improve quality of care, RTI tested a new SMS text messaging system in Uganda and Argentina using mobile phones to report clinical data about medicine stocks and number of patients treated.

The Bill & Melinda Gates Foundation provided funding for these pilot projects.

We tested the SMS system with participants from 10 communities in Uganda during large-scale community-based distribution of drugs to control neglected tropical diseases. The technology was also piloted in Argentina to track the distribution and use of steroids to treat pregnant women at risk of delivering prematurely.

The new process allows clinics to quickly update the head office about their medicine stock levels and the number of patients they have treated in order to avoid running out of one of the several drugs instrumental to fighting disease.

"Without this mobile-based system, clinics typically report stock levels by submitting paper documents, which are easily lost, or by phone, which is costly and complicates data aggregation," said Pablo Destefanis, RTI's project manager. "The impact can be insufficient drug supplies and patients who go untreated."

The technology has low implementation and maintenance costs and can use mobile phone units already deployed.

The SMS reporting system is compatible with any type of cell phone and can be used to send information quickly from a field clinic to the head office. The information is received by a centralized data processing system that interprets the message, processes the data, and makes it available for instant reporting and analysis.

The tool can also generate reports, maps, and alerts.

"The new approach was well accepted by the users in both Uganda and Argentina, and the training participants were enthusiastic about using it," Destefanis said.

Based on the project's success in Uganda and Argentina, the system was expanded for use during two large-scale community-based drug distributions to control neglected tropical diseases in Ethiopia from September to December 2011.

We are further testing the technology over an 18-month period in a multicountry study in Kenya, Pakistan, Guatemala, Argentina, India, and Zambia to track the distribution and use of steroids to treat pregnant women at risk of delivering prematurely.

Implementing Electronic Health Records

During FY2011, RTI researchers continued working to advance the safe, effective, and efficient use of health information technology (health IT) and improve patient and population health.

In the United States, we began a four-year project working with the Office of the National Coordinator for Health Information Technology, the Health Information Technology Research Center, and 60 regional extension centers to identify and develop best practices for implementing electronic health records.

Regional extension centers offer support to small provider practices implementing electronic health records.

Our researchers are developing effective tools and robust training programs to assist 100,000 primary health care providers in becoming meaningful users of electronic health records within two years.

"Adoption and cost are the main barriers to implementing electronic health records," said Carolyn Padovano, PhD, director of Health IT at RTI. "However, health care providers face many other challenges for which they are ill equipped, including assessing their technology needs, identifying and selecting vendors, redesigning work flows, and establishing baseline and performance metrics."

To improve the outcome for health care providers, we completed literature reviews, environmental scans, and case study research to identify the key factors necessary for successful electronic health records implementation.

Assessing Public Health Threats

Barbara Massoudi, PhD, a senior research health scientist at RTI, is leading a project to support the Centers for Disease Control and Prevention (CDC) redesign of a surveillance system that tracks health problems as they evolve.

The three-year project funded by CDC, called BioSense Redesign, is intended to safeguard and improve the health of the American people.

Massoudi and her team are working with CDC to create a cohesive system that provides more useful information for state and local partners, supplies timely data for multiple uses for regional entities and organizations, and offers a national picture of multiple health outcomes and syndromes.

The CDC BioSense Program was originally developed in the aftermath of the events of 9/11 and the subsequent anthrax attacks. Congress mandated funding for early detection and assessment of bioterrorism-related illness, and the BioSense information system was developed and implemented. However, it was done so with insufficient public health and other stakeholder involvement. As a result, adoption and use of the information system was limited.

The new BioSense system will feature a user-driven and community-controlled environment to empower BioSense users as a public health surveillance community. The new model takes advantage of novel and proven data storage and processing technology to allow users to control their data and encourages collaboration in a social network–style environment.

Our researchers have supported CDC's efforts to develop the BioSense Program since 2005, improving statistical models for early detection and assessing the utility of syndromic surveillance.

RTI and our partners are working with 60 percent of Madagascar's communes to fill health service gaps in 5,758 villages that are more than three miles from a health center.

Using this information, we developed a roadmap that integrates more than 200 tools and resources now available to all regional extension centers through a web portal.

As part of the program, RTI and the regional extension centers are working collaboratively in communities to continue to develop best practices, identify and disseminate lessons learned, and define effective practices for supporting and accelerating the adoption, implementation, and effective use of electronic health records, which will enable the electronic exchange and use of health information.

We are continuing to help the centers maximize their resources, facilitate collaboration, and assist in developing actionable electronic health records training materials, tools, and best practices to ensure that primary care providers successfully adopt and implement electronic health records.

Global Health

Making Health Care Accessible to the People of Madagascar

During FY2011, RTI continued to lead a project assisting Madagascar in meeting its goals to improve health outcomes and expand the benefits of health services to its most vulnerable and remote communities.

Part of the U.S. Agency for International Development's outreach efforts in Madagascar, the Santénet2 project is intended to strengthen community-level health systems and address challenges to getting services to remote, rural communities.

RTI and our partners are working with 60 percent of the country's communes to fill service gaps in 5,758 villages that are more than three miles from a health center. This is being accomplished by enhancing and scaling up training of community health workers, expanding public demand for services through information and education campaigns, and linking community health workers to a reliable supply chain for health commodities.

"Our goal is to help communities in Madagascar tackle these barriers by putting communities in control and making the health systems accountable to them," said RTI Chief of Party Volkan Cakir, PhD.

Gender issues also play a role in shaping Madagascar's health sector challenges. Cultural practices that favor men in household decisions

about food consumption contribute to women's undernourishment and, consequently, lower birth weights and higher infant mortality.

We are promoting gender equity at every step in the project; local partners conduct gender sensitivity training for project and partner staff members. They also conduct assessments of project activities' impact on gender equity and recommend remedial measures.

The results are impressive. In FY2011, community health workers trained by Santénet2 provided family planning services to more than 100,000 women in remote communities and treated fever, diarrhea, and acute respiratory infections. They are also providing growth monitoring of more than 1 million children.

"Through raising awareness and leading by example, we're trying to involve Malagasy women in family and community health planning so that fewer women and children die from preventable causes," said Cakir.

Raising Awareness on Efforts Needed to Reduce Stillbirths Worldwide

Millions of stillbirths occur each year, but they go unaccounted for and are not reflected in the world's global health policy efforts, according to a series of articles published in FY2011 in *Lancet*, two of which were coauthored by researchers at RTI International.

The series provides the most comprehensive assessment to date of global numbers and causes of stillbirths, perceptions and beliefs around the world, and solutions to prevent stillbirths—well-known interventions as well as innovations.

Coauthored by RTI epidemiologist Elizabeth McClure, one of the papers presents a large, global-scale survey of health care providers and parents in 134 countries, highlighting the lack of recognition and stigmatization surrounding stillbirth that has held back progress in reducing the number of these deaths.

"Efforts are needed to overcome this fatalism, lessen the stigma associated with stillbirth, and provide bereavement support," McClure said. "Stigma and blame add to and prolong parents' grief. The silence surrounding stillbirths, compared with public clamor over AIDS deaths, hides the problem and impedes investment."

In the second paper, also coauthored by McClure, all countries are called on to reduce the stillbirth rate to 5 per 1,000 births by 2020—and in high-income countries, to eliminate all preventable stillbirths by the same year.

"Achieving a substantial reduction in stillbirths worldwide requires concerted and coordinated action by national and local governments and international organizations," McClure said.

RTI researchers coauthored the most comprehensive assessment to date of global numbers and causes of stillbirths, perceptions and beliefs around the world, and solutions to prevent stillbirths.

Public health researcher Andrea Anater, PhD, found that many low-income people rely on soup kitchens for food. Many were also scavenging from dumpsters, selling blood, and turning to crime to feed themselves.

According to McClure's research, more than 40 high-income countries and several middle-income countries have already achieved a stillbirth rate of less than 5 per 1,000 births. For example, China has halved stillbirth rates in the past 15 years, and the national rate is now close to 5 per 1,000. In the United States, the stillbirth rate is estimated to be 3.8 per 1,000 births.

"The international community, individual countries, professional organizations, and families must take a stand to prevent stillbirths," McClure said. "Everyone has a role to play, and together stillbirths can and must be counted and reduced."

Health Behaviors

Understanding the Desperation Causing Low-Income Americans' Eating Behaviors

Assessing the problem is the first step in finding a solution. RTI public health researcher Andrea Anater, PhD, led a study, published in FY2011, that examined the lengths low-income Americans go to when they are worried about having enough food for themselves and their families.

She found that people are scavenging from dumpsters, selling blood, and turning to crime as a means of feeding themselves in today's tough economic environment.

Anater conducted the study with researchers from Rutgers University Food Policy Institute and Johns Hopkins Bloomberg School of Public Health. It was published in the *Journal of Hunger and Environmental Nutrition*.

"We know that there are numerous federal and nongovernmental assistance programs out there to ensure Americans have enough to eat, but we also know there is a gap where people are still going hungry," Anater said.

Our study, which collected information from almost 500 people at 50 food pantries and soup kitchens in the state of New Jersey, explored the prevalence rates and potential risks of the practices of those interviewed.

"Understanding what it is individuals are doing and the frequency at which they are doing it is critical," said Anater. "In addition to the humane concerns, negative health effects pose serious consequences to the individual, household, community, and larger society."

Some of the reported practices to obtain food are commonly used and publicly acceptable, such as using coupons, buying products when they are on sale, and buying in bulk. Others were more extreme, such as diluting baby formula, pawning items to have money for food, and eating roadkill.

The research showed that while all of the participants received food from soup kitchens or food pantries and almost half Food Stamps, 81 percent of the participants still indicated reduced diet quality, disruption of normal eating patterns, or reduction in food intake during the 12-month period prior to the survey.

"Low-income individuals are using risky practices to make up for gaps between the 'safety net' and their food needs," Anater said. "This gap poses significant implications for researchers and policymakers that we are all challenged to address."

Treating Substance Abusers

RTI researchers used data from a nationwide survey to better understand whether characteristics of drug users differ in terms of routes of administration, oral or injected. Doing so improves researchers' ability to tailor substance abuse treatment and prevention strategies to individual users.

Assessing How Medical Technologies May Improve Maternal and Neonatal Health

A web-based tool that may help improve maternal health has been developed by a team led by Doris Rouse, PhD, and Beth McClure at RTI.

The tool, called MANDATE (Maternal and Neonatal Directed Assessment of Technology), objectively assesses the impact of new medical technologies on maternal, fetal, and neonatal mortality, particularly in low-resource settings, where more than 98 percent of global maternal and neonatal deaths occur. MANDATE was developed with funding from the Bill & Melinda Gates Foundation.

By calculating the potential number of maternal and neonatal lives saved, the tool allows users to identify and compare the potential impact of a technology. Users may adjust variables related to a technology's availability, appropriate use, and efficacy to determine how a technology might be improved to have the greatest impact.

Once the variables are set by the user, MANDATE can determine the technology's potential impact by patient category, medical condition, and health care settings in Sub-Saharan Africa and East Asia, the regions with the highest mortality.

Rouse, McClure, and their team initiated the project in 2009 and made the tool available for public use on the MANDATE website (mnhtech.org) free of charge in November 2011, with additions being made through 2012.

MANDATE can also be used to define the characteristics that a new technology would need to achieve the highest efficacy and coverage in various areas and to estimate the potential benefit in lives saved of any new device under development.

RTI plans to further evolve MANDATE to provide an enhanced user interface, expanded conditions, and additional insights as to the key factors for optimizing technologies in different health care settings.

Pending litigation, beginning in September 2012, all cigarette advertisements, packages, and cartons will feature new health warnings, many of which were designed by RTI staff members.

We found that injection drug users are in greater need of substance abuse treatment than non-injection drug users are.

"Injection drug use is associated with substantially more substance abuse–related problems than non-injection drug use, including a higher prevalence of dependence, unemployment, and co-occurring mental and physical disorders," said Scott Novak, PhD, a senior behavioral health epidemiologist at RTI. "These problems appear to characterize a treatment-resistant population in need of specialized treatments."

Our study, published in the *Journal of Addictive Diseases* and co-authored by Alex Kral, PhD, of RTI, used data from the National Survey on Drug Use and Health (NSDUH) to compare the routes of administration of past-year injection drug users and non-injection drug users who used heroin, methamphetamine, and cocaine.

NSDUH is an annual nationwide survey involving approximately 70,000 youth and adults in the United States per year conducted by RTI for the Substance Abuse and Mental Health Services Administration.

We found that injection was the most preferred route of administration among those living in rural areas compared to those living in either urban or suburban locations.

The study also showed that injection drug users were more likely than those using drugs via other routes to be aged 35 and older, be unemployed, and possess less than a high school education.

Additionally, injection drug users exhibited higher rates of abuse and dependence, perceived need for substance abuse treatment, and co-occurring physical and psychological problems than non-injection drug users.

"This study confirms a longstanding belief that injection drug users are a unique population with their own treatment needs, regardless of what drug they inject," Novak said. "Because injection drug users are disproportionately engaged in the criminal justice system, criminal justice diversion programs, such as Drug Courts, and treatment for incarcerated offenders should also consider the unique needs of injection drug users."

Developing Smart Solutions in Health Communications

Pending litigation, beginning in September 2012, all cigarette advertisements, packages, and cartons will feature new health warnings, many of which were designed by RTI staff members.

Our staff members surveyed more than 18,000 people to help the Food and Drug Administration assess the relative efficacy of the proposed health warnings in conveying information about various health risks of smoking.

The warning labels include rotting and diseased teeth and cancerous lips, the corpse of a smoker, diseased lungs, a man in an oxygen mask, a man exhaling smoke through a hole in his neck, and a man wearing an "I quit" T-shirt.

Based on our research, several of the new, more graphic warning images had a significant impact on participants' beliefs about the health risks of smoking and in some cases on beliefs about the health risks of secondhand smoke exposure for nonsmokers.

Public health officials hope that the new health warnings will increase knowledge about the health risks of smoking and exposure to secondhand smoke. Ultimately, the goal is to prevent youth smoking initiation and promote cessation.

During FY2011, RTI staff members also developed a 200-page graphic novel, *The Docs*, funded by the Naval Health Research Center to help prepare Navy corpsmen for the stress and danger of combat deployments in Afghanistan.

The Docs is designed to psychologically prepare Navy corpsmen by realistically portraying common concerns faced in war zones. Our staff members illustrated the novel and collaborated with Naval Health Research Center personnel on the storyline, text, and production.

The novel follows four fictional corpsmen as they deploy to Iraq and encounter insurgent attacks and roadside bombs, as well as deal with the emotional turmoil of leaving their families behind and of not being able to save a soldier's life.

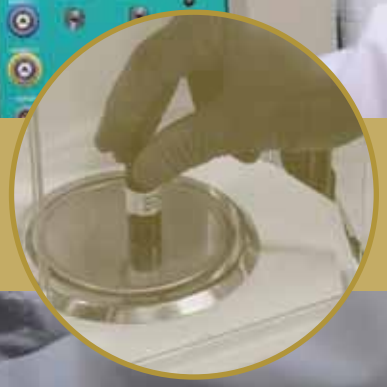
The emphasis is on storytelling and realism. The novel includes drawings of the battlefield and seriously wounded servicemen. The format and genre is appealing to the target audience of 18- to 24-year-olds and includes thought-provoking content for discussion in training sessions.

The Navy and Marine Corps have distributed 10,000 copies of the graphic novel at sites where corpsmen are being trained. The story was also animated into a 90-minute DVD for viewing on portable phones and computers.

During FY2012, we will support Headquarters Marine Corps in developing a follow-on graphic novel specifically for Marines that focuses on pre-deployment training for control of combat operational stress. The novel, to be published in 2013, will depict a Marine Corps unit during a deployment to Afghanistan.

Shari Lambert, Russ Peeler, and Andrew Jessup led a team to develop a graphic novel, The Docs, *to help prepare Navy corpsmen for the stress and danger of combat deployments in Afghanistan.*

Drug Discovery and Development



Katherine Moore and Megan Grabenauer, PhD, are part of the team developing new methods for rapid analysis and detection of designer drugs.

pioneering new ways to treat disease

Science and the War on Designer Drugs

Dangerous new trends in the use of designer drugs—clandestinely produced drugs that are pharmacologically similar to a controlled substance but are not illegal—have created unprecedented challenges for law enforcement and public health.

Of particular concern are products that contain synthetic cannabinoids and have been sold under the names K2 and Spice, or "smokable incense." Users wrongly assume these products are safe.

Five synthetic cannabinoids are banned in the United States, but research literature describes some 400 additional closely related compounds.

"These compounds were developed as research tools," explained senior behavioral pharmacologist Jenny Wiley, PhD. "They were never intended for recreational use, and we know relatively little about their impact on behavior and physiology."

With funding from the National Institute on Drug Abuse, RTI scientists are applying their expertise to help address this global challenge. We developed state-of-the-art approaches for the rapid analysis, detection, and mass spectral confirmation of designer drugs in these misleadingly labeled formulations, as well as in biological fluids. We are also investigating the behavioral effects of these compounds, with an emphasis on how they may differ from those caused by marijuana.

"Put simply," said Brian Thomas, PhD, "testing for individual compounds is inefficient. We need broad-based, non-targeted analyses using high-resolution mass spectrometry and sophisticated data interrogation approaches that can be used as surveillance screens to identify new chemicals as they appear."

RTI tested 25 materials available on the open market that were suspected to contain synthetic cannabinoids to determine their chemical components. Results indicate that bans against the five most common synthetic cannabinoids have not prevented their manufacture and sale. We also detected new analogs in these formulations, suggesting that manufacturers have begun to use alternative chemicals to avoid detection and prosecution.

"RTI works closely with the forensic community," said senior forensic scientist Peter Stout, PhD. "We're leveraging funding from the National Institute

Forensic scientists Cynthia Lewallen and Nichole Bynum display a selection of "smokable incense" that RTI tested for synthetic cannabinoids. This research addresses the growing public health threat created by the commercial availability of designer drugs.

Led by Stephanie Earnshaw, PhD, an RTI Health Solutions study supports the role of aspirin for preventing coronary heart disease in certain patients.

of Justice to provide tools to improve detection and identification of designer drugs in forensic laboratories."

By developing methods that can test for whole classes of designer drugs, RTI aims to increase the efficiency of law enforcement efforts and improve public health response to this rapidly growing social threat.

Cost-Effectiveness of Aspirin for Preventing Coronary Heart Disease

Physicians sometimes prescribe antiplatelet therapy—medications to reduce the risk of blood clots—to reduce the risk of heart attack or stroke in patients with atherosclerosis, or narrowing of the blood vessels. Aspirin is frequently used as an antiplatelet therapy.

When prescribing aspirin, clinicians must balance reduction in risk for coronary events with risk of gastrointestinal bleeding. To help manage this risk, physicians may also prescribe a class of drugs called proton pump inhibitors, which reduce gastric acid production.

Led by Stephanie Earnshaw, PhD, vice president of U.S. Health Economics, RTI Health Solutions (RTI-HS) implemented a project to estimate the cost-effectiveness of aspirin with and without a co-prescription for a proton pump inhibitor for preventing primary coronary heart disease (CHD) in men 45 years of age and older. The study used sophisticated health economics modeling techniques to compare the costs and outcomes of prescribing low-dose aspirin alone, aspirin plus a proton pump inhibitor, or no treatment. We specifically considered the effects of each treatment on cardiovascular events and the risk of upper gastrointestinal bleeding.

The RTI-HS study found that using aspirin for preventing primary CHD was less costly and more effective than no treatment for men aged 45, 55, or 65 years at baseline who had a 10 percent 10-year risk of CHD.

In addition, for men whose risk of gastrointestinal bleeding was average, adding proton pump inhibitors was not cost-effective, although it may be cost-effective for men at increased risk.

This analysis supports the role of aspirin for primary prevention of CHD events in middle-aged men across a range of CHD and gastrointestinal bleeding risk levels. Increased risk of gastrointestinal bleeding does not reduce aspirin's net benefit until gastrointestinal bleeding risk becomes quite high. Study results were published in the *Archives of Internal Medicine*.

RTI Health Solutions is a business unit of RTI International that provides scientifically rigorous research and consulting services to pharmaceutical, medical device, and diagnostic companies.

Accelerating the Search for Novel Drugs

As a nonprofit research institute, we reinvest our net revenues in our programs, our people, and in investigator-led research projects in many areas. Among our FY2011 investments is a program to study a new molecular target that may prove to be useful in the treatment of heart disease, hypertension, diabetes, and a range of other disorders.

This research focuses on a recently discovered receptor known as APJ. The APJ receptor binds apelin, a peptide produced in the heart, liver, kidney, brain, and other organs. Among its many functions in the body, apelin lowers blood pressure, improves heart function, and appears to protect against nerve degeneration.

Led by research pharmacologist Rangan Maitra, PhD, senior research chemist Scott Runyon, PhD, and senior computational scientist Danni Harris, PhD, our multidisciplinary team is gaining a better understanding of the physiological functions of the APJ receptor by developing novel drugs that regulate its function.

The RTI team developed a simple, rapid, and robust in vitro assay to identify compounds that either activate or inhibit the apelin receptor. This assay enabled RTI researchers to identify early lead compounds and study various peptide fragments to better understand how these compounds bind to and activate the APJ receptor.

"Peptides like apelin are not themselves effective drugs because they are degraded too quickly by the body," explained Runyon. "The goal of our research is to accelerate the search for more metabolically stable compounds that bind to this receptor and therefore have therapeutic potential."

To facilitate this work, RTI developed a computer-aided drug design that identified a small motif of amino acids critical for receptor recognition and function. Simultaneously, the team synthesized small molecules that activate the receptor at very low concentrations and began work to refine these compounds to produce drug-like molecules for translational research.

We also undertook research to identify areas of unmet need where APJ ligands would be useful. In collaboration with scientists from Harvard University, we performed an epidemiological evaluation of apelin peptide levels in the blood of pregnant women with or without preeclampsia.

"Our pilot data suggest that lower levels of circulating apelin peptides are associated with preeclampsia," said Maitra.

We are continuing to explore other areas where compounds targeting APJ could be useful, such as HIV-induced neurodegeneration, liver disease, and diabetes.

Research scientist Yanyan Zhang, PhD, measures apelin receptor function as part of RTI-funded research to accelerate the search for novel treatments for heart disease, hypertension, diabetes, and other disorders.

Education and Training

Data from a study led by Debbie Herget and Dan Pratt are being used by researchers and policymakers as an educational baseline for high school students.

measuring educational performance and improving student outcomes

Using Computerized Testing to Capture Plans and Expectations of Ninth Graders

There is a distinct correlation between parents' education levels and how their children perform in the classroom. This is just one of the eye-opening facts gleaned from the High School Longitudinal Study of 2009 (HSLS:09), which was conducted by RTI and sponsored by the U.S. Department of Education's National Center for Education Statistics.

More than 21,000 ninth-grade students nationwide were surveyed for the study using a new, computerized adaptive testing process developed by RTI to accommodate the varying equipment in different schools. At the same time, the new testing process preserved standardization of testing, which ensures the most accurate results.

The data, released in FY2011, are being used by researchers and education policymakers as baseline information at the beginning of high school for this cohort.

The 2009 data focus on students' transitions into high school, especially their decisions about courses and plans for postsecondary education and careers. The HSLS:09 study captured these decisions, plans, expectations, and activities generally but also specifically regarding math and science.

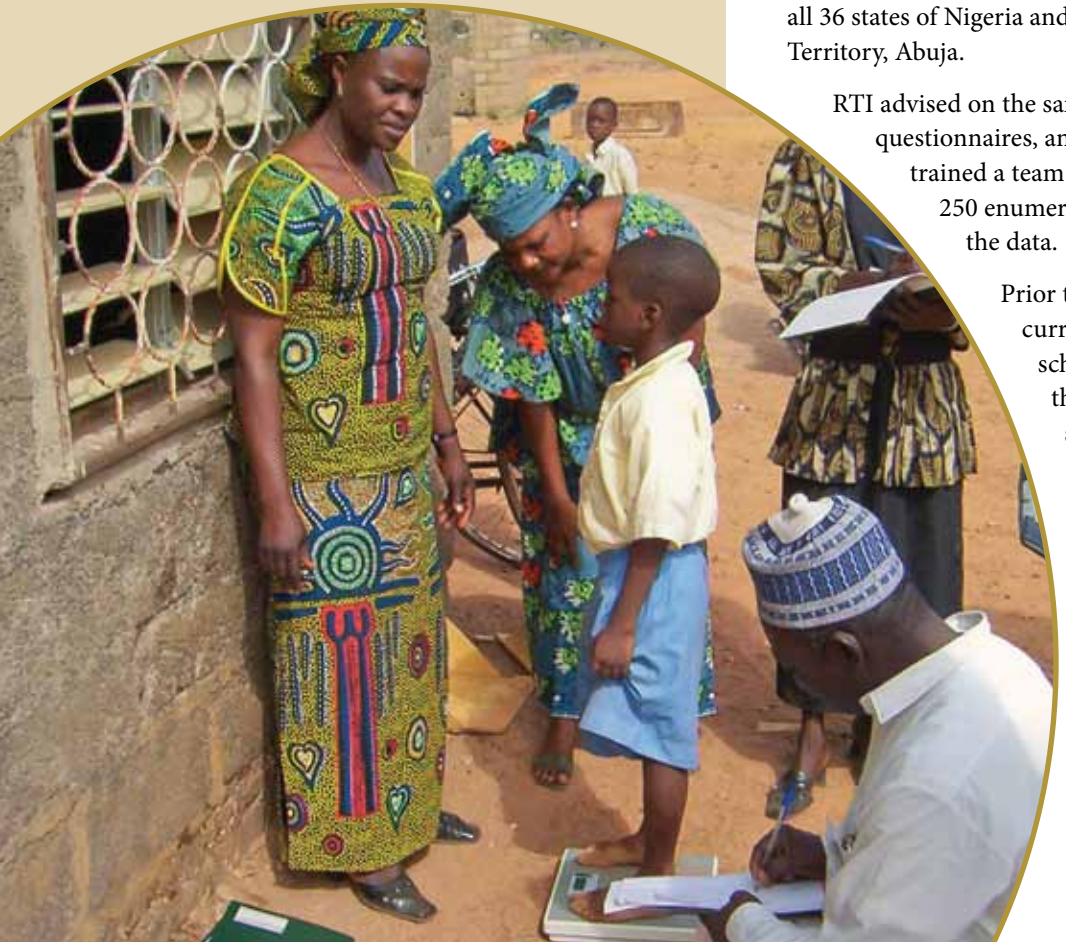
Findings show that of students whose parents hold a master's degree or higher, 44 percent were in the top quintile of math performance and 5 percent in the bottom quintile. Of students whose parents earned a high school diploma or equivalent, 15 percent were in the top quintile and 24 percent were in the bottom quintile.

RTI will conduct the first follow-up of HSLS:09 in the spring of 2012, when most of the students will be in the 11th grade. Additional rounds of data will be collected as the study follows these students through postsecondary education and into the world of work.

Survey Helps Nigeria Measure Achievement of Universal Education Goals

According to a study completed by RTI in 2011, Nigeria is making progress in meeting universal basic education goals, but the progress is unevenly distributed across the country.

Data collectors from the first Nigeria Education Data Survey take height and weight measurements of school children to track their pace of development.



Funded by the U.S. Agency for International Development and the United Kingdom Department for International Development, RTI worked with the National Population Commission of Nigeria in conducting a household-based education survey that examined school attendance and absenteeism, expenditure on schooling, and parents' perception of school quality and the value of schooling.

To provide a more complete picture of schooling needs at the local level, RTI oversaw the largest Nigeria Education Data Survey conducted to date, covering approximately 30,000 households with school-aged children (6–14 years) from all 36 states of Nigeria and the Federal Capital Territory, Abuja.

RTI advised on the sample design, questionnaires, and training manuals; trained a team of more than 250 enumerators; and analyzed the data.

Prior to the survey, lack of current reliable data about school participation and the reasons for low school attendance hindered state and federal education planners.

By providing perspectives and opinions of the parents/guardians responsible for household decisions around schooling, the survey complemented Nigeria's census-based school enrollment data and provided information on the progress made by government reforms and investments to remove barriers to school attendance and improve the quality of instruction.

The findings suggest that a complex array of factors influence school attendance. On average, regions with lower socioeconomic status, lower household expenditure per student, greater distances to school, and lower parental educational attainment have less school participation. A simple assessment of reading ability that was administered to all children in a local language and in English revealed significant deficits in literacy, even among those students attending school, signaling a need for greater attention to teaching quality.

The final report—whose official launch was attended by the vice president of Nigeria, the U.S. ambassador to Nigeria, and the UK High Commissioner—has been widely circulated and has provided a more complete picture of the barriers that must be overcome at the household level to achieve universal basic education.

Evaluating Programs that Encourage Low-Income Students to Attend College

During FY2011, RTI researchers played an integral role in determining which education interventions within the GEAR UP (Gaining Early Awareness and Readiness for Undergraduate Programs) program received implementation awards.

GEAR UP is a discretionary grant program, funded by the U.S. Department of Education, designed to increase the number of low-income students who are prepared to enter and succeed in postsecondary education.

"Our efforts helped the Department of Education identify the promising short-term interventions and effective evaluation plans that were most likely to help low-income students make it to college," said project director Laura Knapp.

RTI worked with the Department of Education in a multiphase effort to support and evaluate promising GEAR UP interventions in three priority areas. Once the 12 grantees were chosen, RTI provided support to the programs as they implemented their service, collected data, and wrote evaluation reports.

Implementation awards were given to programs that evaluated short-term outcomes of an innovative or promising practice in one of three priority areas: services to support the transition of eighth graders to achieve ninth-grade success, services to support the achievement of successful completion of grade-appropriate math, or services to support high school students in their readiness to enter college without the need for remedial coursework.

These implementation awards were designed to help build capacity among the grantees to engage in rigorous studies focused on program improvement. Many of the programs included Saturday and summer programs, new high school courses, and a range of tutoring models and embedded support.

Keeping Focus in the Middle of a Revolution

When the Egyptian revolution broke out in early 2011, the future of the Girls' Improved Learning Outcomes (GILO) project was uncertain.

Funded by the U.S. Agency for International Development (USAID), and working in collaboration with RTI and the Government of Egypt, GILO has trained nearly 9,000 teachers to shake off outdated, ineffective practices and gender stereotypes and to implement new learning methods in schools across the country.

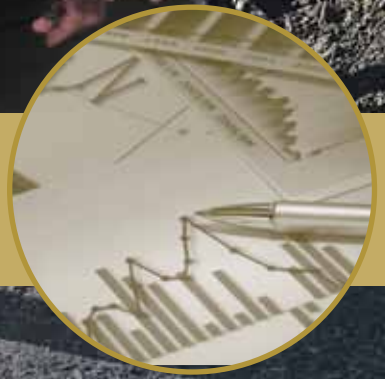
At the recommendation of USAID Egypt, all GILO offices closed for nearly two weeks during the most intense periods of the revolution.

This and other factors associated with the uprising forced GILO to postpone and reschedule the implementation of a number of project activities.

During this period, at their request, many teachers trained by GILO were reassigned to schools closer to their homes. As a result, smaller, more remote communities with few local teachers were significantly impacted by change that came with the revolution.

"There was a lot of uncertainty surrounding GILO during the revolution, but the teachers never lost sight of the importance of education or their desire to change the system for future generations," said RTI Chief of Party Barbara Toye-Welsh. "When things stabilized afterwards, GILO was still on track to achieve great things in Egypt."

Economic and Social Policy



Brent Rowe, Galen Hatfield, PhD, and Vijay Gupta, PhD, are working to better understand barriers to the adoption of new technologies in civil infrastructure.

informing public policy with independent analysis

Paving the Way for Innovation in Civil Infrastructure

In its Report Card for America's Infrastructure, the American Society of Civil Engineers currently grades U.S. civil infrastructure as "D" overall, with many categories slipping toward failure. The critical condition of roads and bridges in particular presents tremendous challenges to state and local governments, which bear the financial burden of maintenance and repairs.

Although innovative technologies exist that would increase the useful life of infrastructure, lower operating and repair costs, and improve the ability to withstand catastrophic events such as hurricanes, these technologies have not been widely adopted in the United States. Barriers to the adoption of new materials and processes in civil infrastructure, and in construction in general, are not well understood.

This year, RTI laid the groundwork to apply our expertise in behavior research, economics, and advanced technology to better understand these barriers.

Working with two multinational corporations, Owens Corning and TenCate, we are isolating a single case study—the use of interlayer technologies in road construction—to study the financial and social issues regarding technology adoption.

"In the United States, the primary owner, operator, and investor in infrastructure is the public sector," said Galen Hatfield, PhD, who assembled the study team. "Because nearly all investment decisions are made based on lowest initial cost, investment in infrastructure-related R&D is quite low, largely uncoordinated, and primarily focused on maintenance."

The RTI team is comparing the use of interlayer paving on publicly funded projects with its use on private projects, such as toll roads and commercial parking lots. We will also study its use in China and India, where public-private partnerships are more common. Our goal is to document the influence of economic motivators and social factors on technology adoption.

We are also aiming to quantify the financial impact of the failure to adopt new technologies and make recommendations for improving the rate of technology adoption both in the United States and in countries experiencing rapid growth.

By applying our expertise in behavior research, economics, and advanced technology, we are working to inform public policy and behavior in infrastructure management.

RTI helped launch an institute that will help Sarasota County, Florida—and the rest of the nation—prepare for the challenges associated with aging populations.

Our goal is to inform policy and practice and enable the best use of scarce public resources for the public good. "When governments invest in civil infrastructure, the investments should be smart ones, based on the highest-value-added technology with the greatest return on investment," said Hatfield.

An Institute for the Ages

Arguably the most important demographic trend facing communities today is the aging of our population. By 2050, a third of the U.S. population—and nearly 40 percent of the population of the developed world—will be over 55. This demographic transition will necessitate changes in the design of goods and services, the delivery and use of public resources, the characteristics of the workforce, and the structure of communities.

At the vanguard of this shift is Sarasota County, Florida, where the proportion of residents over 55 is already ahead of global projections for 2050.

In 2010, RTI was sought out by the county to develop a plan that would leverage their unique position and improve lives in their community, as well as in other communities facing the same issues.

Drawing on our expertise in multiple interrelated fields—aging and health, engineering, open innovation, and economic development—RTI conceptualized and planned the launch of the Institute for the Ages.

Led by senior economic development analyst Adrienne Brown, RTI sought the input of more than 200 representatives of global businesses, research organizations, government agencies, and the local community to develop a sound business plan for the Institute.

Founded specifically to prepare for the opportunities and challenges associated with aging populations, the Institute is working to identify and advance innovations in policy, products, and services that will improve the lives of people across age groups.

Building on the business plan, RTI initiated collaborations with leading organizations such as Intel, Oregon Center for Aging and Technology, the Sloan Center on Aging and Work at Boston College, and the Coalition to Transform Advanced Care. Our work helped the community secure more than $2.1 million in start-up funds in July 2011 to hire staff and seed the first pilot projects.

RTI anticipates a productive partnership with the Institute going forward. In support of one of its pilot projects, RTI is helping to develop an inventory of organizations that serve people over 65 in Sarasota County. This inventory will provide important community context for subsequent projects led by Institute for the Ages.

Assessing the Impacts of Uranium Mining

What may be one of the richest undeveloped deposits of uranium in the United States lies at a site known as Coles Hill near Danville, Virginia. To better understand the potential economic and environmental impacts of a proposed mine and mill at Coles Hill, the Danville Regional Foundation contracted RTI to undertake a comprehensive socioeconomic evaluation.

We assembled a team of environmental scientists, engineers and risk assessors, economic development analysts, and economists and other social scientists. The team studied potential impacts of the mine and mill on employment, regional business development and competitiveness, and the region's infrastructure and government services. We examined and evaluated operational, waste management, and emission control alternatives for the mine and mill. We also estimated environmental releases that could result from different mining, milling, and waste management technologies, and analyzed the potential impacts on residents, plants, and animal life.

Our focus extends beyond the direct impacts of the mine to the downstream benefits, costs, and risks that could result from changes in public policy and land use.

Working with a community advisory panel, RTI identified and interviewed a wide range of stakeholders—including health care professionals, environmental groups, teachers, public officials, business and community leaders, and randomly selected residents.

"We wanted to understand what residents value most about the region, what they believe are the most significant challenges facing the region, and what their concerns and questions are about the mine and mill," explained senior economist and project director Katherine Heller.

"This project will provide area decision makers and residents with scientifically sound information about the potential direct and indirect impacts of the mine and mill within a 50-mile radius of the Coles Hill site," said Heller. "RTI's role is not to make recommendations or draw conclusions about the advisability of the mine and mill. Rather, the study's findings will be made available to the public and policymakers so they can make informed choices."

Following the delivery of the draft report to the Danville Regional Foundation, we presented our findings at a public meeting in December 2011, finalized the project report, and prepared a summary to help local stakeholders fully understand the study methods and results. The final report is available at coleshillimpacts.rti.org.

Our study of the potential economic and environmental impacts of a proposed uranium mine and mill near Danville, Virginia, will provide local residents and leaders with a scientifically sound basis for policy decisions.

International Development

We are applying our cross-institute expertise to understand and solve the critical health and environmental problems created by indoor use of biomass cookstoves in developing countries.

Biomass Cookstoves and Human Health

Under the leadership of the RTI Fellow Program, we continue to pursue our multidisciplinary efforts to address the critical health and environmental problems created by indoor use of biomass cookstoves in developing countries. Working with the scientific community and U.S. federal agencies, and investing our own funds, we are tackling the technical, economic, and societal challenges that make this issue so complex.

In FY2011, we made progress on several fronts.

We completed and, through the RTI Press, published a study of environmental health risks associated with the use of biomass stoves in Sri Lanka. Undertaken in partnership with the Sri Lanka National Institute of Health, the study found that health risks associated with biomass stoves disproportionately affect the poor—especially women, children, and Sri Lanka's sizable elderly population.

"Very little is known about the environmental health risks of indoor air pollution at a national scale. Our profile helps fill this gap," said study leader Myles Elledge.

In addition, RTI engineers explored the application of advanced technologies to offer simple and adaptable solutions for reducing harmful stove emissions.

"We developed a thermoelectric enhanced cookstove add-on [TECA] that converts waste heat to electricity to power a fan, which enhances combustion," explained senior research engineer David Stokes, PhD.

The TECA device significantly lowers emissions without compromising the operation or usability of the stove, and actually generates excess electricity that can be used to power a light or radio, charge a cell phone, or meet other needs. These combined advantages could enhance the adoption of the stove in some countries.

RTI and the U.S. Centers for Disease Control and Prevention are currently partnering to adapt our TECA device for the Kenyan Upesi Jiko stove and test its performance in the field against an unmodified Jiko stove.

RTI also joined the Global Alliance for Clean Cookstoves, and three of our senior scientists now serve on four Alliance working groups.

Looking ahead, the RTI Fellow Program is committed to supporting the Alliance and

helping developing and transitional countries with science-based best practices

David Stokes, PhD, is monitoring and characterizing exposure to carbon emissions from biomass cookstoves using the MicroPEM™ personal exposure platform developed by RTI.

In Liberia, RTI is strengthening higher education's ability to develop young professionals for careers in agriculture and engineering to spur the country's economic development.

its partners in rolling out the Alliance's new strategic plan. We will also pursue collaborative projects with federal and other agencies to demonstrate that our TECA device reduces exposures during actual use, support studies to assess other cookstove technologies, and conduct additional in-country field studies on environmental health risk and cookstove use.

Restoring Higher Education for Liberian Prosperity

Beginning in 2011, RTI launched a five-year U.S. Agency for International Development (USAID)–funded project in Liberia called Excellence in Higher Education for Liberian Development (EHELD). As Liberia emerges from nearly two decades of civil wars ready to grow and prosper, EHELD aims to equip young Liberian women and men for careers as leaders, entrepreneurs, and valued professionals.

The EHELD team, led by RTI, includes the University of Michigan, Rutgers University, North Carolina State University, and Associates in Rural Development. To develop a capable and qualified workforce for Liberia, EHELD is creating centers of excellence at two universities—the University of Liberia and Cuttington University—to produce skilled male and female graduates in the high-demand fields of agriculture and engineering.

"Reinvigorated agriculture and engineering undergraduate programs can propel graduates into many available sector jobs and small business opportunities," according to Nate Bowditch, home office technical manager. Agriculturists will serve as Ministry of Agriculture extension workers and farm business entrepreneurs and will manage large-scale farming operations. Engineers are needed in iron mining, road and railroad construction, and electrical power.

To extend the effectiveness of EHELD, the project is reaching out to high school students to ensure they are prepared for college and to attract students—especially girls—to agriculture and engineering programs. Internships, service-learning, and work study opportunities will build pathways to permanent job opportunities for students.

On the teaching side, EHELD is focused on strengthening the capacity of faculty at the universities through extensive degree training programs as well as short courses and mentoring in areas such as curriculum development, pedagogical techniques, use of computers, recordkeeping and fiscal management, applied research, grant writing, and monitoring and evaluation.

"By the end of the program, high-performing graduates from the centers of excellence will be far better prepared to respond to the economic

and development challenges facing Liberia as it rebuilds its economy, physical infrastructure, social structure, and government institutions," said Bowditch. "EHELD will also have developed a model for the restoration of higher education that can be replicated throughout Liberia."

Improving Local Government Service Delivery in Indonesia

In Indonesia, RTI is working with USAID to improve the delivery of basic services at the local level in a new program called Kinerja, which means "performance" in Bahasa Indonesia, the official language of Indonesia.

Kinerja builds capacity and uses accountability and incentives to produce measurable enhancements in the way health, education, and business development programs are managed and delivered by local service providers. "Kinerja stimulates local demand for better service delivery by encouraging citizens to be the judges of and advocates for performance improvements," said Nicole Barnes, RTI's home office technical manager.

RTI is leading a team of specialists to build human and technical capacity in economic governance diagnostics, local budgeting and planning for key public services, civil society organization strengthening, and citizen involvement in local services management so both citizens and officials can better measure service delivery.

To realize the goals of Kinerja, the RTI-led team uses incentives, innovations, and replication of practices. Incentives to improve local government service delivery are expected to come through greater involvement of and accountability to citizens, rewards or penalties for performance quality, and the prestige or embarrassment that comes with publicly available performance information.

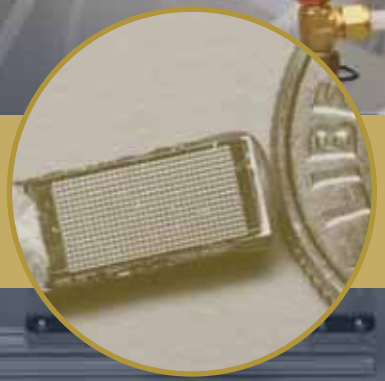
Innovative practices are being piloted, shared, and scaled in local government departments. Each innovation has a set of governance steps that include community input, planning, budgeting, monitoring, oversight, and feedback mechanisms to measure success.

Finally, we are helping to define a strategy and create tools to replicate and extend the impact of Kinerja nationally. Replication began at project launch and continues as we compile good governance practices applied in a particular sector and then review and tailor the adoption process in other districts.

Kinerja is one of several USAID governance projects to pilot randomized selection of districts in its monitoring and impact evaluations. The project will initially work in 20 districts within four provinces and anticipates replicating its successful activities on a national scale over the next four years.

Kinerja health specialist Pak Mahlil Ruby and provincial coordinator Dina Limanto hold discussions with health stakeholders in Kabupaten Jember.

Advanced Technology



David Ensor, PhD, Howard Walls, PhD, and Karin Foarde lead a team that developed a breakthrough prototype technology to improve the United States' biosurveillance program.

harnessing science to transform the world

Deploying Science for Homeland Security

To help protect military personnel, first responders, and the general public, RTI scientists have developed novel scientific tools to detect and prevent exposure to hazardous gases and airborne particles and pathogens.

Under an effort funded by the Department of Homeland Security (DHS), RTI made dramatic progress toward solving a long-standing challenge facing the nation's biosurveillance program. Currently, systems monitor the air in several large U.S. cities for pathogens released by natural, accidental, or terrorist sources.

"Because organisms trapped in the filters die quickly," said principal investigator Karin Foarde, "scientists cannot determine whether they are infectious or assess their virulence."

RTI has developed a laboratory prototype system that preserves the live organisms long enough for agencies to do further testing. The RTI system achieves this by controlling inlet humidity, employing a special nanofiber filter, and chilling the sample.

With additional DHS funding, RTI is moving forward with development of field prototypes. By enabling the system to capture and store viable bioaerosols, agencies will be better able to plan and mobilize an appropriate and accurate response.

Under another program, led by RTI's James Hanley and funded by the Department of Defense, our experts in aerosol filtration have developed two simple but effective tests to help improve protective clothing. In one test, a participant wearing the garment is exposed to a safe, fluorescent aerosol and photographed under black light. The second test employs a hollow, perforated mannequin and theatrical fog to give garment developers a real-time visual assessment of closures and interfaces.

"While these tests aren't quantitative, they give a quick indication of where leaks occur," said Hanley.

Hanley's team is also helping develop a new imaging system to support full quantitative testing at RTI. The system uses phosphorescent particles and an off-gated camera to measure aerosol deposits on skin. The system rapidly cycles the camera and lights, capturing images a fraction of a second after the light source is turned off and the skin's natural luminescence has decayed.

Chemical engineering technician Clint Clayton conducts one of RTI's new tests that will help garment designers improve protective clothing worn by military personnel and first responders.

Systems engineer Alex Stewart examines signal cabling for RTI's prototype ultrasound catheter, which may give surgeons better visibility during intracardiac procedures.

Breakthrough Ultrasound Imaging for Minimally Invasive Surgery

This year, RTI made significant progress toward developing and commercializing a technology that may reduce risks associated with surgical procedures requiring intracardiac or intravascular ultrasound imaging. Our aim is to develop a live volumetric imaging (LVI) catheter that enables real-time three-dimensional—also known as 4D—visualization for minimally invasive surgeries.

Conventional ultrasound imaging catheters produce two-dimensional image "slices" and limit a surgeon's field of view, potentially leading to diagnostic ambiguity and longer procedure times.

Our LVI technology provides greater field of view and continuous imaging of the anatomic environment. Incorporated into a cardiac catheter, the LVI technology could improve accuracy and reduce procedure times and complications, benefitting both patients and physicians. In procedures such as pulmonary vein ablation, enhanced visualization with the LVI catheter could increase efficacy and help avoid injury to unintended targets, such as the esophagus.

In 2011, RTI engineers reached significant development milestones, including completion of a 14-French prototype catheter, the size and type used in intracardiac imaging. This required major advancements to miniaturize the imaging transducer and innovative approaches to the signal cabling.

"In tests, the LVI prototype catheter successfully generated 4D images," said David Dausch, PhD, inventor and principal developer of LVI, "an achievement that represents the culmination of 10 years of R&D by a creative team of scientists and engineers."

In the coming months, we expect to conduct the first-ever in vivo imaging tests of the LVI technology and complete the development and regulatory work necessary for first-in-human studies, in parallel with RTI's commercialization efforts.

Nanomaterials Registry Supports Research and Standards

On behalf of four of the National Institutes of Health, RTI is leading a three-year, collaborative effort to develop a web-based nanomaterial registry. The registry will contain curated information about the physical and chemical properties of nanomaterials, as well as their environmental and biological interactions.

The project draws on our expertise in nanomaterials, analytical characterization, statistics, nanotoxicology, and biological and environmental applications for nanotechnology.

This year, the RTI team worked with an advisory board of experts from industry, government and regulatory agencies, and academia to define criteria known as the Minimal Information About Nanomaterials (MIAN). With these criteria established, the registry will provide information that should be known about nanomaterials in order to begin assessing their biological and environmental implications.

In the coming year, RTI will lead efforts to define MIAN for biological and environmental interactions, such as data on the fate and transport of nanomaterials in ecological and biological systems.

When fully developed, the registry will serve as a tool for consumers, manufacturers, researchers, regulatory agencies, and others. For each material, the registry will generate compliance scores to indicate the extent to which a material has been characterized and allow users to apply weighting factors according to need. For example, the purity of a material may be more important for a biological application than for a manufacturing application.

"Ultimately, the registry will help identify gaps in data and support future research to accelerate the safe translation of new nanomaterials for biomedical and environmental applications," said principal investigator Michele Ostraat, PhD. "It will also support development of new models, assays, standards, and manufacturing methods and promote science-based regulatory decision-making."

A prototype of the tool is available online at www.nanomaterialregistry.org.

Photovoltaics the World Can Afford

Despite its enormous potential as a renewable and carbon-neutral source of electricity, solar energy still represents less than 1 percent of the U.S. energy supply. One reason for this lag is the cost of photovoltaics—including the materials, capital infrastructure, and energy associated with manufacturing.

RTI research scientists Ethan Klem, PhD (pictured below), and Jay Lewis, PhD, have tackled this challenge and in FY2011 achieved significant milestones toward a low-cost solution. Under an effort funded by RTI, Klem and Lewis developed a layered solar technology that has achieved a power conversion efficiency of greater than 5 percent in demonstration tests. This compares favorably with other emerging photovoltaic technologies. With further development, the technology could approach a theoretically estimated maximum of 22 percent efficiency.

Equally important, the RTI technology comes at a material cost of as much as 75 percent less than traditional solar cells.

"The device lends itself to manufacturing using high-volume roll-to-roll processing," said Klem, "which reduces capital costs and increases throughput. And because all processing takes place at room temperature, input energy requirements are minimal."

RTI has applied for patents for the device structure and methods for its fabrication. In the coming year, we will continue development and assess its commercialization potential.

Given its strong performance and low material and manufacturing costs, this unique device technology could dramatically change the landscape of the photovoltaic market.

Environmental Research

RTI's Marion Deerhake and NC State's Mark Rice collaborated to help farmers improve nutrient management practices and better understand the environmental effects of their operations.

applying scientific solutions to environmental challenges

Helping Livestock and Poultry Operations Manage Nutrients

Under a four-year cooperative agreement with the U.S. Environmental Protection Agency's Office of Water, RTI and North Carolina State University's Animal and Poultry Waste Management Center helped livestock and poultry farmers better understand the potential for environmental impacts from their facilities and identify best management practices they can use.

Since 2007, the Comprehensive Livestock Environmental Assessment and Nutrient Management Planning (CLEANEast) project has provided confidential environmental assessments and nutrient management planning assistance to beef, dairy, swine, poultry, and other livestock operations at no cost to the farmer.

Working in 27 states east of the Mississippi River, an RTI team led by Marion Deerhake conducted a threefold program of tools development, outreach to farmers, and environmental assessments.

RTI developed a set of tools and methods that included a farm operation profile, an environmental assessment tool, a nutrient management plan protocol, a nutrient environmental release potential indicator, and an ammonia air emissions mitigation indicator.

The RTI team reached out to farm owners and operators by creating a website containing information about CLEANEast, speaking at professional and trade association meetings, placing stories and advertisements in trade journals, and communicating with state and local agents.

RTI's Karen Schaffner managed the team of technical assistance professionals, who worked with more than 430 farms to conduct an environmental assessment, update an existing nutrient management plan, or prepare a new nutrient management plan.

"The outreach methods and tools we developed can be used in guiding livestock and poultry farmers in the U.S. and internationally, and our systems for managing farm-based technicians help growers run efficient and effective services," explained Deerhake.

RTI is helping the Abu Dhabi government reduce the cost of energy used to cool homes and offices by conducting a pilot air conditioner maintenance project.

By project's end, the RTI team completed more than 295 environmental assessments and more than 390 nutrient management plans for participating farms. Follow-up surveys of farm operators showed that more than 90 percent of respondents agreed that the CLEANEast process increased their awareness of potential environmental challenges.

Conserving Resources in Abu Dhabi

In 2011, RTI completed a three-year evaluation of Abu Dhabi's increasing demand for water and electricity. Our experts worked with Abu Dhabi engineers, economists, planners, and regulators to investigate current electricity and water use, looking for waste and inefficiency.

"We looked for technically feasible reduction levels based on installing new technology or changing consumer behaviors," said Mike Gallaher, PhD, an RTI expert in environmental and energy economics.

This approach is called demand-side management (DSM). To gauge potential reductions in demand and associated savings from DSM, we compared existing technologies and policies in Abu Dhabi to the most effective DSM activities around the globe.

In electricity use, we found that the biggest reductions and savings could be made in residential cooling and lighting by upgrading appliances and increasing use of fluorescent lighting. In water use, more efficient irrigation techniques together with plant substitutions in outdoor landscaping could save 32 million imperial gallons of water per day.

Extrapolating to 2020, we found that Abu Dhabi could realize more than 17,000 gigawatts of electricity savings and more than 22 billion imperial gallons of water savings per year through DSM practices.

"The models we helped build for Abu Dhabi are applicable to other Emirates and to other countries in the region with similar issues," said Gallaher.

RTI engineers also piloted an air conditioner maintenance program and discovered that energy used for cooling could be reduced by up to 27 percent with proper maintenance, yielding an annual energy savings of approximately 668 gigawatt-hours for the commercial sector alone.

RTI's evaluation and impact study of Abu Dhabi water and energy use is now helping the United Arab Emirates address their wider growth concerns and overall carbon footprint.

Modeling the Impact of Climate Change on Water Resources in Latin America

For the Inter-American Development Bank (IDB), RTI is developing an integrated modeling system that evaluates the potential impacts of global climate change on water availability across Latin America.

We are creating a custom simulation tool derived from our long-term experience with the U.S. National Hydrography Database and our innovative Watershed Flow and Allocation (WaterFALL™) model. Our team includes RTI specialists in geographic information systems, database development, hydrology, economics, urban water supply engineering, and workshop design/stakeholder participation.

"Our regional expertise and multidisciplinary approach to international development is a distinct advantage for our team as we help our IDB clients engage this critical issue," said Alan Wyatt, a senior water and sanitation specialist with RTI.

The model will allow the IDB and member countries to analyze the effects of climate change on water resource availability, define and evaluate potential adaptation measures, and reduce the uncertainty in timing and location of serious challenges from climate change. The primary focus of this activity is measuring impacts on water and wastewater services.

In 2011, we developed an analytical hydrographic database that combines space shuttle topographic information and other data to create a map of stream networks for the entire Latin America/Caribbean region. This database, a hydrologic model, and future climate scenarios form the integrated tool we will use to conduct a detailed case study of an IDB water resources project.

Looking ahead, our team will deliver conference presentations, sponsor capacity-building workshops, and create a project website to gather feedback and impart information about the model and its results. These outreach efforts will target local stakeholders in a northern Argentina study as well as academia, water utilities, government agencies, and nongovernmental organizations throughout the region.

Although RTI modeling, database, and communications expertise is now helping Latin American countries respond proactively to the impact of climate change on their water resources, we can tailor and apply these same tools to similar vulnerable regions around the world.

Hydrologist Fekadu Moreda, PhD, economist Katherine Heller, and GIS specialist Jay Rineer confer over maps of critical watersheds for a project helping Latin American countries respond to climate change.

Corporate Information

RTI staff members donate money, time, and expertise to charitable and community causes. This year, their donations to United Way pushed RTI's total donation to more than $500,000.

taking care of our people, our communities, and our environment

Living Our Mission

Supporting Our Communities

At RTI, we strive to improve our communities not only through our work, but by serving as good corporate citizens as well. Through our community partnerships program, during FY2011 RTI contributed $145,000 to 86 charitable organizations that serve the communities where RTI staff members live and work, including Chicago, the Research Triangle Park area, San Francisco, Waltham, the Washington, DC, area, Guatemala, and South Africa.

RTI executive leaders and staff members also helped raise the roof—literally—on two neighboring homes in Cary, North Carolina, in support of Habitat for Humanity of Wake County. In addition to assembling volunteer teams to help build the homes, RTI provided a donation of $5,000 in support of Habitat's efforts to provide families in need with simple, decent, and affordable homes.

RTI remains a strong supporter of United Way. Recognizing that continuing economic difficulties create increased demand for services, our staff members exceeded previous years' efforts and raised $381,000. Together with RTI's corporate donations, we provided $507,000 to the United Way of the Greater Triangle and United Way agencies serving each of our regional office locations. For our extraordinary success, we received the United Way of the Greater Triangle Chairman's Award and the United Way Spirit of North Carolina Award.

RTI also made a $25,000 corporate contribution to relief efforts in Japan following the earthquake and tsunami in March 2011.

Additionally, our staff members undertook a variety of volunteer efforts to improve the lives of others. For example, more than 30 staff members supported the annual Expanding Your Horizons conference and the North Carolina Science Olympiad at North Carolina State University, events to encourage youth to pursue careers in science, technology, engineering, and math. We also collected nearly 2,700 pounds of food and other items during a holiday drive to benefit the Food Bank of Central and Eastern North Carolina.

Creating a Great Place to Work

While staff members are working to improve the lives of people around the world,

Executive Vice President of Operations Satinder Sethi, PhD, joined with a team of RTI volunteers to build two Habitat for Humanity homes near our North Carolina campus.

RTI hosted seven policy forums at the National Press Club in Washington, DC, to share research insights on pressing challenges facing our nation.

RTI is working to make the institute a great place to work. For the third consecutive year, we were named one of North Carolina's Family-Friendly 50 companies by *Carolina Parent* magazine for our dedication to helping employees balance work and family life.

We also earned the National Standard of Excellence in commuter benefits by Best Workplaces for Commuters for the eighth consecutive year. This is a designation given to environmentally and employee-friendly employers that offer outstanding commuter benefits. Our commuter benefits include transit and vanpool subsidies, rideshare matching, preferred parking for carpools and vanpools, and secure bicycle parking.

Extending the Reach of Our Research

Policy Forums

At RTI, we make an effort to extend the reach of our research to the general public and policymakers.

During FY2011, we held seven policy forums at the National Press Club in Washington, DC, to explore pressing policy challenges facing our nation. The forums brought together thought leaders representing public, private, and academic communities to review research on cyber security, food safety, health information technology, nanotechnology regulation, health care reform, personalized medicine, and the impact of deployment on military families.

The meetings assessed current research, informed public policy, and laid a foundation for future research in those fields.

RTI Press

The RTI Press works to bring our research, analytic tools, and technical expertise to national and international attention. This year, the RTI Press published 19 manuscripts, including six books. One of the books was reviewed favorably in the September 19 issue of *Chemical and Engineering News*; another includes a foreword by the President of Liberia, a 2011 Nobel Peace Prize Laureate; and a third includes review comments from former U.S. Surgeon General David Satcher and others.

Awards and Recognition

RTI encourages employees to become involved in scientific and professional organizations to enhance their careers, and we celebrate their many professional achievements.

During FY2011, a study by RTI researchers won the South Carolina Notable State Document Award for its role in changing public policy to promote development for 17 counties along the Interstate 95 corridor in South Carolina. Conferred by the South Carolina State Library, the annual award recognizes state governmental publications of outstanding merit and usefulness to the citizens of South Carolina.

Our nanofiber light improvement technology (NLITe™), developed by a team led by Lynn Davis, PhD, won a prestigious 2011 R&D 100 Award. Sponsored by *R&D Magazine*, the award honors the 100 most significant new technologies of the past year.

For the third year in a row, RTI won an Alexander Hamilton Award for Enterprise Risk Management by *Treasury & Risk* magazine. We were awarded the Silver Alexander Hamilton award for our effective strategic risk assessment and planning components.

Several other staff members earned awards and honors in recognition of their achievements.

RTI Distinguished Fellow **F. Ivy Carroll,** PhD, was selected as the 2012 recipient of the Alfred Burger Award in Medicinal Chemistry sponsored by GlaxoSmithKline. Carroll was selected for his numerous significant contributions to organic chemistry and drug discovery and development research.

Rochelle "Shelley" Tyl, PhD, received a lifetime achievement award from the Reproductive and Developmental Toxicology Specialty Section of the Society of Toxicology. The award recognizes her efforts in reproductive and developmental toxicology. During 2011, Tyl was also appointed to serve on the Health Advisory Board of the National Sanitation Foundation International.

Rama Venkatasubramanian, PhD, was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE) in recognition of his contributions to the field of nanoscale thermoelectric materials and device technologies. He was also named to IEEE's Electron Device Society editorial board.

Improving Corporate Sustainability

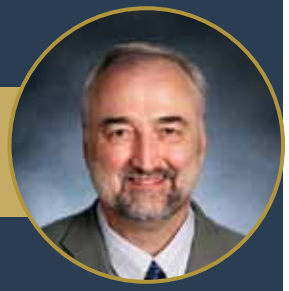
RTI is committed to implementing smart, sustainable practices across our operations. During FY2011, these efforts included reducing our paper waste; promoting recycling of electronics, batteries, toner cartridges, and cell phones; and launching a composting program on our Research Triangle Park campus.

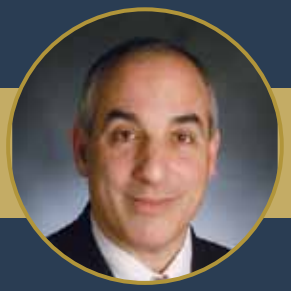
RTI staff members undertook a significant effort to recycle office supplies, materials, and equipment as many staff members moved from a leased office space onto RTI's main campus. The effort—known as the "Spread the Love" campaign—diverted more than 42 tons of materials from landfills, donating useful items to 140 schools and charitable organizations.

These staff members now occupy RTI's newest office facility in Research Triangle Park, a $25.2 million building that is anticipated to be our second to achieve LEED Gold certification standards as defined by the U.S. Green Building Council.

Other sustainability efforts launched in FY2011 included a program to identify and implement low-cost operational and maintenance improvements in existing buildings that will reduce energy consumption. We launched a comprehensive inventory of greenhouse gas emissions, and with financial assistance from the NC Solar Center, we added three neighborhood electric vehicles to our Facilities fleet and installed two electric vehicle charging stations on our main campus.

Our sustainability efforts earned RTI a 2011 Alexander Hamilton Award for Best Green Strategy and a Green Award from the *Triangle Business Journal.*





Leadership

RTI is led by an experienced group of senior executives who represent a cross-section of our research fields and business operations. These leaders implement our business strategy and oversee operations for our global enterprise. They are accountable to RTI's president and board of governors, our primary governing body.

Board members, who represent the University of North Carolina campuses, Duke University, and the business and scientific communities, formulate policy that is consistent with our mission.

Senior Management

Victoria F. Haynes
President and Chief Executive Officer

James J. Gibson
Executive Vice President and Chief Financial Officer

E. Wayne Holden
Executive Vice President, Social, Statistical, and Environmental Sciences

Jennie Hunter-Cevera
Executive Vice President, Discovery and Analytical Sciences, Government Affairs, and Corporate Development

Barbara Kennedy
Vice President, Global Health

Lon E. Maggart
Executive Vice President, International Development

Allen W. Mangel
Executive Vice President, RTI Health Solutions

Martha Roberts
Senior Vice President, Human Resources

Satinder K. Sethi
Executive Vice President, Operations

G. Edward Story
Senior Vice President, General Counsel, and Corporate Secretary

James A. Trainham
Vice President, Strategic Energy Initiatives

Board of Governors

William M. Moore Jr. (Chair)
Managing Partner, Lookout Capital

Peter M. Scott III (Vice Chair)
Former Chief Financial Officer, Progress Energy; Former President and Chief Executive Officer, Progress Energy Services Company

Thomas F. Darden
President and Chief Executive Officer, Cherokee Investment Partners

Barbara Entwisle
Kenan Professor and Vice Chancellor for Research, University of North Carolina at Chapel Hill

Victoria F. Haynes
President and Chief Executive Officer, RTI International

Robert A. Ingram
General Partner, Hatteras Venture Partners; Former Chief Executive Officer, GlaxoWellcome

Earl Johnson Jr.*
Chairman, Southern Industrial Constructors, Inc.

Peter Lange
Provost, Duke University

Terri L. Lomax
Vice Chancellor for Research and Innovation, North Carolina State University

Harold L. Martin Sr.
Chancellor, North Carolina A&T State University

W. G. Champion Mitchell**
Former Chief Executive Officer, Network Solutions

John H. Moellering
Chairman, USAA

H. Troy Nagle
Professor, Joint Department of Biomedical Engineering, University of North Carolina at Chapel Hill and North Carolina State University

Hilda Pinnix-Ragland
Vice President, Corporate Public Affairs, Progress Energy

James N. Siedow
Vice Provost for Research, Duke University

Phail Wynn Jr.
Vice President, Durham and Regional Affairs, Duke University

* *Retired Board Member as of November 2011; elected Distinguished Governor Emeritus.*

** *Board Member as of November 2011.*

Financials

During FY2011, we experienced the most successful business year in our 53-year history, with annual revenue from contracts and grants totaling $777 million for the year ending September 30, 2011.

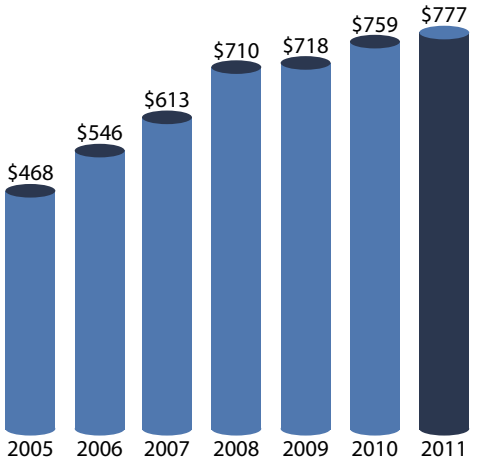
Our financial position and outlook remain strong, with equity increasing to $256 million as of September 30, 2011 (an 11 percent increase). Our net revenue (revenue after expenses) totaled $25.1 million (a 15 percent increase from FY2010). As a nonprofit corporation, RTI invests net revenue in facilities and infrastructure, programs, and new capabilities to further our mission to conduct research and development that improve the human condition. During FY2012, RTI will invest substantially in developing new capabilities in areas ranging from survey research and health information technology to sustainable agriculture and global health programs.

RTI maintained its AA- long-term bond rating (high investment grade) and a stable outlook from Standard & Poor's Ratings Services on our $23 million series 2010 fixed-rate revenue bond. The rating is based on information RTI provided to Standard & Poor's regarding the strength of our business, growth in research activities, emphasis on operational efficiency, and stable management team. RTI used the bond proceeds to fund the construction and equipping of a new 127,000-square-foot office building and related parking deck, completed in March 2011, on RTI's main campus in Research Triangle Park.

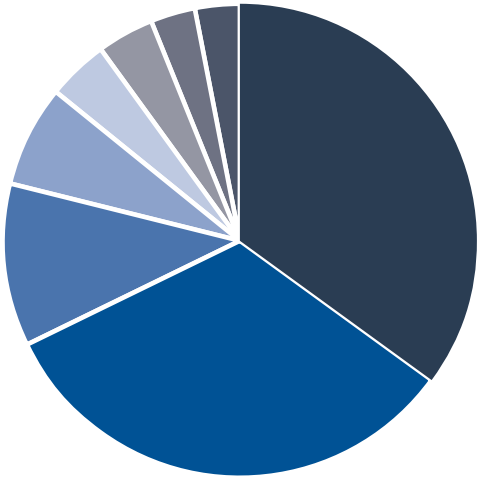
Financials (in thousands of dollars)

For the Year	FY2010	FY2011
Revenue from research programs	$758,688	$777,113
Current assets	$297,864	$293,045
Property and equipment, net	$138,551	$153,962
Total assets	$441,858	$455,855
Current liabilities	$170,495	$158,901
Institute equity	$231,835	$256,302

Revenue in Millions

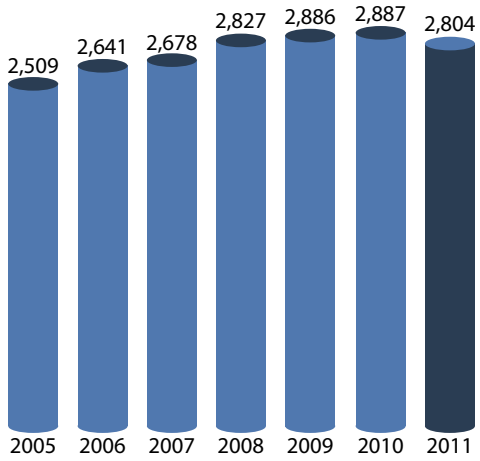


FY2011 Revenue by Source, in Millions



Source	Percentage	Revenue
USAID	35%	$274.4
DHHS	33%	$257.3
Commercial	11%	$83.3
Other Federal Agencies	7%	$54.1
Other Non-Federal	4%	$32.2
Department of Education	4%	$26.8
EPA	3%	$25.2
Department of Defense	3%	$23.8
Total	**100%**	**$777.1**

Staff



Client List

U.S. Government Clients

Department of Agriculture
Department of Commerce
Department of Defense
Department of Education
Department of Energy
Department of Health and Human Services
- Administration for Children and Families
- Agency for Healthcare Research and Quality
- Centers for Disease Control and Prevention
- Centers for Medicare & Medicaid Services
- Food and Drug Administration
- Health Resources and Services Administration
- National Institutes of Health
- National Toxicology Program
- Office of the National Coordinator for Health Information Technology
- Office of Population Affairs
- Office of the Secretary
- Substance Abuse and Mental Health Services Administration

Department of Homeland Security
Department of the Interior
Department of Justice
Department of Labor
Department of State
Department of Transportation
Environmental Protection Agency
National Aeronautics and Space Administration
National Institute of Standards and Technology
National Science Foundation
U.S. Agency for International Development

Private-Sector Clients

3M
Abbott Laboratories
Amgen
Arkema
AstraZeneca
BASF
Bayer Yakuhin, Ltd.
Biogen Idec
Boehringer Ingelheim
Bristol-Myers Squibb Co.
Cemex
Chevron Corporation
Cisco Systems
Dow Chemical
DRS Technologies
DuPont
Eli Lilly and Company
GE Healthcare
General Mills
Golden Pacific Laboratories, LLC
The Hamner Institutes
The Johnson & Johnson Family of Companies
Johnson Matthey
KBR
Lockheed Martin
Medtronics
Merck & Co., Inc.
The Nielsen Company
Novartis
Novo Nordisk
Ogawa & Co. USA
Pfizer
Qualcomm
Roche
Sanofi-Aventis
Shaw Group, Inc.
Shell
Shire
Takeda Pharmaceuticals UK
Talisman Environmental Services, Inc.
Teva Neuroscience
Tioga Pharmaceuticals
U.S. News & World Report

Other Clients

Abu Dhabi Executive Affairs Authority
American Heart Association
American Legacy Foundation
ASHRAE
Bill & Melinda Gates Foundation
Ford Foundation
Global Alliance for TB Drug Development
The William and Flora Hewlett Foundation
International Partnership for Microbicides
Ministry of Foreign Affairs of the Republic of China (Taiwan)
National Multiple Sclerosis Society
Robert Wood Johnson Foundation
Smith Family Foundation
Spencer Foundation
U.S. state governments
The World Bank
World Health Organization

RTI International is one of the world's leading research institutes, dedicated to improving the human condition by turning knowledge into practice. Our staff of more than 2,800 provides research and technical expertise to governments and businesses in more than 40 countries in the areas of health and pharmaceuticals, education and training, surveys and statistics, advanced technology, international development, economic and social policy, energy and the environment, and laboratory and chemistry services. For more information, visit www.rti.org.

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