

FROM THE EDITOR

In this issue of *Forum*, we explore current issues in Environmental Health for GIM. In some instances, bibliographies have been omitted or abbreviated. Please refer to the *Forum* Web site for further references.

—Karen R. Horowitz, Forum Editor

SIGN OF THE TIMES: PART I

Grit and Resilience: Louisiana Health Care Delivery Redesign

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CONTENTS

1. Sign of the Times: Part I 1
2. From the Editor 2
3. President's Column 3
4. Sign of the Times: Part II 4
5. Best Practices 5
6. Perspective 6
7. Research Corner 7
8. Clinical Update 8

As I reflect on SGIM's call to take pride in General Internal Medicine (GIM) and to highlight our grit and resilience, I cannot help but think back to the whirlwind experience I have had over the last 11 years. I returned to New Orleans, Louisiana, my home town, in July 2005 after completing my GIM fellowship training. I just started my "first real job" at Tulane University School of Medicine. Shortly thereafter, on August 29, 2005, Hurricane Katrina decimated the city and health care facilities with widespread flooding. By September 2005, I was learning how to commandeer unoccupied buildings to set up makeshift clinics for first responders and local residents.¹ By 2006, I was thrown head first into a barrage of health policy work all while trying to set up and manage community clinics and maintain the typical responsibilities expected in academic medicine (teaching, seeing patients, writing grants, publishing). Burnout was inevitable, but the joy of being a part of a phenomenal movement in health care redesign in Louisiana was worth it. This is the story of my journey and that of my colleagues in Louisiana.

Two-Tiered System of Care

The state of Louisiana ranks 50th in overall rankings of state population health, and is home to roughly 4.5 million people among whom 31% self identify as black (versus 12% nationally) and 23% live in poverty (versus 15% nationally).² Most uninsured adults (12-15% of its nonelderly population) represent low-income working families. Louisiana's racial and ethnic minorities and its impoverished populations bear a disproportionate share of the health disparities.

Historically, the delivery model in Louisiana has been a "two-tiered" system of care: Patients with insurance have always had access to a range of providers and clinical services while the poor and uninsured received most care through state-run and state-funded facilities. Having Medicaid did not open up options for clinical services since many providers (especially specialists) did not and still do not accept this in-

continued on page 11

The World Changes and GIM Responds

Karen R. Horowitz, MD

Editor in Chief, SGIM Forum

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It is remarkable how an environmental catastrophe can define a place and disrupt its communities. When I arrived in Buffalo, New York, in 1979, the disastrous impact of chemical dumping in Love Canal and its effects on the community of Niagara Falls, New York, had just come to national attention. To members of the entering SUNY medical school class, the suffering experienced by that community and the medical and political consequences which followed added meaning to the emerging discipline of environmental health care and created a sense of urgency for each of us. Since then, many years have passed and, with them, more questions than answers have emerged

regarding our relationship with the environment and our responsibility for stewardship of the earth.

We often separate ourselves psychologically from geopolitical tragedies. Tsunamis in the Philippines, earthquakes in Haiti, epidemics in Africa, nuclear disasters in Japan—even those events we have experienced vicariously through television and social media are often experiences we leave behind when we turn off our electronic devices at the end of the day.

I once traveled to Hiroshima, Japan, to the Peace Memorial Park and Museum at ground zero. On a sunny morning in May, with cherry blossoms still in bloom, school children wandered through the park and attentively listened to their teachers describing the significance of the place. My discomfort with being an American at that moment was real, but was tempered by the museum guides who insisted that Hiroshima's enduring message transcends any inclination toward finger pointing. Rather, it mandates each of us to bear witness to the horror of those events and commit ourselves to the elimination of nuclear weapons.

Since that trip, the world has seemed smaller, and the needs of faraway communities are more real to me than they had been before. I cannot separate images of Hurricane Katrina from the city of New Orleans or the World Trade Center attacks from New York City. We were *all* New Yorkers on September 11, 2001. The children of Flint, Michigan, are now all our children.

In this issue of *SGIM Forum*, we explore the intersection of environmental health and the world of primary care. From these and many other events, one unifying truth emerges: Whether triggered by

...whether triggered by forces of nature or acts of man, our changing planet presents ongoing challenges to which healthcare systems must adapt and evolve.

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New Year's Resolutions for SGIM

Eileen E. Reynolds, MD

I resolve to be more politically engaged, to try to understand my patients better, to understand their views on healthcare, and how their financial strain and other stressors affect their lives and their health.



When you read this column, it will be early January 2017. My calendar today though says November 16th. It has been just one week since the election. It's been a rough week for me, and I'm having more trouble than usual deciding what to write about. I had planned to write about opioids, and about how SGIM needs to get more involved in the conversation about the epidemic and its solutions. But the election is weighing much more heavily on my mind.

While I am conscious of the fact that some SGIM members voted differently than I did (and I don't want to disrespect those votes or those members), I also want to be honest about how shocked and depressed I've been about the results. The morning after the election, I had a full schedule of patients to see. It was the only time in my career when I haven't felt emotionally capable of caring for others. I've had what I think is a grief reaction, going through many of the Kübler-Ross stages.¹ First, Denial: if I go back to bed and pull up the covers, none of this will have happened when I get up. Next, Anger: I hate the FBI, Bill Clinton, and gender bias. Bargaining usually follows Anger, but I went straight on to Depression: I felt down, depressed and hopeless; I had real trouble falling or staying asleep; I felt tired and had little energy. My PHQ-9 score was pretty high. I avoided news, newspapers, political conversation, and social media.

But now I'm entering Acceptance. Or at least I'm getting closer. In the Kübler-Ross model, Acceptance means thinking that everything is going to be okay. Acceptance comes with calmness and stable emotions. That doesn't quite describe where I am, but I am calm and have spent a lot of time thinking about how to respond to the election—how to respond personally, as a physician caring for a group of patients, as an educator caring for a group of learners; and also how to respond as an SGIM member, and how SGIM should respond as an organization.

My thoughts about how to respond are starting to take the form of a list of New Year's resolutions. I'm not the best resolution maker. Sometimes I forget to make resolutions. Sometimes I forget what resolutions I made. But, over the years, I've realized that the key to both making and keeping resolutions is to keep them simple and limited in number, to try not to aim too high, and to pick things that are achievable. Here are two resolutions for me, for SGIM, and for SGIM members.

Personally, I'm making the following election-related New Year's resolutions:

1. I resolve to be more politically engaged. Despite having strong opinions, I have been pretty passive as an often-overwhelmed-and-having-too-

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many-commitments private citizen, but I resolve to pay more attention to local and national politics, and to redistribute my charitable contributions to support more of my personal agenda.

2. I resolve to try to understand my patients better. The election taught me that I am out of touch with how almost half of the United States feels about many important issues related to their health and their health care. I don't care about my patients' politics, but I *do* want to understand their views on their health care, and how their financial strain and other stressors affect their lives and health. I need to do a better job

continued on page 10

An Overview of the World Trade Center Health Program at the Selikoff Centers for Occupational Health: 15 Years Post-9/11

Claudine Holt, MD, MPH, Sharon S. Lee, MD, MPH, and Michael Crane, MD, MPH

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The World Trade Center (WTC) terrorist attack on September 11, 2001, created an unprecedented burden of occupational exposure in the United States for the men and women who worked as first responders at Ground Zero. In 2002, the Centers for Disease Control (CDC) created the WTC Worker and Volunteer Medical Screening Program (MSP) at the recommendation of Congress.¹ After passage of the James Zadroga 9/11 Health and Compensation Act in 2010, the MSP evolved into the current WTC Health Program (WTCHP).²

There are approximately 65,000 first responders across the national WTCHP, including the seven clinical centers of excellence (CCE) located in the New York City metropolitan area.² There are approximately 22,000 responders enrolled in the WTCHP at the Irving J. Selikoff Centers for Occupational and Environmental Medicine at The Mount Sinai Hospital, New York City.

The WTCHP is federally funded through the year 2090 under the previously mentioned Zadroga Act.³ The funding covers annual medical monitoring examinations as well as periodic treatment visits with WTC providers and specialists. Participants are also referred for cancer diagnostic consultations. Medications for the treatment of WTC medical conditions and imaging studies (i.e., chest computed tomography) and procedures required for diagnosis (i.e., biopsies), surveillance (i.e., esophagogastroduodenoscopy) or treatment (i.e., surgery) are all covered.

Responders learn of the WTCHP through a variety of channels, including notifications from their employer

or colleagues; advertisements periodically placed in local media outlets; and through unions and community groups. In addition, the CDC has a comprehensive Web site where responders can go to learn about and enroll in the program.⁴

The Medical Monitoring Program

The medical monitoring program is an annual surveillance program designed to monitor the health status of WTC responders and to address any health effects related to their exposure at Ground Zero. During the medical monitoring visit, a detailed 9/11 exposure assessment—including a pre- and post-9/11 occupational and environmental exposure history, past medical and surgical history, family history, and social history (including a smoking history)—is obtained via a series of questionnaires administered by a trained health care provider. The information is reviewed by a physician or nurse practitioner, and discussed with the patient. During the monitoring visit, participants are offered referrals for breast, cervical, colon, and lung cancer screenings in accordance with the United States Preventive Services Task Force recommendations. The program also provides annual influenza vaccinations. Participants also complete a self-administered mental health questionnaire. Based on scoring, patients may be referred to speak with a social worker to address any new or ongoing mental health concerns.

During the monitoring visit, participants with symptoms or health conditions that may be related to WTC exposure are provided referrals for additional evaluation and

management in the treatment program. At the conclusion of the visit, a letter summarizing the preliminary findings of the examination is provided to all participants.

Retention in our program, defined as the percentage of patients who have monitoring examinations within 27 months, is 60%. To promote retention, the WTCHP has a dedicated call center staff that reaches out to participants who may have been lost to follow-up. Providers also communicate closely with their patients via phone, e-mail, or an online patient portal which helps to foster the relationship with each member.

WTC Medical Conditions

Virtually every organ system has been affected by exposure to the dust and debris from the WTC disaster. Health conditions are divided into two categories: WTC-related and WTC-associated conditions. Related conditions are those illnesses in which exposure to airborne toxins, other hazards, or any other adverse condition resulting from the terrorist attack is likely to be a significant factor in aggravating, contributing to, or causing the illness. Associated conditions are those that result from the treatment of or the progression of a WTC-related health condition.⁵

The most common WTC-related conditions observed in the first responder population are as follows:

- upper respiratory conditions (chronic rhinitis, chronic sinusitis, chronic laryngitis, chronic nasopharyngitis);
- lower respiratory conditions

continued on page 12

Air Pollution as a Cause of Cardiovascular Disease: Looking beyond Traditional Risk Factors

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The World Health Organization (WHO) estimates that air pollution is responsible for an estimated 7 million deaths per year worldwide.¹ Although the link between respiratory illnesses and air pollution is well known, the majority of these deaths are attributed to cardiovascular disease. Exposure to air pollution may be responsible for as much as 7% of nonfatal myocardial infarctions and 18% of sudden cardiac deaths.² No safe thresholds have been established, and even present-day concentrations in the United States are associated with increased mortality.

Pathophysiology

Fossil fuel combustion, the predominant source of air pollution in the United States, releases a complex mixture of gaseous, liquid, and semi-solid particles. The principle components of this mass include carbon dioxide (CO₂), oxides of nitrogen (NO_x), sulfur dioxide (SO₂), volatile organic compounds (VOC), and particulate matter (PM). Globally, the practice of biomass burning for heating, cooking, and other indoor activities is a major contributor to air pollution. PM is further categorized by aerodynamic diameter as coarse (2.5-10 μm), fine (<2.5 μm), or ultrafine (<20.1 μm). The majority of studies show that PM_{2.5} levels (<2.5 μm) are most highly correlated with morbidity and mortality, but adverse effects are likely a result of the complex interaction between these various organic and inorganic components.

Given the multitude of pollutants and heterogeneity of individual exposure, assessment of an individual's risk can be challenging. Although ambient air quality monitors and predictive spatial models are now highly

sophisticated, no reliable biomarker for individual exposure has been developed. Inhaled dose is affected by physiologic characteristics, such as tidal volume and respiratory rate, and behavioral characteristics, such as the amount of time spent outdoors, commuting, or engaged in physical activity. Furthermore, the internal response to a given dose is thought to vary according to polymorphisms in anti-oxidant genes, effects of other environmental toxins, and chronic medical conditions. Those with pre-existing coronary artery disease, diabetics, pregnant women, and other susceptible groups are likely to be at substantially higher risk.

The exact pathologic mechanism of air pollution is still unknown, but several biologically plausible pathways have been suggested per the table on page 13. After inhalation, air pollution particles deposit throughout the lungs, with larger particles settling in the airways and the smaller particles reaching the terminal bronchioles and alveoli. Upon deposition, particles can cross the epithelial barrier to enter the systemic circulation, activate sensory receptors in the lung, or trigger local and systemic inflammation. These initial insults lead to disruption of lipid metabolism, systemic oxidative stress, and alteration in the autonomic nervous system. Controlled exposure experiments in humans have also shown subclinical cardiovascular effects occurring after acute exposure, such as alteration in blood pressure, endothelial dysfunction, decreased heart rate variability, and decreased cardiac output. Seen over the long term, these changes are thought to contribute to the pathophysiology of peripheral vascular disease, ischemic events, cardiomyopathy, and congestive heart failure.²

It is important to recognize that air pollution not only causes chronic cardiovascular disease but also acute cardiovascular events. Acute exposure, over the course of one to several days, is associated with increased cardiovascular hospital admissions, heart failure, fatal and non-fatal myocardial infarctions, and ischemic strokes. The effect of more chronic exposures is of even greater magnitude, with mortality increasing by 3-76% per 10ug/m³ elevation in long-term average PM_{2.5} exposure.³

Clinical Management

As health care professionals, we traditionally focus efforts on preventing coronary artery disease through the control of personally modifiable risk factors, such as diabetes, hypertension, or tobacco use. While there is good evidence for a causal association between air pollution exposure and disease, it is less clear how we should counsel patients to best reduce their risk.

There is little evidence on whether lifestyle or pharmacologic interventions can mitigate the adverse effects of air pollution. Given the proposed importance of oxidative stress on the underlying pathophysiology, several experiments have examined whether antioxidants and other specific micronutrients may be beneficial in preventing cardiovascular disease.⁴ However, results have been mixed and, in some instances, suggest that antioxidant supplementation may actually worsen markers of subclinical cardiovascular disease.

Similarly, it is unclear whether physicians should counsel their patients to avoid outdoor activity when pollutant levels are high. The beneficial effects of regular exercise likely continued on page 13

The Impact of Emerging Diseases in Today's Medical Practice

Maria (Gaby) Frank, MD, FACP, FHM

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Throughout history, physicians have dealt with the emergence of new infectious diseases. Some became endemic, some pandemic, and some episodic. Each of these occurrences challenged our healthcare system to modify common practices, to adapt our facilities to serve an unusual subset of patients, and to educate both healthcare workers and the public. Most of the modifications (made to the way we approach patients during counseling, triage, and management) during these instances were transient; our practices returned to the prior status quo after "alert" was removed. Even when practice modifications were not maintained, these events highlighted the need to adapt our systems of care to the changing needs of our communities and to foster a culture of "continuous learning" for the medical community.

Impact of HIV on Isolation Precautions

The practice of universal infectious precautions (gloves, gowns, masks), although widely used in the operating room, was not formally introduced to other clinical practice settings until the CDC published the "Guideline for Infection Control in Hospital Personnel" in 1983. These recommendations were based on the assumption that every patient (and healthcare worker) was potentially a transmitter of blood borne pathogens.

In 1996, the *Guideline for Isolation Precautions in Hospitals*, last updated in 2007, replaced "universal precautions" with "standard precautions."¹ The guideline introduced the concept of "transmission based precautions"—recommendations focused on the clinical presentation of the patient or syndrome in question and informed by knowledge of the most likely causative pathogens.

The Human Immunodeficiency/AIDS epidemic was one of the main drivers of this change for the healthcare setting as well as for society at large. Despite the best intentions for protecting and promoting public health, these education campaigns also resulted in stigmatization and fear within our communities.

Reports of universal precautions being viewed as "discriminating" against HIV patients, as well as lack of evidence behind the "need" for universal precautions to prevent blood-borne infections when no contact with bodily fluids was anticipated, led to the switch from universal to standard precautions in 1996. The HIV pandemic led to some of the most recent, long-lasting behavioral changes in health care (and society) since the advent of immunizations.

SARS

On March 15, 2003, we awoke to the news of a Heightened Global Health Alert issued by the World Health Organization (WHO) regarding Severe Acute Respiratory Syndrome (SARS), after cases in Singapore and Canada were identified. The alert included an emergency travel advisory for international travelers, health care professionals, and health authorities. This outbreak began in November 2002 in China and, within five months, became a global epidemic due to air travel. By April 2003, Canadian scientists isolated the causative agent as a novel Coronavirus (CoV), a zoonosis with small mammals as its reservoir. SARS-CoV mortality ranged from 9-12%, reaching 50% in persons 65 and older. Pictures of individuals wearing surgical masks in airports, streets, and crowded places flooded the media. By mid-May 2004, the WHO lifted the alert as

no new cases had been reported within a three-week period.

H1N1 Influenza

In April 2009, panic took over the streets and once again surgical masks became "the new fashion." This time, the outbreak started in North America, not in China. A new virus containing genetic sequences from human and swine influenza viruses resulted in the H1N1 influenza pandemic.² It spread rapidly through Mexico and the southwestern United States. The WHO advisory issued in late April became a Grade 6 Alert in June and the 2009 H1N1 outbreak became the first flu pandemic since 1968. By the end of October 2009, President Barack Obama declared it to be a National Emergency. H1N1 pandemic was responsible of more than 18,000 deaths in more than 214 countries and resistance to oseltamivir was detected in some isolated viruses. Several international airports initiated temperature monitoring of travelers upon arrival before deciding if entrance to the country was allowed or if quarantine was necessary. After intense international collaboration by vaccine developers, an effective vaccine was successfully developed and offered to at-risk populations in October 2009. Since 2010, many countries have reported limited outbreaks of H1N1.

MERS-CoV

Another emergent zoonosis was reported in 2012, this time originating in Saudi Arabia. The Middle Eastern Respiratory Syndrome (MERS-CoV) is attributed to a Coronavirus.³ Interestingly, despite the clinical similarities with SARS, MERS is caused by a different, more virulent Coronavirus, and camels have been described as reservoirs. Since September 2012,

continued on page 14

Unconventional Natural Gas Development: Epidemiologic Studies and Public Health Implications

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Unconventional natural gas is natural gas in shale rock layers deep underground that generally require vertical and horizontal drilling with hydraulic fracturing (“fracking”) to bring to the surface. Over the last decade, unconventional natural gas development (UNGD) has rapidly become a major energy source in the United States, growing from 5 to 46% of the country’s natural gas production between 2005 and 2015. Pennsylvania, Texas, and Louisiana lead the United States in UNGD. Although UNGD has environmental and social impacts, research on the health effects of UNGD is in its infancy. Here, we describe the UNGD process and its environmental and community impacts, and summarize our epidemiology studies on UNGD and health outcomes. Finally, we provide recommendations, both on the clinical and public health levels, to protect the health of residents in communities undergoing UNGD.

During the first step of UNGD, the land (about seven acres) for the well pad is cleared and materials are brought to the site. This process requires more than 1,000 diesel truck trips per well. The well is then drilled vertically and horizontally. After drilling is completed, the horizontal portion of the well is perforated. Hydraulic fracturing follows, and requires three to seven million gallons of fluids, which is comprised of 90-95% water, 5-10% sand proppant (to keep the rock fractures open), and 0.1-1% chemical additives (including friction reducers, biocides, acids, and gelling agents). Although the term *fracking* is often used to describe the entire process, the hydraulic fracturing phase only

lasts less than a month out of the multi-year lifetime of the well. After hydraulic fracturing, gas production begins. The gas is compressed, and then distributed or stored.

The impacts of this rapid industrial development can vary in spatial scale and over the different phases of well development. Nearby residents can experience physical exposures including noise, light, and vibration. Chemical exposures from air, water, and soil pollution are also possible. Community and social impacts have included changes in home prices, increased truck traffic on local roads, and changes to the built environment and neighborhood aesthetics. Together, these changes can contribute to stress and anxiety. While much media attention has been paid to potential water impacts, we think that air pollution and social impacts may be of more immediate concern for public health. Whereas cancer and other conditions resulting from potential water contamination could take years to develop, air pollution and stress can lead to health effects within days.

To date, we have conducted three epidemiologic studies of UNGD that evaluated the association of UNGD with birth and pregnancy outcomes, asthma exacerbations, and nasal and sinus, migraine, and fatigue symptoms.¹⁻³ We selected these outcomes because we hypothesized it was biologically plausible for UNGD to affect the outcome through air pollution and/or stress pathways. Several methods were common across the three studies. We conducted these studies in partnership with the Geisinger Clinic, located in 40 counties in central and northeast-

ern Pennsylvania that cover a range of UNGD. The clinic has had an electronic health record (EHR) system since the early 2000s, and the EHR provides a rich source of longitudinal data on patients. In the birth and pregnancy outcomes and asthma exacerbations studies, we identified cases and control events in the EHR, and in the nasal and sinus, migraine, and fatigue symptoms study, we identified cases and controls through a questionnaire on these conditions. In all three studies, we created covariates (*e.g.*, age, sex, race/ethnicity, co-morbid conditions, body mass index, and tobacco use) using EHR data for the study population. We categorized patients into very low, low, medium, and high UNGD groups using a metric that incorporated the distance from the patients’ home to active wells, the density of wells, and the size of the wells (defined as the well depth and natural gas production). In our analyses, we controlled for other potential causes of the outcome (for example, smoking in the asthma exacerbation study). We compared patients with higher UNGD activity to those in the lowest UNGD activity group.

In the birth outcome study, we found increased odds of preterm birth and suggestive evidence for reduced birth weight among women with higher UNGD activity (those living closer to more and bigger unconventional wells), compared to lower UNGD activity during pregnancy. In the asthma study, we found increased odds of asthma hospitalizations, emergency department visits, and use of a medication for asthma attacks among asthma

continued on page 16

Endocrine Disrupting Chemicals: What to Tell Your Patients

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There are more than 80,000 synthetic chemicals on the Toxic Substance Control Act registry, many of which exist in consumer products that we use every day—from furniture to toys to household cleaning products to cosmetics. In 2000, 400 million tonnes (880 billion lbs) of man-made chemicals were produced world-wide; the equivalent of 180,000 Olympic-sized pools! Due to outdated chemical-safety laws and loopholes, only 14% of these synthetic chemicals have been adequately tested for their effects on human health, leaving consumers to make purchasing decisions without proper information. Currently, there are many organizations, such as the National Resource Defense Council, actively pressuring the U.S. Environmental Protection Agency, U.S. Food and Drug Administration, and state governments to update these laws while, in the meantime, health care professionals play a necessary role in helping patients make informed decisions.

Within the long list of synthetic chemicals, Endocrine Disrupting Chemicals (EDCs) is a subgroup that receives (and deservedly so) considerable attention. By definition, any chemical that can interfere with our endocrine system and adversely impact any aspect of hormone action is considered an EDC. Also referred to as hormone-disruptors, these chemicals mimic or antagonize normal hormone signaling to produce adverse effects on development, reproduction, and immune signaling, among other physiologies. Although hundreds of man-made and natural substances can cause endocrine disruption, there are several classes that are especially studied, including plasticizers (e.g., bisphenol A, phtha-

lates), pesticides (e.g., DDT and atrazine), dioxin and dioxin-like compounds (e.g., TCDD), and polychlorinated/polybrominated biphenyls (e.g., PCBs). Combined, these EDCs have been found in a wide array of consumer products, such as plastic bottles, detergents, flame retardants, food, toys, cosmetics, pesticides, and metal food cans.

In 2015, the Endocrine Society released its second “Scientific Statement on Endocrine Disrupting Chemicals” (<https://www.endocrine.org/endocrine-press/scientific-statements>), designed to provide a comprehensive update of the current scientific literature.¹ The authors read thousands of published papers with the goal of evaluating the evidence that EDCs do adversely affect health. For results to be included in their final assessment, the authors set the following criteria:

1. evidence must span several levels of analysis, if possible from both human epidemiological data and mechanistic studies in animal models;
2. appropriate controls (both negative and positive) must be included;
3. sample size must be high enough to have adequate power for statistical conclusions; and
4. methodology must be appropriate.

They also include both government- and industry-funded research. The authors summarize the data into specific health categories where the impact of EDCs was most clear: obesity/diabetes, female reproduction, male reproduction, hormone-sensitive cancers in females, prostate, thyroid, and neurodevelopment/neuroendocrine

systems. Any physician interested in learning more about the scientific evidence linking EDCs to these diseases is strongly recommended to download (for free) this position statement from the link.

In the meantime, the authors state “conclusive evidence [exists] for whether, when, and how EDCs perturb endocrine systems, including in humans.” They go on to conclude that “it is more necessary than ever to minimize further exposures, to identify new EDCs as they emerge, and to understand underlying mechanisms in order to develop interventions.”

In support of these conclusions, a recent report in the *Lancet* estimates that the United States spends more than \$340 billion each year on health care related to EDC exposure and that almost 13 million IQ points are lost due to hormone-disrupting chemicals.² The authors warn that flame retardant chemicals (PBDEs) are the worst culprits, causing \$268 billion in health care spending and the loss of 11 million IQ points. As a reference, despite the population of the European Union being nearly twice that of the United States, the authors estimate that health care costs for PBDEs to be only \$12.6 billion, demonstrating a sharp improvement in health when PBDEs are not widely used in consumer products. Finally, the authors opine that 4,400 cases of attention-deficit/hyperactivity disorder and about 1,500 cases of autism per year can be attributed to exposure to hormone-disrupting chemicals.

If the scientific data are so strong that EDCs are harmful to human health and lead to high medical costs, then why are hormone-disrupting chemicals still being used in consumer products? Predictably,

continued on page 9

CLINICAL UPDATE

continued from page 8

the answers to this question are multi-faceted—an example is the plasticizer bisphenol A (BPA). Recent reviews of the scientific literature by regulatory agencies in the United States, Canada, Europe, and Japan conclude that BPA is safe for consumers at current exposure levels. One reason for this disparity is because cause-and-effect is hard to show in humans. When a patient is diagnosed with endometriosis, it is nearly impossible to link it to BPA exposure, which is often low-level and chronic over many years. Moreover, there is always some debate when translating studies from animal models back to humans, and inconsistencies between doses and age of exposure can be exploited to point to conflicting literature. And finally, plastic manufacturing is a \$375 billion per year industry that motivates invested parties to keep the debate alive. That being said, manufacturers are keen to produce products consumers want to buy, so they are actively trying to find safe alternatives to epoxy can liners that leach BPA, for example. Unfortunately, cheap, odorless alternatives that do not peel, chip, or flake have proven to be challenging to develop. Plus, in the meantime, consumers continue to buy these products in an act that diminishes the urgency to find safe replacements.

As a clinician, what do you need to share with your patients? First, and foremost, it is important for everyone to keep a balanced approach. Chemicals surround us, and there are only so many preventative steps that can be taken; it is not helpful to obsess. Second, the age of the patient is a large factor in determining the appropriate level of concern. Although everyone should be making educated decisions that limit exposure to EDCs, the level of urgency is much different for a post-menopausal woman than for others, such as a pregnant woman or a child. Recent research has demonstrated that developing brains and organ systems, both in

utero and in early life, are particularly susceptible to EDCs and pregnant women should take some level of precaution to limit exposure where feasible (see “Scientific Statement on Endocrine Disrupting Chemicals” for more details). The following are tips on how to avoid EDCs:

- 1. BPA:** 93% of Americans have BPA in their urine. BPA is found in polycarbonate plastics, canned foods, thermal paper, and other consumer goods. Advice to limit exposure is to drink and eat from glass or stainless steel containers. If a plastic container is used to bring lunch to work, for example, do not heat it in the microwave nor put it in the dishwasher. Better to recycle the container when it starts to become worn. It is also a good idea to decline print receipts since thermal paper is often coated with BPA.
- 2. Phthalates:** 95% of Americans have phthalates in their urine. Phthalates are used to make soft and flexible plastics, such as plastic wrap, but can also be found in perfume, hair spray, carpet, plastic toys, and almost anything fragranced (e.g., shampoo and laundry detergent). To limit exposure, avoid plastic food containers and plastic wrap with recycling labels #3 or #7. In 2009, many types of phthalates were banned from children's toys, teething rings, and bottles, but older soft plastic toys likely contain phthalates. It is also wise to start reading labels and avoiding products that list “fragrance” or “parfum” since this can sometimes mean hidden phthalates.
- 3. Fire Retardants:** Due to flammability standards in the United States, chemical fire retardants are heavily used across a variety of household items, including furniture, electronics, appliances, and baby products. Children have been exposed to higher levels of fire retardants than adults; in large part due to these retardants leaching out of products and contaminating house dust that accumulates on the floor where infants or young children sit and play. Reducing in-home exposure to fire retardants is not easy and usually requires careful purchasing decisions of upholstered chairs and sofas, carpet, car seats, changing table pads, and crib mattresses. The best strategy is to buy items made without fire retardants and that usually requires contacting the manufacturer directly to ask if its furniture contains these chemicals.
- 4. Perfluorinated Chemicals (PFCs):** 99% of Americans have perfluorinated chemicals in their urine. PFCs are used to make non-stick cookware and water-resistant coatings on furniture, carpet, and clothes. To reduce exposure, do not use non-stick pans for cooking and try to limit purchasing goods sprayed with water-resistant coatings.
- 5. Organophosphate Pesticides and Atrazine:** These pesticides are widely used on crops throughout the United States. If budgets allow, try to buy organic produce. Alternatively, shopper guides³ can identify produce that has the fewest pesticide residues (including asparagus, avocado, cabbage, cantaloupe, carrots (peeled), cauliflower, eggplant, grapefruit, kiwi, onion, mango, mushrooms, papaya, pineapple, sweet corn, sweet peas, sweet potato, and watermelon).

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continued on page 13

PRESIDENT'S COLUMN

continued from page 3

of understanding where they are coming from.

For SGIM as an organization, the election results bring challenges to many of our core values and to our advocacy platform. As I wrote in a letter to members, SGIM will be doubling down on our efforts and advocacy on preserving and promoting universal access to health care. SGIM believes access to health care is a fundamental right, and keeping Americans healthy strengthens our economy, families, communities, and security. SGIM's other high-priority areas will continue to include funding for biomedical and health services research, equitable reimbursement for general internists, and adequate funding for health professions training. There are also significant threats to those priorities.

My two resolutions for SGIM as an organization are the following:

1. SGIM will strive to keep members informed about policy changes and advocacy opportunities. We are still working on details, but hope to more effectively highlight the quarterly policy updates from CRD, our Washington consultants. You can access it on the Web site link: <http://www.sgim.org/communities/advocacy/advocacy-reports>. We can and should do a better job of sending you there as just one of the ways we try to keep you informed about the current policy climate. The advocacy Web site contains other useful tools: the Health Policy Committee's series of articles in the *Forum* and sponsors useful content at every annual meeting, but especially at the meeting in Washington in April.
2. SGIM will work to broaden our reach and strengthen our voice by engaging with other organizations interested in advocating for preserving and promoting access to health

care. We have already formed a coalition with pediatric and family medicine groups and are actively working on a shared policy agenda. See my November *Forum* column for more information.² We must reach out further to other organizations that have also prioritized universal access to care to create the most effective and loudest opportunities for influence.

As SGIM members, you will, of course, make your own resolutions. In your lists, along with exercising more, sleeping more, and working less, I hope you will consider adding one of the following:

1. Resolve to get to Acceptance and to move on. We will do our best work if we can have stable emotions and embrace the future. Our patients and their families always do best when they get to Acceptance. We will all need to work together, in a nonpartisan way, to protect the advances in access and the commitment to primary care that the Affordable Care Act has created.
2. Resolve to stay engaged and informed about policy issues affecting your patients and SGIM. That's hard, and it might directly counteract the resolutions to work less and sleep more. It means opening those GIM Connect e-mails, reading those *Forum* articles about policy, and perhaps choosing a policy related workshop instead of whatever other session you want to attend at the regional or national meeting. But, SGIM needs you *and* your voices to have the greatest impact for our patients.

I hope that these two resolutions are achievable for me, for SGIM as an organization, and for you, the SGIM member. SGIM members are amazing advocates

for their patients—inpatients, outpatients, insured, uninsured, legal, undocumented, addicted, sober, in red states or in blue states.

I feel privileged to work with you and hopeful about 2017.

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SGIM

FROM THE EDITOR

continued from page 2

forces of nature or acts of man, our changing planet presents ongoing challenges to which healthcare systems must adapt and evolve.

Primary care physicians are and will continue to be frontline defenders of public health. We must maintain vigilance in our anticipation of the effects of environmental change on the health of our communities and advocate for effective systems to diagnose and manage these issues as they emerge. I hope you find this issue of *Forum* informative and thought provoking.

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SGIM

SIGN OF THE TIMES: PART I

continued from page 1

insurance due to low reimbursement rates. For generations, most low-income families in New Orleans (including mine) sought all of their care through Charity Hospital or other local emergency rooms for episodic care. Typically, doing so required almost a full day off from work for medical problems that ideally should be addressed through regular primary care visits. These are the same families who largely support the service/tourist industry in New Orleans but unfortunately do not have access to insurance through their employers. The fact that Charity Hospital and University Hospital, its affiliated facility, were known as great places for health professional training because of the “great pathology” seen on inpatient teaching services was a testament to what happens to a community when access to the right care at the right time is minimal to none.

Primary Care Practice Transformation

Try to imagine the local panic that set in when Charity Hospital closed after Hurricane Katrina. The public hospital system’s services were downsized. In the aftermath of the storm, Louisiana received an unprecedented opportunity to revamp its health care delivery model for medically underserved populations to shift care from acute care settings to community-based health care providers. The Louisiana Healthcare Redesign Collaborative (led by the Department of Health and Hospitals) developed guiding principles for system redesign. These principles included affordable health care coverage, interoperable health information technology, medical home systems of care, and shared quality standards.³ New Orleans safety-net providers quickly adopted these principles to build a network of accessible, neighborhood-based clinics for the underserved populations in four southeast Louisiana parishes (aka counties). The 504HealthNet, an organization of federally qualified

health centers, governmental agencies, academia, and faith-based organizations in the Greater New Orleans area, formed rapidly to galvanize local leadership into rebuilding and expanding primary care.⁴ They also advocated for health policy that would support this effort.

To achieve these goals, Louisiana secured \$100 million in funding from the Centers for Medicare and Medicaid Services for the Primary Care Access Stabilization Grant (PCASG) to support health care delivery redesign in southeast Louisiana.⁵ From 2007 to 2010, 25 safety-net provider organizations participated in PCASG to increase access to primary care and mental/behavioral health services, develop organized systems of care coordination, develop sustainable business models, and provide evidence-based high quality care. Payments were dispensed every six months using a formula adjusted for patient mix and service type focusing on quality rather than volume of care. PCASG also incentivized participants to achieve National Committee for Quality Assurance (NCQA) patient-centered medical home recognition. In 2009, PCASG participants were among the first health care organizations recognized by NCQA nationwide. We were doing this work out of necessity before the Affordable Care Act was passed. Providing high-quality care to the medically underserved was simply the right thing to do!

Anticipating Medicaid expansion under the Affordable Care Act, PCASG-funded providers transitioned to the Greater New Orleans Community Health Connection (GNOCHC; 1115 Medicaid Demonstration Waiver) program in 2010. GNOCHC provided insurance coverage for adults who lived in the southeast Louisiana parishes affected by Katrina and otherwise did not qualify for Louisiana Medicaid.⁶ By 2013, close to 134,000 patients were served by 18 participating provider organizations providing integrated primary care and mental/behavioral health services.

Louisiana saw a rapid expansion of community health centers in southeast Louisiana as result of these health policy efforts, and now has 30 federally qualified health centers operating 162 sites throughout the state.

Most of the GNOCHC-funded provider organizations simultaneously participated in the \$13.5 million Crescent City Beacon Community Initiative (CCBC) between 2010 and 2013 to accelerate the role of health information technology in population health management.⁷ The CCBC’s successful initiatives included implementing the Greater New Orleans Health Information Exchange with more than 170,000 unique patient records; generating automatic notifications from local emergency departments to community clinics to facilitate transitions of care; funding chronic disease care management quality improvement efforts in four hospital systems and 20 primary care practices; establishing a clinical seminar series for community providers to share best practices; and, launching a mobile health diabetes awareness program.

All of the aforementioned health care redesign efforts were under the leadership of the 504HealthNet and the Louisiana Public Health Institute (LPHI). While the 504HealthNet members did most of the health policy advocacy work and implemented practice transformation, LPHI administered the PCASG and CCBC initiatives. One of LPHI’s greatest assets was its ability to effectively engage community stakeholders in designing pragmatic delivery models and health care interventions. LPHI also strongly promoted population health management—a concept that was relatively new to some organizations. Perhaps it was this attribute that has kept so many health care providers engaged in this challenging yet rewarding work for the past 11 years.

Nonetheless, we have seen “casualties” along this journey. Some organizations have either downsized
continued on page 15

SIGN OF THE TIMES: PART II

continued from page 4

(asthma, reactive airways dysfunction syndrome, chronic obstructive pulmonary conditions);

- gastrointestinal conditions (gastroesophageal reflux disease);
- psychological conditions (posttraumatic stress disorder, depression, anxiety, substance abuse); and
- sarcoidosis, which is increasingly seen in our population and has more recently been accepted as a WTC-related condition.

Common WTC-associated conditions include the following:

- obstructive sleep apnea;
- Barrett's esophagitis; and
- chronic cough.

Additionally, many kinds of cancer are covered through the WTCHP. The most common cancers seen in this population are skin cancer, prostate cancer, lymphoma, and thyroid cancer.⁶

WTC Treatment Program

Individuals can be certified for medical conditions by the National Institute for Occupational Safety and Health (NIOSH) if the illness is an accepted WTC condition and if the timing of symptom onset is consistent with the guidelines established by NIOSH. Certification ensures that any ongoing care and treatment of the WTC medical condition is covered by the program.

If a participant is identified as having a medical condition that is WTC-related, he or she is managed by the WTC treatment program. Each participant is matched with a treatment provider who is a board-certified physician in occupational medicine, internal medicine, or pulmonary medicine, or is a nurse practitioner. A participant is encouraged to regularly follow-up with his or her treatment provider. The frequency of follow up is determined by the severity of the condition(s) and the individual needs of each participant.

Program members often have

multiple co-morbid conditions that contribute to the level of complexity. Management of these participants requires an interdisciplinary team approach. Participants are referred for consultation with a specialist (in areas such as pulmonology, otolaryngology, or gastroenterology) when they fail standard treatment or if they require further evaluation. Individuals with findings suspicious for cancer or diagnosed with cancer are referred to the cancer management team which facilitates further coordination of care.

Mental Health and Other Services

Participants with WTC-related mental health conditions are offered ongoing care and support through the WTC psychiatry program and are managed by psychiatrists, psychologists, and licensed social workers. Social workers also help program members access comprehensive services and benefits such as workers' compensation, social security disability, pension/union benefits, the 9/11 Victims Compensation Fund, and medical insurance. There is also an on-site workers' compensation program coordinator who meets with patients individually as needed to further discuss these benefits. In our program, 40.68% (N=9,177) are working, 1.96% (N=442) are disabled, and 5.57% (N=1,256) are unemployed.

Our clinic also offers a comprehensive tobacco cessation program that includes a detailed behavioral assessment, counseling, treatment, and regular follow up. Registered nurses in clinic are available to provide patient education regarding their health conditions and medication use (such as inhaler technique).

As a substantial proportion of the program members are non-English speaking, we provide Spanish- and Polish-speaking staff who provide interpretation and translation services. For individuals who speak other languages, interpretation services are provided through a telephone translation service. Our interpreters also provide on-site assistance to pa-

tients during their diagnostic studies and consultations.

Conclusion

In this article, we have described the components of the WTCHP at the Selikoff Centers for Occupational Health in Manhattan. The WTCHP has successfully managed thousands of first responders and survivors in the 15 years that have passed since the WTC disaster. Members are generally very satisfied with the care and services they receive. NIOSH continues to review and modify certification criteria so participants can garner as much benefit from the program as possible. Continued research on this population will be necessary to further enhance the services provided to members through the program.

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BEST PRACTICES

continued from page 5

outweigh adverse effects, and many individuals may be unable to afford access to fitness centers or other indoor recreational venues. It is possible that behavioral modifications, such as wearing a face mask during workouts, may be able to reduce cardiovascular responses.⁴ Nonetheless, vulnerable populations—such as the elderly, diabetic patients, or those with pre-existing cardiopulmonary disease—should be advised to follow local air quality forecasts and plan exercise accordingly.⁵

Advocacy

The risks associated with exposure to ambient air pollution are substantial when applied to the entire population.³ As the global economy rapidly urbanizes, air quality will be an ongoing concern. In 2016, record-breaking pollutant levels occurred in China and Southeast Asia, and more than 85% of the global population is regularly exposed to concentrations

exceeding World Health Organization standards.⁶ Furthermore, while air pollution is ubiquitous, it disproportionately affects individuals with lower socioeconomic status who may be forced to live or work in areas with high levels of pollutants. As health care providers, we need to understand the detrimental health effects associated with air pollution and also advocate for public policies that will help reduce exposure.

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SGIM

Adverse Cardiovascular Effects of Air Pollution Exposure ²				
Exposure Source	Pollutants	Physiologic Mechanisms	Subclinical Effects	Cardiovascular Clinical Outcomes
Fossil fuels	<ul style="list-style-type: none"> • Carbon dioxide (CO₂) • Oxides of nitrogen (NO_x) • Sulphur dioxide (SO₂) • Volatile organic compounds (VOC_s) • Particulate matter (PM) 	<ul style="list-style-type: none"> • Disruption of lipid metabolism • Systemic oxidative stress • Autonomic nervous system changes 	<ul style="list-style-type: none"> • Endothelial dysfunction • Atherosclerosis • Blood pressure changes • Decreased heart rate variability • Decreased cardiac output 	<p>Acute:</p> <ul style="list-style-type: none"> • Arrhythmia • Myocardial infarction • Ischemic stroke • Heart failure <p>Chronic:</p> <ul style="list-style-type: none"> • Increased cardiovascular mortality • Cardiomyopathy • Peripheral arterial disease

CLINICAL UPDATE

continued from page 9

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SGIM

PERSPECTIVE

continued from page 6

1,826 cases were confirmed with a mortality rate of 36%. No vaccine or treatment is currently available. Preventive measures are therefore limited to stressing personal hygiene; avoidance of contact with sick camels, and standard precautions. As of today no travel advisory or notice has been instituted.

Ebola

Since its discovery from Africa in 1976, the largest outbreak of Ebola was in 2014-2015. A total of 11,310 out of 28,161 cases reported during this outbreak died with a resultant mortality rate of close to 40%. The outbreak affected West Africa (Liberia, Guinea, and Sierra Leone) and, due to air travel, cases were also reported in Europe and America.⁴ Travel notice to affected countries was implemented in July 2014. Hospitals in the United States responded by creating protocols, designating triage and treatment areas, educating staff, and training a limited number of health care workers on the use of protective garments. Four cases were treated in the United States, two were returning travelers (one died) and two were health care workers exposed to a patient in Dallas, Texas. The WHO terminated the Public Health Emergency of International Concern on March 29th, 2016, due to no new cases in the previous 6 months.

Zika

The current Zika pandemic originated in South America in early 2016. The 20-fold increase in microcephaly in Brazil attributed to the Zika virus (ZKV) infection in April 2016 led patients worldwide to seek travel and family planning counseling. Zika virus was first isolated in Uganda in 1947, with the first human case described in 1952. The first major outbreak in humans occurred in 2007 in the Yap Islands. In 2011, sexual transmission was confirmed in a traveler returning to the United States from Senegal as well as several other cases also confirmed in Europe. Although Zika virus infection is an arthropod-borne dis-

ease, its transmission includes vector, sexual, vertical, and suspected parental (yet to be confirmed) pathways. Since the first Brazilian case was reported in March 2015, Zika has spread to more than 56 countries and territories. After an incubation phase of around one week, up to 80% of infected individuals remain asymptomatic while 20% develop mild symptoms including arthralgias, fever, rash, and conjunctivitis. Guillain-Barre syndrome has also been associated with ZKV. Viremia has been reported to last one week and the virus has been detected in sperm for up to 60 days. This fact supports the recommendation for returning male travelers (both symptomatic and asymptomatic) to use barrier contraception if pregnancy is present or planned in their partners for six months post exposure. Prevention guidelines and travel advisories are evolving. We therefore should refer our colleagues and patients to the Center for Disease Control (CDC) and/or WHO Web sites for the latest recommendations.⁵

Over the last 15 years, our health care system has confronted the emergence and/or resurgence of multiple infectious pathogens, some preventable through immunizations and many others for which no vaccines are available. Extensive literature and publications describe the “anti-vaxer” movement and its public health implications, including recent resurgence of poliomyelitis and measles in developed countries. It continues to be our duty to educate health professionals and our communities about both individual and societal risks (few) and benefits (many) of immunizations. (Further discussion of immunization-preventable outbreaks exceeds the scope of this article.)

When reviewing the aftermath of the most recent outbreaks, many questions arise:

- What does it take for an emerging or resurgent disease to shape behaviors in healthcare workers and society?
- What changes have we made in our practice to address the

eventuality of dealing with an “outbreak” in our system? and

- What can we, as general internists, do to help our communities and patients prepare for the next emerging pathogen?

Answers to these questions are complex and will require further analysis; however, I hope that this article will initiate a conversation.

General internists, whether in primary care or hospital medicine, will be at the front lines of any future outbreak. Our roles will vary from discussing “pre-travel planning” with our patients to recognizing the patient who presents to clinic or is admitted to the hospital with symptoms suggestive of a new acute infectious outbreak. Our ability to recognize and respond appropriately to such an outbreak will require continued vigilance, awareness, and ongoing epidemiologic knowledge. Such vigilance will determine how effective we will be in rapidly diagnosing and implementing the correct treatment for our patients while also protecting the public in appropriate ways. It is *imperative* to bear in mind that a “local” remote outbreak can become “global” just by air travel, and the first responder may not have the adequate triage questions in mind. It is our duty to protect our patients and communities and the best way to do it is to stay informed and vigilant.

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SIGN OF THE TIMES: PART I

continued from page 11

services or closed clinics to maintain financial stability while caring for a largely uninsured population. For those of us who kept the doors open, we continued to struggle to gain timely access to specialty services for both the uninsured and Medicaid population. While we took pride in expanding primary care services, it was professionally dissatisfying to advise patients that they can only receive certain specialty services in select places and that they might have to wait several months to a year to receive it.

Medicaid Funding

While most states implemented Medicaid expansion in 2014, Louisiana's former Governor Bobby Jindal vowed not to adopt it. By 2012, the Louisiana legislature reduced Medicaid funding and applied most of these cuts to the state hospital system. Private-public partnerships were created in 2013 and 2014 through which private companies lease and operate the hospitals and their affiliated clinics. The privately run hospitals are still required to provide indigent care to uninsured individuals and participate in graduate medical education.

The newly elected Democratic Governor John Bel Edwards campaigned in 2015 on implementing Medicaid expansion. He issued an executive order by January 2016 to adopt it during his first month in office. The state used the Supplemental Nutrition Assistance Program to successfully facilitate enrollment by July 2016 when coverage took effect. To date, we have more than

350,000 Medicaid enrollees for the first time ever in Louisiana history. The need for coverage in such a largely rural and impoverished state is obvious.

The Struggle Continues

I have shared only snapshots of our story, but there are many important lessons that can be gleaned from our experiences. First, health care providers must engage in health policy advocacy work if we truly believe in keeping patients first. Second, the practice of medicine is best achieved when we integrate public health perspectives into the design of our work. Third, galvanizing the community and other stakeholders in our mission will always help us surpass our goals beyond what we could ever achieve on our own. Finally, this work is not for the weary. It takes grit and resilience to see the light at the end of the tunnel.

Given U.S. president-elect Donald Trump's intent to repeal or amend the Affordable Care Act, our 11-year journey to health care reform in Louisiana remains tenuous. Nonetheless, as a community, we remain unmoved and dedicated to ongoing health policy advocacy work on local, state, and national levels. It is our form of social justice for the historically disadvantaged.

Indeed, the struggle is real. The battle is not yet won. However, this too shall pass.

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SGIM

RESEARCH CORNER

continued from page 7

patients with higher UNGD activity, compared to those with lower UNGD activity. Finally, in our study of symptoms, we found that patients with higher UNGD activity had higher odds of nasal and sinus, migraine headache, and fatigue symptoms, compared to those with lower UNGD activity. In each study, we conducted sensitivity analyses to evaluate the robustness of our findings. For example, we repeated the studies with a different outcome, gastrointestinal illness, which we would not expect to be associated with UNGD. Had we seen an association between UNGD and gastrointestinal illness, we would have been concerned that a factor other than UNGD was responsible for our results, but we did not see an association between UNGD and gastrointestinal illness. As these studies are observational, they cannot prove that an exposure caused an adverse health outcome. However, these studies contribute to a growing literature on UNGD and health outcomes. Other research groups have also found associations of UNGD with pregnancy outcomes and symptoms; together these suggest that UNGD is associated with health impacts.

While our studies have several strengths, including large, population-based samples, they also had limitations: importantly, our UNGD metrics cannot determine if our associations are due to air pollution, stress, or another pathway. Future studies are

needed to take environmental measurements and establish pathways, but in the meantime, what can be done to protect the health of people who live near UNGD?

At the individual level, the Southwest Pennsylvania Environmental Health Project (environmentalhealth-project.org), a nonprofit organization working on health impacts of UNGD in Pennsylvania, provides several recommendations for secondary and tertiary prevention for nearby residents. These include frequently vacuuming with a HEPA filter vacuum and taking notes of health symptoms over time. They also recommend residents stop drinking water from the tap if it causes rash or pain for someone in the household.

At the public health level, best practices and regulations can prevent populations from exposure to potentially harmful impacts of UNGD. Some states, like Maryland and New York, have taken this path—they established moratoriums on UNGD at a time when few health studies had been published because of possible uncharacterized environmental and health impacts. Currently, several studies have found associations between UNGD and health outcomes. Maryland's moratorium ends in 2017. As the state evaluates what to do next, we urge it to take these now published studies into consideration. These states can learn from the experiences of states like Pennsylvania, which has rapidly moved forward with UNGD.

Specific recommendations on what people should do to protect their health if they live nearby UNGD, whether at the individual or public health level, is not something that neither we nor any other epidemiologic researchers have evaluated to date. Therefore, health studies with detailed exposure measurements (e.g., noise and air pollution levels) are needed so that we can understand why we are seeing associations between UNGD and health. With these studies, we can better inform doctors and patients. Until then, we hope that policy makers adopt the precautionary principle and make the decision to protect public health in the absence of complete data.

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