



# The JOURNEY of HEALTH

## Making the Connections that Make the World a Healthier Place

The air we breathe, the food we eat, the neighborhoods we live in, and the choices we make all affect the quality of our health. RTI International knows this.

Join us on a variety of journeys across the health spectrum. Learn how everything around us can affect health and why RTI's multidisciplinary expertise—which includes human, animal, and environmental health—offers a more holistic view of health and creates unique opportunities for improving the human condition.



delivering **the promise of science** for global good





# Making Connections: Neonatal

Infants born prematurely regularly face intense—and often painful—life support procedures. Many people also fear that the children who survive will ultimately suffer from debilitating disabilities.

But programs like the Neonatal Research Network<sup>1</sup> and RTI's Center on Newborn Screening, Ethics and Disability Studies have worked hard to advance maternal care and treatment protocols for premature newborns. For example, studies conducted through the Neonatal Research Network have shown that administering antenatal steroids or increasing oxygen saturation improves preterm infant survival rates and lessens the rate at which disabilities occur.

Although these advancements improve the chances for preterm infants, new threats that challenge infant and maternal health continually emerge—threats like Zika.

The World Health Organization estimates that the Zika virus will infect 3 million to 4 million people across the Americas this year, with 1 in 5 people likely becoming sick. Unborn children are particularly susceptible to more serious conditions such as microcephaly and other health and developmental disabilities.

Public health campaigns like the *This is How We Stop Zika*<sup>2</sup> effort that RTI conducted in Puerto Rico provided clear instructions to pregnant women and their partners on how to prevent transmission of the virus.

Another key to addressing the threat of Zika and other mosquito-borne illnesses—and in many cases, eliminating the spread of diseases like malaria—is through comprehensive vector control efforts. Spraying homes with insecticides, installing mosquito nettings, and eliminating pools of water that provide mosquito

<sup>1</sup> Funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development.

<sup>2</sup> Funded by the Centers for Disease Control and Prevention, the CDC Foundation, the Puerto Rico Department of Health, and the Pan American Health Organization and its partners.



# Health, Zika, and Drones

breeding grounds have shown success in reducing the spread of mosquito-borne zoonotic diseases. In fact, RTI distributed more than 2 million long-lasting mosquito nets to reduce malaria transmission in Guinea.<sup>3</sup>

RTI has created several tools, including the Coconut Surveillance software<sup>4</sup> and the Integrated Disease Surveillance and Response (IDSR) system, to monitor and track outbreaks of malaria and other infectious diseases. Coconut Surveillance allows health workers to manage cases by mobile device, and the IDSR system captures disease data collected by health facilities.

New technology is offering even more ways to perform vector control. At RTI, researchers are experimenting with using drones to quickly and easily conduct research—from public perception studies to environmental monitoring to vector control for diseases.

Continue this journey of health and learn more about neonatal research, efforts to stop emerging health concerns like Zika, or ways in which new technology is changing how we understand and address health care concerns—all at [www.rti.org/apha](http://www.rti.org/apha).



<sup>3</sup> Part of the *StopPalu* project funded by the U.S. Agency for International Development as part of the U.S. President's Malaria Initiative.

<sup>4</sup> Funded by the U.S. President's Malaria Initiative.



# Making Connections: Addictive

E-cigarettes are quickly replacing traditional cigarettes, growing to a \$4.4 billion industry. Of notable concern is the rise of young people using e-cigarettes, which tripled from 2011 through 2013.

Advertising is having a profound effect on e-cigarette consumption. Teens who had never used e-cigarettes perceive them as cooler, more fun, healthier, and more enjoyable, according to RTI studies. Engaging in social marketing campaigns targeting those perceptions has the potential to reduce e-cigarette use.

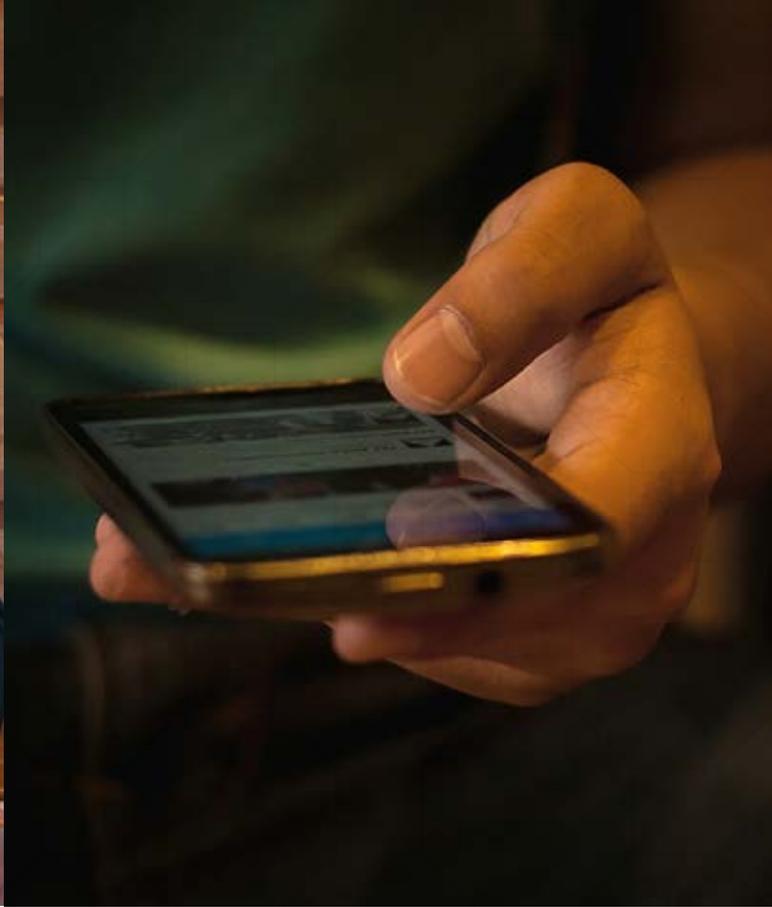
Similar to how cigarette use is changing, marijuana consumption is evolving as its use is legalized. States across the nation are adopting laws to allow legal medicinal and recreational marijuana use—and as a result, new products and edibles are coming to market. These new products can result in unexpected highs and present potential public health concerns. RTI research shows that improving communications and marijuana packaging can help users better prepare for the different experience these new products offer.

Pain management remains an area where marijuana could prove useful, but little actual evidence exists beyond anecdotes. If marijuana can be used to relieve pain, it may have a use in helping slow the opioid crisis, which is killing more than 90 people a day.

With so many lives on the line, reducing the harms associated with using drugs may be one way to prevent overdose deaths. RTI researchers studied a supervised injection site for 2 years. During that time, the site prevented two deaths and more than 2,300 instances of public drug injections. Furthermore, the site ensured that all needles were disposed of properly.

In another RTI study, researchers found that one (hypothetical) supervised injection facility in San Francisco could save as much as \$3.5 million in health-related costs—mostly by preventing new cases of the hepatitis C virus and HIV infections.

Despite many treatment and prevention successes, HIV remains a major health concern throughout the world, with about 1.8 million new infections each year.



# Behaviors, Devastating Results

The issue is more pronounced in low-resource countries. Research in South Africa, for example, shows that women are the most likely to be affected, and consuming drugs or alcohol before sexual activity can increase risky behavior.

RTI is working to address these concerns through gender-focused interventions. RTI is testing a mobile health application, the NC Young Women's CoOp, to educate women ages 18–25 in low-resource areas on ways to prevent HIV and to encourage testing. If successful, it can be rolled out to other countries.

Mobile apps, virtual reality, and social media are among a variety of new communication channels for promoting

behavior change. But if you're not delivering the right message through these channels, public health campaigns will have a limited or negligible impact. RTI's Center for Communication Science works to better understand how to implement outreach programs by engaging the right communication tools, messages, and techniques.

Continue exploring the journey of health and learn more about how effective communications can be used to address a variety of public health concerns—ranging from e-cigarettes to marijuana to HIV at [www.rti.org/apha](http://www.rti.org/apha).





# Making Connections: Reducing P

China's economic growth over the last few decades has had a profound, negative effect on the country's air quality. At times, industrial smoke and dust emission levels have been so severe that officials have closed schools and stopped transportation, and people have had to wear gas masks to breathe.

RTI found that China could maintain its economic growth while reducing pollution and improving public health if the country develops emissions standards that reflect the best control technologies; updates and implements emergency programs when pollution levels are too high; and develops a strong, but fair, enforcement program.

New technologies can also be used to address the problem. Coal and petroleum-based fuels still serve as major fuel sources for energy production in the United States and China, contributing greatly to greenhouse gases and other pollutants.

RTI has developed a new warm gas desulfurization<sup>5</sup> process that can remove 99.9% of sulfur from gases emitted during electricity production. And because this process can be done at incredibly high temperatures, the cost to operate is relatively low. So far, RTI has tested a precommercial system at a Tampa Electric Company plant in Florida.

Air pollutants—like those created through energy production and manufacturing—are widely regarded as drivers of climate change. Studies show that the world is growing hotter each year, and weather patterns are growing increasingly unstable—creating massive 100-year storms, like those that recently hit Houston and Florida, while simultaneously producing major droughts affecting large portions of the United States and elsewhere.

Such unpredictability will have a great impact on the future water supply around the globe, affecting everything from drinking water to agricultural irrigation to hydro-

<sup>5</sup> Funded by the U.S. Department of Energy.



# ollution, Addressing Climate Change

power development. Communities need the ability to accurately predict future water levels to inform sustainability policies and ensure responsible water use to meet current and future demands.

Tools like RTI's Watershed Flow and ALlocation system (WaterFALL®) use watershed delineations and historic climate information to evaluate how potential developments and growth will affect the water supply. The tool can help communities better prepare for their future water demands.

Continue the journey of health and learn more about efforts to address environmental challenges that affect human and animal health at [www.rti.org/apha](http://www.rti.org/apha).





# Making Connections: Antibiotic R

Overuse and misuse of antibiotics have resulted in a growing threat of antimicrobial resistance. Many of the antibiotics we commonly use are no longer working, threatening lives around the globe.

RTI is an active participant in the Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator, or CARB-X project,<sup>6</sup> which is working to develop new antibiotics to address this troubling public health threat.

One driver of antimicrobial resistance is the use of antibiotics in livestock. Producers frequently pump animals, notably chickens, with antibiotics to promote growth and prevent the spread of illness in often-crowded coops. The routine use of antibiotics in livestock kills off weak bacteria but can create scenarios for superbugs to emerge. Those bacteria can then enter our environment through chicken droppings that can contaminate soil and water used to grow fruits and vegetables.

Hundreds of millions of tons of livestock manure are produced each year, which can create environmental concerns related to nutrient runoff, odor, ammonia, greenhouse gases, and particulates. Many farmers are not aware of the impacts of manure, and they do not have the tools to address them.

But nutrient management plans, like RTI's CLEAN-East<sup>7</sup> can provide planning tools and technical assistance to dairy, poultry, beef, and swine farmers. Already, these programs have shown the ability to substantially reduce nitrogen and phosphorous levels in watersheds that support our drinking supply.

Dirty water can lead to a variety of illnesses and water-borne diseases, including parasites and deadly bouts of diarrhea. Bacteria and nitrates found in human and animal waste, heavy metals, fertilizers, and industrial and household waste all present threats to water supplies.

<sup>6</sup> Funded by and operating in partnership with United Kingdom charity Wellcome Trust, the U.S. Department of Health and Human Services Biomedical Advanced Research and Development Authority, the National Institute of Allergy and Infectious Diseases, Boston University, the Broad Institute of MIT and Harvard, the Massachusetts Biotechnology Council, the California Life Sciences Institute, Achaogen, and VenatoRx Pharmaceuticals.

<sup>7</sup> Funded by the U.S. Environmental Protection Agency.



# Resistance, Waterborne Diseases

Across the globe, more than 300,000 children die each year because of diarrhea caused by poor sanitation and unsafe water—and in many parts of the world, open defecation is a cause of contaminated drinking water. To address this problem, RTI<sup>8</sup> is working on the Bill & Melinda Gates Foundation's *Reinvent the Toilet Challenge* and recently began field testing a new, closed-loop toilet system in Durban, South Africa.

Continue the journey of health and discover new connections among bacterial, animal, and human health, and the available options to address those concerns at [www.rti.org/apha](http://www.rti.org/apha).



<sup>8</sup> Partners include Duke University, Colorado State University, NASA's Ames Research Center, and the U.S. Naval Research Laboratory.



# Making Connections: Crop Irrig

Droughts have ravaged many parts of the country in recent years, stressing agricultural regions like California's Central Valley and forcing farmers to find new ways to irrigate their crops.

One potential solution is to reuse water generated from oil wells. Water trapped underground is frequently brought to the surface when drilling for oil and natural gas. Typically, such water is contaminated with some level of salt, oil, or other chemicals and needs to be treated before being used.

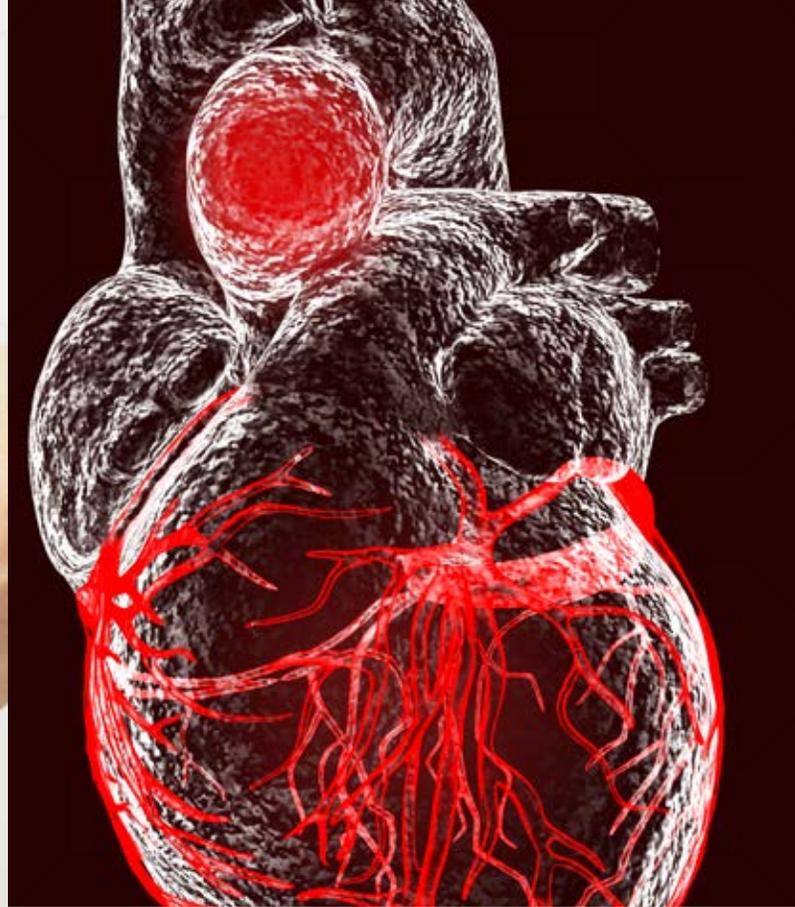
RTI is working to explore what, if any, health impact using such water on crops could have on people, and to identify ways to use such alternative water sources safely.

A safe food supply is critical to human development, particularly child development. Early childhood lays a

foundation for how a person develops, and more than 250 million children in low- and middle-income countries are at risk for not reaching their development potential because of extreme poverty and chronic undernutrition.

RTI researchers, working on part of a series of studies on childhood development, found that many interventions are fragmented and inadequate. To address this challenge, more action is needed at the global, national, and local levels to provide comprehensive and high-quality health, nutrition, security, safety, learning, and caregiving during early childhood.

Moreover, high-calorie, nutrient-poor food and lack of exercise are directly driving the growing rates of obesity across the United States. Childhood obesity is significant, with 1 in 3 children ages 2–19 being overweight or obese.



# ation, Childhood Nutrition

RTI supports efforts to promote healthy eating and physical activity in children and is working to assess the Healthy Out-of-School Time Coalition,<sup>9</sup> which created standards for after-school programs to encourage healthier lifestyle habits.

Programs like the Coalition can help reduce later incidence of diabetes and cardiovascular disease, which is the most costly and prevalent killer in the United States.<sup>10</sup>

In a recent study, RTI researchers predicted that the number of Americans diagnosed with cardiovascular

disease will grow to more than 131 million, and the costs will rise to \$1.1 trillion, twice its current cost. But there is a way to prevent that from happening—focusing on prevention and healthy living.

Continue the journey of health and learn more about environmental issues affecting health and nutrition, and how those directly impact our food supply and weight at [www.rti.org/apha](http://www.rti.org/apha).

<sup>9</sup> Funded by the Robert Wood Johnson Foundation, with work done in partnership with the Alliance for a Healthier Generation.

<sup>10</sup> Funded by the American Heart Association.





# Making the Right Connections on the Journey of Health

## Connecting Research Skills and Real-World Capabilities with Health Challenges Around the World

Fully comprehending the complex scope of health across the entire spectrum of human, animal, and environmental concerns requires a diverse collection of tools and capabilities.

Our researchers offer a vast array of skills and capabilities that enable us to conduct research at all levels and within all fields of health.

From impact and evaluation studies to data science to health communications, surveys, or economic analysis, we offer the tools needed to comprehend and improve health conditions around the world.

Learn more about how we can help you better understand and address existing and emerging health challenges at [www.rti.org/apha](http://www.rti.org/apha).

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