

May 29, 2014

The Honorable Andrew M. Cuomo
Governor of New York State
NYS State Capitol Building
Albany, NY 12224

Acting Health Commissioner Howard A. Zucker
New York State Department of Health
Corning Tower
Empire State Plaza,
Albany, NY 12237

Dear Governor Cuomo and Acting Health Commissioner Zucker,

We, the undersigned physicians, nurses, researchers and public health professionals, write to update you on the alarming trends in the data regarding the health and community impacts of drilling and fracking for natural gas. The totality of the science—which now encompasses hundreds of peer-reviewed studies (Physicians Scientists & Engineers for Healthy Energy (PSE), 2014) and hundreds of additional reports and case examples—shows that permitting fracking in New York would pose significant threats to the air, water, health and safety of New Yorkers. At the same time, new assessments from expert panels also make clear that fundamental data gaps remain and that the best imaginable regulatory frameworks fall far short of protecting our health and our environment.

Concerned both by the rapidly expanding evidence of harm and by the uncertainties that remain, we urge you to adopt a concrete moratorium of at least three to five years while scientific and medical knowledge on the impacts of fracking continues to emerge.

Many of us have previously submitted official comments that highlight various studies and data that raise a range of concerns about impacts to public health. In light of such concerns, New York has wisely maintained a *de facto* moratorium. However, since the close of the last public comment period, the body of scientific studies has approximately doubled in size. Moreover, the pace at which studies are emerging has accelerated: the number of studies on the health effects of fracking published in the first few months of 2014 exceed the sum total of those published in 2011 and 2012 combined. (Mobbs, 2014).

All together, these new data reinforce the earlier evidence, reveal additional health problems associated with drilling and fracking operations, and expose intractable, irreversible problems. They also make clear that the relevant risks for harm have neither been fully identified nor adequately assessed. While the scope of concerns and new information is far greater than this letter can accommodate, trends in the data include the following:

Evidence linking water contamination to fracking-related activities is now indisputable.

An investigation by the Associated Press has confirmed cases of water contamination in Pennsylvania, Ohio, West Virginia, and Texas (Begos, 2014). Fracking-related contaminants detected in water sources within the last twelve months include methane (Jackson et al., 2013),

radium (Vengosh, Jackson, Warner, Darrah, & Kondash, 2014), arsenic (Fontenot et al., 2013), and hormone-disrupting substances (Kassotis, Tillitt, Davis, Hormann, & Nagel, 2014).

Reviewing the entirety of the evidence, the Council of Canadian Academies concluded, “A common claim. . . is that hydraulic fracturing has shown no verified impacts on groundwater. Recent peer-reviewed literature refutes this claim and also indicates that the main concerns are for longer term cumulative impacts that would generally not yet be evident and are difficult to predict reliably. . . . The most important questions concerning groundwater contamination from shale gas development are not whether groundwater impacts have or will occur, but where and when they will occur. . . .” (Council of Canadian Academies, 2014).

The structural integrity of wells can fail. These failures are common, unavoidable, and increase over time as wells age and cement and casings deteriorate.

According to industry data, five percent of wells leak immediately; more than half leak after 30 years (Brufatto et al., 2003). Data from the Pennsylvania Department of Environmental Protection show a 6 to 7 percent failure rate for new wells drilled in each of the past three years. The consequences of gas leaks include risk of explosion, drinking water contamination, and seepage of raw methane into the atmosphere where it acts as a powerful greenhouse gas (Ingraffea, 2013).

Drilling and fracking contribute to loss of well integrity. Drilling creates microfractures in the surrounding rock that cement cannot fill and so opens pathways for the upward migration of liquids and gases. Additionally, high pressure from repeated fracturing can deform cement, further raising the risk of leakage. Age-related shrinkage and deterioration cause cement to pull away from the surrounding rock, reduce the tightness of the seal, thus opening potential portals for contamination. According to one expert panel, “the greatest threat to groundwater is gas leakage from wells from which even existing best practices cannot assure long-term prevention” (Council of Canadian Academies, 2014).

The disposal of fracking wastewater is causally linked to earthquakes and radioactive contamination of surface water. It remains a problem with no solution.

As confirmed by the U.S. Geological Survey, deep-well injection of fracking waste has triggered significant earthquakes in Oklahoma (Sumy, Cochran, Keranen, Wei, & Abers, 2014). A team from Columbia University’s Lamont-Doherty Earth Observatory reports similar findings in Ohio and demonstrates how injection of fracking waste can stress geological faults and make them vulnerable to slippage (Davies et al., 2014).

In the United Kingdom, Canada, Mexico and Ohio, geologists have also linked fracking itself to earthquakes (Godoy, 2014; The Canadian Press, 2012; Vukmanovic, 2011). Members of the Seismological Society of America warn that geologists do not yet know how to predict the timing or location of such earthquakes: “We don’t know how to evaluate the likelihood that a [fracking or wastewater] operation will be a seismic source in advance.” (Kiger, 2014).

Researchers further warn that earthquakes can occur tens of miles away from the wells themselves. (Walsh, 2014)

Both the certainties and the uncertainties about the risk of earthquakes from fracking operations raise serious, unique concerns about the possible consequences to New York City's drinking water infrastructure from fracking-related activities. No other major U.S. city provides drinking water through aging, 100-mile-long aqueducts that lie directly atop the Marcellus Shale. Seismic damage to these aqueducts that results in a disruption of supply of potable water to the New York City area would create a catastrophic public health crisis.

At the same time, hauling fracking wastewater to treatment plants has resulted in contamination of rivers and streams with unfilterable radioactive radium (Nelson et al., 2014; Warner, Christie, Jackson, & Vengosh, 2013).

Air quality impacts from fracking-related activities are clearer than ever.

Air pollution arises from the gas extraction process itself, as well as the intensive transportation demands of extraction, processing and delivery. And yet, monitoring technologies currently in use underestimate the ongoing risk to exposed people, especially children (Brown, Weinberger, Lewis, & Bonaparte, 2014; Rawlins, 2014; University of Texas, 2014).

Fracking-related air pollutants include carcinogenic silica dust (Moore, Zielinska, Pétron, & Jackson, 2014), carcinogenic benzene (McKenzie, Witter, Newman, & Adgate, 2012), and volatile organic compounds (VOCs) that create ozone (Gilman, Lerner, Kuster, & de Gouw, 2013). Exposure to ozone—smog—contributes to costly, disabling health problems, including premature death, asthma, stroke, heart attack, and low birth weight (Jerrett et al., 2009).

Unplanned toxic air releases from fracking sites in Texas increased by 100 percent since 2009, according to an extensive investigation by the Center for Public Integrity, InsideClimate News and the Weather Channel (Morris, Song, & Hasemyer, 2014).

We are alarmed that Utah's formerly pristine Uintah Basin now appears on the list of the nation's 25 most ozone-polluted counties (American Lung Association, 2014). Indeed, total annual VOC emissions from Uintah Basin fracking sites are roughly equivalent to those from 100 million cars (Lockwood, 2014). Questions about possibly elevated rates of stillbirth and infant deaths in the area have prompted an ongoing investigation (Stewart & Maffly, 2014).

Community and social impacts of fracking can be widespread, expensive, and deadly.

Community and social impacts of drilling and fracking include spikes in crime, sexually transmitted diseases, vehicle accidents, and worker deaths and injuries (Ghahremani, 2014; Gibbons, 2013; Healy, 2013; Hennessy-Fiske, 2014; O'Hare, 2014; Olsen, 2014). A new investigation by the Associated Press found that traffic fatalities more than quadrupled in intensely drilled areas even as they fell throughout the rest of the nation (Associated Press, 2014).

The Multi-State Shale Research Collaborative's new report, "Assessing the Impacts of Shale Drilling: Four Community Case Studies," documented economic, community government and

human services impact of fracking on four rural communities. Among the findings: the advent of fracking brings a rapid influx of out-of-state workers and attendant costs for police, emergency services, road damage, medical and social services. At the same time, increased rent costs bring shortages of affordable housing (Multi-State Shale Research Collaborative, 2014). As medical professionals, we know that these kinds of social impacts bring health consequences, especially for low-income single mothers and their children.

Industry secrecy contributes to unsettled science

Even as evidence of harm continues to emerge, reviews of the science to date note that investigations necessary to understand long-term public health impacts do not exist. Medical and scientific organizations and groups of scholars in the United States, England, Canada, and Australia have, very recently, acknowledged the legitimacy of public health concerns and called for high-quality, comprehensive health studies (Adgate, Goldstein, & McKenzie, 2014; Coram, Moss, & Blashki, 2014; Council of Canadian Academies, 2014; Kovats et al., 2014).

These recommendations echo those made earlier by the U.S. Government Accountability Office. In 2012, the GAO pointed out that drilling and fracking clearly pose “inherent environmental and public health risks.” And yet, “the extent of these risks...is unknown” due to lack of serious study of the long-term, cumulative impacts (U.S. Government Accountability Office, 2012).

To explain why science is missing in action, we emphasize the obstacles faced by researchers seeking to carry out the needed research. Specifically, as independent observers have noted, “the gas industry has sought to limit the disclosure of information about its operations to researchers” (Sadasivam, 2014), and prolifically uses non-disclosure agreements as a strategy to keep data from health researchers, among others (Efsthathiou Jr. & Drajem, 2013).

Nevertheless, important studies continue to fill research gaps and build a clearer picture of the longer-term and cumulative impacts of fracking. Many such studies currently underway will be published in the upcoming three-to-five year horizon. These include further investigations of hormone-disrupting chemicals in fracking fluid; further studies of birth outcomes among pregnant women living near drilling and fracking operations; further studies of air quality impacts; and further studies of drinking water contamination.

Just as medical professionals assert a sacred oath to ‘first do no harm,’ this is the proper course for New York State to follow in its decision about fracking. Indeed, Governor Cuomo, we hold you to your promise that fracking will not be allowed if the health of all New Yorkers and the quality of all watersheds cannot be protected. Amidst all the uncertainty, this much is very clear: based on the knowledge available to us now, the NYS Department of Health can come to no other determination except to say that this admirable and appropriate standard cannot be met.

Accordingly, and while critical ongoing studies are conducted, we urge that New York State take a leadership role in the nation by announcing a formal moratorium. Given the lack of any evidence indicating that fracking can be done safely – and a wealth of evidence to the contrary – we consider a three-to-five year moratorium to be an appropriate minimum time frame.

Finally, we believe that public health is best served by transparency and inclusiveness – particularly among those who stand to be affected. With a moratorium in place—and as more data

on the impacts of fracking emerge—the state should open a comprehensive New York-specific health assessment process that engages and seeks input from the public and the independent medical and scientific community (Concerned Health Professionals of New York, 2013).

Sincerely,

HEALTH & MEDICAL ORGANIZATIONS

Alliance of Nurses for Healthy Environments

American Academy of Pediatrics, District II New York State

American Lung Association in New York

Babylon Breast Cancer Coalition

Breast Cancer Action, *a national grassroots education and advocacy organization with over 2600 members in New York State*

Breast Cancer Coalition of Rochester

Breast Cancer Fund

Breast Cancer Options, Kingston

Capital Region Action Against Breast Cancer

Center for Environmental Health, New York

Great Neck Breast Cancer Coalition

Huntington Breast Cancer Action Coalition, Inc.

New York State Breast Cancer Network, *a statewide network of 23 member organizations reaching over 135,000 New Yorkers affected by breast cancer each year*

Otsego County Medical Society

Physicians for Social Responsibility

Physicians for Social Responsibility, Arizona

Physicians for Social Responsibility, Philadelphia

Physicians for Social Responsibility, San Francisco Bay Area

Physicians for Social Responsibility, NYC Chapter

Physicians for Social Responsibility/Hudson-Mohawk Chapter

Physicians Scientists & Engineers for Healthy Energy

Science and Environmental Health Network

Southwest Pennsylvania Environmental Health Project

Tompkins County Medical Society

Western NY Professional Nurses Association Legislative Committee

Directors and Board Members

Holly McGregor Anderson RN BS, Breast Cancer Coalition of Rochester

Beverly Canin, Board Member, Breast Cancer Options, Kingston NY, New York State Breast Cancer Network, Breast Cancer Action

Donna Flayhan PhD, Director, The Lower Manhattan Public Health Project

Andi Gladstone, Executive Director, New York State Breast Cancer Network

Tess Helfman, President, Babylon Breast Cancer Coalition, Copiague, NY

Roy Korn Jr. MD MPH FACP, President, Schoharie County Medical Society

Karen Joy Miller, President, Huntington Breast Cancer Action Coalition, Inc.

Hope Nemiroff, Executive Director, Breast Cancer Options, Kingston NY

Raina Rippel, Director, Southwest Pennsylvania Environmental Health Project

Jeanne Rizzo RN, President & CEO, Breast Cancer Fund

Laura Weinberg, President, Great Neck Breast Cancer Coalition, Great Neck, NY

HEALTH PROFESSIONALS & SCIENTISTS

(affiliations provided for identification only)

Allan J. Ahearne DVM, Cooperstown, NY

John Alves MD

Kimberley Baker MSN, Clinical Nurse Specialist, Capital Region Action Against Breast Cancer

MaryAnn Baker RN, United Health Services

Michelle Bamberger MS DVM

Frederick M. Barken MD

Steven Barnett MD, Associate Professor of Family Medicine and Public Health Science, University of Rochester

Emily Barrett PhD, Assistant Professor of Obstetrics and Gynecology, University of Rochester School of Medicine and Dentistry

Camille Barrow RN

Monica J. Bauman MD, Attending Anesthesiologist, Bassett Medical Center; Assistant Professor of Clinical Anesthesiology, Columbia University

Jennifer D. Becker MPH, University of Rochester

Carol Beechy MD, Internal Medicine, Pain and Palliative Care Consult Service, Bassett Medical Center, Cooperstown, NY

R.A. Bennett MD PhD, Child/Adolescent Psychiatrist, Bassett Medical Center

Paul C. Bermanzohn MD, Rosendale, NY

Carlos Bermejo MD

Edward Bischof MD FACP, Program Director, Internal Medicine, Bassett Medical Center

Ronald E. Bishop PhD CHO, Department of Chemistry and Biochemistry, SUNY College at Oneonta

Nathan Boddie MD MS, Brooklyn, NY

Betsy Bonsignore RN LMT

James Bordley IV MD, Attending Surgeon, Bassett Medical Center

Rebekah L. Bowser RN BSN

Monica Brane MD, Pediatrician, Bassett Healthcare

Kelly K. Branigan RN

Michael P. Branigan CRNA MS

Arlene Bregman DrPH

David Brown ScD, Public Health Toxicologist and Director of Public Health Toxicology for Environment and Human Health, Inc.; past Chief of Environmental Epidemiology and Occupational Health in Connecticut; former Deputy Director of the Public Health Practice Group of Agency for Toxic Substances and Disease Registry (ATSDR) at the National Centers for Disease Control and Prevention

Glenda Brown RN, Health Alliance of the Hudson Valley

Richard J. Brown MD, Bassett Healthcare

Liz Bucar LPN

Sarah Buckley RN

Deborah Buechner PA, Arnot Health, Corning, NY

Cynthia S. Burger CAE, Executive Director, Medical Societies of Broome, Delaware, Otsego and Tompkins Counties, Sixth District Branch of MSSNY, Southern Tier Foundation for Medical Care

Anna Burton MD, New York, NY

Sheila Bushkin-Bedient MD MPH, Concerned Health Professionals of New York; Member, Institute for Health and the Environment; Vice-chair, Medical Society of the State of New York Preventive Medicine and Family Health Committee

Lynn Cahill-Hoy ANP MSN, Family Care Medical Group

Douglas H. Cannon MD, Bassett Healthcare

Gabriela Rodriguez Caprio MD, Assistant Professor, Mount Sinai School of Medicine, New York

Marybeth Carlberg MD, Family Practice, Skaneateles, NY; Associate Professor SUNY Upstate Medical University; Onondaga County Health Department Physician Advisory Board

David O. Carpenter MD, Director, Institute for Health and the Environment, University at Albany

Jennifer K. Carroll MD MPH, Associate Professor, Director of Community Health Promotion Research, University of Rochester Medical Center

Lisa M. Clauson FNP

Andrew D. Coates MD FACP, Physicians for Social Responsibility, Hudson-Mohawk Chapter

Nicholas Cohen PhD, Professor Emeritus of Microbiology & Immunology and of Psychiatry University of Rochester Medical Center

Richard Collens MD, Twin County Cardiology, Columbia Memorial Hospital, Hudson, NY

Shelby Cooper MD, Vascular and Endovascular Surgery, Department of Surgery, Associate Chief of Surgery; Clinical Assistant Professor of Surgery, Columbia University Bassett Medical Center, Cooperstown

Juliette Ramírez Corazón MPH

Monica Daniel LM LAc MS, Midwife, Nurse

John S. Davis MD, Cooperstown, NY

Douglas M. DeLong MD FACP

Antonia Demas PhD, President, Food Studies Institute; Visiting Scholar, Johns Hopkins School of Public Health; Clinical Assistant Professor, University of Illinois College of Medicine at Rockford

Jennifer Dengler PA-S

Lauren Derrick, NP

Patrick Dietz MD

Wendy Dwyer RN, Canaan, NY

Larysa Dyrszka MD, Concerned Health Professionals of New York

Sandra J. Eleczko DDS

Dorothy S. Elizabeth PA student and NYS Certified EMT

David A. Fanion MD FACEP, Emergency Department Physician, Bassett Medical Center

Tawn R. Feeney MA CCC-SLP, Speech-Language Pathologist

Philip L. Ferro MD, Professor, OB/GYN, Director of Family Planning, Associate Director - Residency Program, SUNY Upstate Medical University

Daniel Fierer MD, Assistant Professor, Mount Sinai School of Medicine, New York

Madelon L. Finkel PhD, Professor of Healthcare Policy and Research, Weill Cornell Medical College
Coveney Fitzsimmons MD

Paula Fitzsimmons PA, Schuyler Hospital

Heather L. Fiumera PhD, Department of Biological Sciences, Binghamton University

Colleen T. Fogarty MD MSc, Associate Professor, Department of Family Medicine University of Rochester Medical Center

Amy Freeth MD, Department of Endocrinology, Diabetes and Metabolism Bassett Healthcare

Shep Friedman MD

Gianfranco Frittelli MD FAS FAAP, Skaneateles, NY

Tova Fuller MD PhD, Columbia University Medical Center, Internal Medicine Residency Program

Anne Gadomski MD MPH, Research Scientist/Attending Pediatrician, Bassett Medical Center, Cooperstown, NY

Jacquelyn H. Gailor BSN RN, Cortland County Health Department (retired)

Shannon Gearhart MD MPH, Steering Board Member of Physicians for Social Responsibility /NYC

Jeremiah M. Gelles MD FACP FACC

Mark Goldgeier MD, Rochester, NY

Sueane Hemmer Goodreau ND RN CFNP

Yuri Gorby PhD, Howard N. Blitman Chair of Civil and Environmental Engineering, Rensselaer Polytechnic Institute, Troy, NY

David Gould MD MBA, New York, NY

Robert M. Gould MD, President, Physicians for Social Responsibility (National) and San Francisco Bay Area

Janet Gray PhD, Director, Program in Science, Technology, and Society, Vassar College

Jonathan Greenberg MD

Judith Greenberg MD, Cooperstown, NY

Emily Greenspan MD, Brooklyn, NY

Alice Grow RN, Ithaca, NY

Mary Ann Haley BSN, Deputy Public Health Director, Cortland County Health Department

Chad B. Haller MD, Mount Sinai Hospital Queens

Frank Harte MD, Attending Anesthesiologist, Bassett Healthcare

Ellen Henry PhD, Department of Environmental Medicine, University of Rochester Medical Center

Mary Herbst RN MS ANA-NY

Elizabeth Hess FNP, Nurse Practitioner, Gannett Health Center, Cornell University, Ithaca, NY

Joyce Hexum RN, Arnot Health

Claire Robinson Howard, Nurse Practitioner in Adult Health and Psychiatry

Robert W. Howarth PhD, David R. Atkinson Professor of Ecology and Environmental Biology, Cornell University; Founding Editor, *Biogeochemistry*

Nancy L. Huber RN BSN MS, Chief Steward, CWA Local 1122

Julie Huntsman DVM, Fly Creek, NY

Thomas Huntsman MD, Chief of the Division of Plastic, Reconstructive and Hand surgery, Bassett Medical Center

Ofra Hyman DSW LCSW-R, Otsego County, NY

Susan L. Hyman MD FAAP

Anthony R. Ingraffea PhD PE, Dwight C. Baum Professor of Engineering and Weiss Presidential Teaching Fellow at Cornell University

Patricia Jacob, FNP, Bassett Cancer Institute

Matthew Jackson DO, Internal Medicine

Connie Jones PhD Bassett Medical Center

Mark Josefski MD, Institute for Family Health

Lila Kalinich MD, Professor of Psychiatry, Columbia University College of Physicians and Surgeons

Marion Karl RN, American Red Cross (retired)

Maryanne Hidalgo Kehoe RN MS FNP

Sandra L. Keller RN

Karen Kilgore RN

Laura Kilty MD, Bassett Health Network

Chris Kjolhede MD, MPH, FAAP

Paul Klawitter MD PhD, Internist Associates of Central New York

William Klepack MD, Dryden Family Medicine

Reginald Q. Knight MD MHA, Director, Bassett Spine Care Institute, Division of Orthopedic Surgery, Bassett Healthcare Network, Cooperstown

Christie Koedel MSN CPNP, President Elect of WNY National Association of Pediatric Nurse Practitioners

Harold Kooden PhD

Katrina Smith Korfmacher PhD, Associate Professor of Environmental Medicine, University of Rochester

Maureen Kussard RN BSN MSA

Antoinette Kuzminski MD

Michael P. Lachance PhD MD, Chief of Anesthesia, Bassett Healthcare

Karen LaFace MD PLLC Women's Care, Ithaca

Kate Larrabee RN

Jonathan Latham PhD, Executive Director, The Bioscience Resource Project

Pamela J. Lea DVM, Richfield Springs, NY

Peggy Chadwick Ledwon RN, Mercy Hospital

John Andrew Leon MD, Bassett Healthcare Network, Cooperstown

Gerson Lesser MD, New York University School of Medicine

Linda Lovig MSN CNM NP, Certified Nurse Midwife and Ob/Gyn Nurse Practitioner, Syracuse, NY

D. Rob Mackenzie MD, Schuyler County

Michele Manisoff MA OTR/L, Physicians for Social Responsibility, New York

Marge Marash MD, private practice, psychiatry

Catherine Mason MD

Arnold Matlin MD FAAP, Linwood, NY

John May MD, attending physician, Bassett Healthcare Network

Ellen McHugh MD, Assistant Clinical Professor, Department of Pediatrics, Upstate Medical University

Michelle McNamara RN

Victoria Meguid MD, Associate Professor, Department of Pediatrics, Golisano Children's Hospital, SUNY Upstate Medical University

Mary Menapace RN, Women's Services Upstate Medical University

Renee E. Mestad MD MSCI, Assistant Professor, Department of Obstetrics and Gynecology, SUNY Upstate Medical University

Jacque C. Millar MSN NP-C, Owego, NY

Michael Millar RN

Nancy Miller RN CNM PA-C

Richard K. Miller PhD, Professor of Obstetrics/Gynecology, of Environmental Medicine and of Pathology, University of Rochester, School of Medicine and Dentistry, Rochester

Lisa K. Mooney, MD FAAP, pediatrician, Bassett Healthcare

Paula Moore CNM RN MSN, Associate Professor of Nursing, Tompkins County Community College

David M. Newman MD, Evergreen Family Medicine, PC, Brockport, NY

Kiran Nakkala MD MPH, Attending Physician, Gastroenterology, Bassett Medical Center

Kathleen Nolan MD MSL, Regional Director for the High Peaks Catskill Mountainkeeper – Woodstock

Michael R. O'Brien MD, Robert Wood Johnson Clinical Scholars Program Fellow, Yale University

Luis M. Ocegüera MD, surgeon, Bassett Medical Center

Beth Olearczyk MD, Assistant Clinical Professor of Medicine, Columbia University College of Physicians and Surgeons; Attending Physician, Department of Medicine, Bassett Healthcare

Carmi Orenstein, MPH

Komron A. Ostovar MD FHM, Senior Attending Physician, Division of Hospital Medicine, Bassett Medical Center

Robert Oswald PhD, Professor of Molecular Medicine, Cornell University

Graham Ottoson CNM NP MSN

Colleen Parsons RN, Pine City, NY

MaryLouise Patterson MD

Jerome A. Paulson MD FAAP, Professor of Pediatrics and Professor of Environmental & Occupational Health, George Washington University, Washington, DC

Rohan Perera MD, Clinical Assistant Professor, Department of Medicine, Stony Brook University Stony Brook, NY

Simona L. Perry PhD, c.a.s.e. Consulting Services

Nina Pesante MD, Functional Medicine-certified Practitioner

Norman C. Pfeiffer MD

Charlotte Phillips MD, pediatrician, retired

Nina Pierpont MD PhD, Malone, NY

Naomi Pless MD

E. Louis Priem MD, Intensivist at Bassett Healthcare

Joan Puritz DVM, Oneonta Veterinary Hospital

Jonathan Raskin MD

Marilyn Raudat RN BSN MS, Elmira, NY

Phoebe Reese FNP, Bassett Pediatrics, Oneonta

Nina Regevik MD FACP ABIHM

Steven Resnick MD, Cooperstown

Elizabeth J. Robinson NPP

Thomas P. Rodgers MD, Arnot Health

Robert Roth MD, Kingston Family Practice Center

Paul D. Russo OD MB, FAAO, Board Certified, American Board of Optometry, Division of Ophthalmology, Bassett Medical Center

Carol S Ryan RN BSN, MPH, Sundown, NY, Town of Denning

Pouné Saberi MD MPH, Physicians for Social Responsibility, National and Philadelphia Board Member

Elizabeth G. Salon RNC MS FNP, Integrative Health Family Nurse Practitioner

William R. Sawyer PhD, D-ABFM, D-ABFE, TCAS, Toxicology Consultants and Assessment Specialists, LLC

Charles Schaeffer MD, Cooperstown NY

Jane Schantz FNP, Hospicare & Palliative Care Services of Tompkins County

Ted Schettler MD MPH, Science and Environmental Health Network

Stephen S. Schneider MD, Oral And Maxillofacial Surgeon (Retired)

Barton Schoenfeld MD FACC, Physicians for Social Responsibility, Hudson-Mohawk Chapter

Shirley Schue PNP

Coby K. Schultz BSN RN MICU, Rochester General Hospital, Rochester, NY

Peter Schwartz MD

Avniel Shetreat-Klein MD, Assistant Clinical Professor, Physical Medicine and Rehabilitation, Mt. Sinai School of Medicine

Maya Shetreat-Klein MD, Pediatric Neurology, Assistant Clinical Professor, Albert Einstein College of Medicine

Seth B. Shonkoff PhD MPH, Executive Director, Physicians Scientists & Engineers for Healthy Energy

Susan Sikule DVM, Guilderland, NY

Don Simkin DDS, Youngsville, NY

Jeffrey Snedeker MD, Northeast Pediatrics and Adolescent Medicine, Ithaca, NY

Sarra Solomon MD

Carol A. Somers ScD RN, Lakeshore Hospital, Irving, NY

Ken Spaeth MD MPH, Assistant Professor, Occupational and Environmental Health Hofstra University School of Health Sciences and Human Services

Matthew Spencer MD, Bassett Healthcare

Staff of the Ithaca Health Alliance

Sandra Steingraber PhD, Distinguished Scholar in Residence, Department of Environmental Studies and Sciences, Ithaca College; Concerned Health Professionals of New York

Kristin Stevens Ob Gyn NP, IthacaMed

Nancy B. Stewart MD, Integrative Medicine Center, Department of Family Medicine, Cayuga Medical Center

Wilma Subra MS, MacArthur fellow, former vice-chair of the Environmental Protection Agency's National Advisory Council for Environmental Policy and Technology, and president, Subra Company

Paul C. Tirrell MD PhD, Bassett Healthcare

Jose A. Torrado MD FACOG Attending physician in private practice and Fellow of the American College of Obstetrician/Gynecologists, Ithaca, NY

Walter Tsou MD MPH, past president, American Public Health Association; former health commissioner for Philadelphia; Adjunct Professor, University of Pennsylvania

Marguerite Uhlmann-Bower RN, East Meredith, NY

Mary Jane Uttech RN MSN, Retired Deputy Director of Public Health, Cortland County Health Department

Lois Van Tol MD, TouchStone Family Medicine, Rochester, NY

Barbour S. Warren PhD

Barbara Warren RN MS, Executive Director, Citizens' Environmental Coalition

William Wassel MD, Bassett Medical Center

Jennifer Watts RN MSN

Ellen Webb MPH, Center for Environmental Health

Gregory A. Weiland PhD, Department of Molecular Medicine, College of Veterinary Medicine Cornell University

Theodore J. Weiner DVM

Richard Weiskopf MD, volunteer faculty, Upstate Medical University

Mary E. Wheat MD, College of Physicians & Surgeons, Columbia University Medical Center

Brian F. White DO

Gerri Wiley RN, Southern Tier Solar Works

Allison Wilson PhD, The Bioscience Resource Project, Inc, Ithaca, NY

Geniene Wilson MD AAHIVS, Clinical Professor of Family and Social Medicine, Albert Einstein College of Medicine of Yeshiva University; Mid-Hudson Regional Family Practice Residency, Institute for Family Health

David Wirtz MD MPH, Medical Staff President, Cortland Regional Medical Center

Barb Wood FNP, Cayuga Family Medicine

Andrea Worthington PhD, Professor of Biology, Siena College

Max Yarowsky MD, The Bioscience Resource Project, Inc.

Margo A. Yntema RN

Lauren Zajac MD MPH, Physicians for Social Responsibility / NYC Chapter

Joseph Zanfordino MA CCC/SP

Cynthia A. Zehr OD

References

- Adgate, J. L., Goldstein, B. D., & McKenzie, L. M. (2014). Potential public health hazards, exposures and health effects from unconventional natural gas development. *Environ. Sci. Technol.* Retrieved from doi:10.1021/es404621d
- American Lung Association. (2014). State of the Air 2014 Retrieved from <http://www.stateoftheair.org/2014/assets/ALA-SOTA-2014-Full.pdf>
- Associated Press. (2014). AP IMPACT: Deadly side effect to fracking boom. *Washington Post*. Retrieved from http://www.washingtonpost.com/business/ap-impact-deadly-side-effect-to-fracking-boom/2014/05/05/606f8e28-d488-11e3-8f7d-7786660fff7c_story.html
- Begos, K. (2014). 4 states confirm water pollution from drilling. *USA Today*. Retrieved from <http://www.usatoday.com/story/money/business/2014/01/05/some-states-confirm-water-pollution-from-drilling/4328859/>
- Brown, D., Weinberger, B., Lewis, C., & Bonaparte, H. (2014). Understanding exposure from natural gas drilling puts current air standards to the test. *Rev. Environ. Health* Retrieved from 10.1515/reveh-2014-0002

- Brufatto, C., Cochran, J., Conn, L., Power, D., El-Zeghaty, S. Z. A. A., Fraboulet, B., . . . Rishmani, L. (2003). From Mud to Cement - Building Gas Wells. *Oilfield Review*, 15, 62-76.
- Concerned Health Professionals of New York. (2013). Call for a Comprehensive Health Impact Assessment Retrieved May 12, 2014, from <http://concernedhealthny.org/call-for-a-comprehensive-health-impact-assessment/>.
- Coram, A., Moss, J., & Blashki, G. (2014). Harms unknown: Health uncertainties cast doubt on the role of unconventional gas in Australia's energy future. *Medical Journal of Australia*, 200(4), 210-213.
- Council of Canadian Academies. (2014). Environmental Impacts of Shale Gas Extraction in Canada: the Expert Panel on Harnessing Science and Technology to Understand the Environmental Impacts of Shale Gas Extraction Retrieved from <http://bit.ly/1nNicuf>
- Davies, R. J., Almond, S., Ward, R. S., Jackson, R. B., Adams, C., Worrall, F., . . . Whitehead, M. A. (2014). Oil and gas wells and their integrity: Implications for shale and unconventional resource exploitation. *Marine and Petroleum Geology*. Retrieved from <http://dx.doi.org/10.1016/j.marpetgeo.2014.03.001>
- Efstathiou Jr., J., & Drajem, M. (2013). Drillers silence fracking claims with sealed settlements, *Bloomberg News*. Retrieved from <http://www.bloomberg.com/news/2013-06-06/drillers-silence-fracking-claims-with-sealed-settlements.html>
- Fontenot, B. E., Hunt, L. R., Hildenbrand, Z. L., Carlton, D. D., Oka, H., Walton, J. L., . . . Schug, K. A. (2013). An evaluation of water quality in private drinking water wells near natural gas extraction sites in the Barnett Shale formation. *Environmental Science & Technology*, 47(17), 10032-10040.
- Ghahremani, Y. (2014). Fractured Healthcare: Pumping Resources Back into the Eagle For Shale Communities/Executive Summary: Methodist Healthcare Ministries and Center for Community and Business Research at the University of Texas San Antonio.
- Gibbons, B. S. (2013). Environmental groups calculate social cost of natural gas boom. *The Scranton Times-Tribune*. Retrieved from <http://thetimes-tribune.com/news/environmental-groups-calculate-social-cost-of-natural-gas-boom-1.1558186>
- Gilman, J. B., Lerner, B. M., Kuster, W. C., & de Gouw, J. A. (2013). Source signature of volatile organic compounds from oil and natural gas operations in northeastern Colorado. *Environmental Science & Technology*, 47(3), 1297-1305.
- Godoy, E. (2014). Fracking, seismic activity grow hand in hand in Mexico. *Inter Press Service News Agency*. Retrieved from <http://www.ipsnews.net/2014/04/fracking-seismic-activity-grow-hand-hand-mexico/>
- Healy, J. (2013). As oil floods plains towns, crime pours in. *New York Times*,. Retrieved from <http://www.nytimes.com/2013/12/01/us/as-oil-floods-plains-towns-crime-pours-in.html>
- Hennessy-Fiske, M. (2014). Fracking brings oil boom to south Texas town, for a price. *Los Angeles Times*. Retrieved from <http://www.latimes.com/nation/la-na-texas-oil-boom-20140216,0,7621618.story - ixzz30Iw9FXoz>
- Ingraffea, A. R. (2013). Fluid migration mechanisms due to faulty well design and/or construction: An overview and recent experiences in the Pennsylvania Marcellus Play. Retrieved from <http://www.psehealthyenergy.org/site/view/1057>

- Jackson, R. B., Vengosh, A., Darrah, T. H., Warner, N. R., Down, A., Poreda, R. J., . . . Karr, J. D. (2013). Increased stray gas abundance in a subset of drinking water wells near Marcellus shale gas extraction. *Proc Natl Acad Sci U S A*, 110(28), 11250-11255.
- Jerrett, M., Burnett, R. T., Pope III, A., I., K., Thurston, G., Krewski, D., . . . Thun, M. (2009). Long-term ozone exposure and mortality. *N Engl J Med*, 360, 1085-1095.
- Kassotis, C. D., Tillitt, D. E., Davis, J. W., Hormann, A. M., & Nagel, S. C. (2014). Estrogen and androgen receptor activities of hydraulic fracturing chemicals and surface and ground water in a drilling-dense region *Endocrinology*, 155(3), 897-907.
- Kiger, P. J. (2014). Scientists warn of quake risk from fracking operations. *National Geographic*. Retrieved from <http://news.nationalgeographic.com/news/energy/2014/05/140502-scientists-warn-of-quake-risk-from-fracking-operations/>
- Kovats, S., Depledge, M., Haines, A., Fleming, L. E., Wilkinson, P., Shonkoff, S. B., & Scovronick, N. (2014). The health implications of fracking. *The Lancet*, 383(9919), 757-758.
- Lockwood, D. (2014). Harmful pollutants build up near oil and gas fields. *Chemical & Engineering News*. Retrieved from <http://cen.acs.org/articles/92/web/2014/03/Harmful-Air-Pollutants-Build-Near.html>
- McKenzie, L., Witter, R. Z., Newman, L. S., & Adgate, J. L. (2012). Human health risk assessment of air emissions from development of unconventional natural gas resources. *Science of the Total Environment*, 424, 79-87.
- Mobbs, P. (2014). Shale gas and public health - the whitewash exposed. *The Ecologist*. Retrieved from http://www.theecologist.org/News/news_analysis/2385900/shale_gas_and_public_health_the_whitewash_exposed.html
- Moore, C. W., Zielinska, B., Pétron, G., & Jackson, R. B. (2014). Air impacts of increased natural gas acquisition, processing, and use: A critical review. *Environ. Sci. Technol.* Retrieved from dx.doi.org/10.1021/es4053472
- Morris, J., Song, L., & Hasemyer, D. (2014). Big Oil, Bad Air: Fracking the Eagle Ford Shale of South Texas, from <http://eagleford.publicintegrity.org/>.
- Multi-State Shale Research Collaborative. (2014). Assessing the Impacts of Shale Drilling: County Case Studies, from <https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWVpbnxtdWx0aXN0YXRlc2hhbGV8Z3g6NGU4MjIyNWU5ZjFhZjM4Yg>.
- Nelson, A. W., May, D., Knight, A. W., Eitheim, E. S., Mehrhoff, M., Shannon, R., . . . Schultz, M. K. (2014). Matrix complications in the determination of radium levels in hydraulic fracturing flowback water from Marcellus Shale. *Environ. Sci. Technol. Lett.*, 1(3), 204-208.
- O'Hare, P. (2014). Health needs unmet in some Eagle Ford Shale areas. *Eaglefordtexas.com*. Retrieved from <http://eaglefordtexas.com/news/id/58689/health-needs-unmet-eagle-ford-shale-areas/>
- Olsen, L. (2014). Houston Chronicle exclusive: Drilling boom, deadly legacy. *Houston Chronicle*. Retrieved from <http://www.houstonchronicle.com/news/special-reports/article/Houston-Chronicle-exclusive-Drilling-boom-5259311.php - /0>.
- Physicians Scientists & Engineers for Healthy Energy (PSE). (2014). PSE Study Citation Database: Health, from

- https://http://www.zotero.org/groups/pse_study_citation_database/items/collectionKey/ASKSKDG.
- Rawlins, R. (2014). Planning for fracking on the Barnett Shale: Urban air pollution, improving health based regulation, and the role of local governments. *Virginia Environmental Law Journal*, 31, 226-306.
- Sadasivam, N. (2014). Drilling for certainty: The latest in fracking health studies. *ProPublica*. Retrieved from <http://www.propublica.org/article/drilling-for-certainty-the-latest-in-fracking-health-studies>
- Stewart, K., & Maffly, B. (2014). Is air pollution causing Vernal's neonatal deaths to rise? . *The Salt Lake City Tribune*. Retrieved from <http://www.sltrib.com/sltrib/news/57914660-78/vernal-birth-health-utah.html.csp>
- Sumy, D. F., Cochran, E. S., Keranen, K. M., Wei, M., & Abers, G. A. (2014). Observations of static Coulomb stress triggering of the November 2011 M5.7 Oklahoma earthquake sequence. *Journal of Geophysical Research*, 119(3), 1904-1923.
- The Canadian Press. (2012). Fracking causes minor earthquakes, B.C. regulator says. *CBC News*. Retrieved from <http://www.cbc.ca/news/canada/british-columbia/fracking-causes-minor-earthquakes-b-c-regulator-says-1.1209063>
- U.S. Government Accountability Office. (2012). *Oil and Gas: Information on Shale Resources, Development, and Environmental and Public Health Risks*. (GAO-12-732). Retrieved from <http://www.gao.gov/assets/650/647791.pdf>.
- University of Texas. (2014). Air pollution and hydraulic fracturing: Better monitoring, planning and tracking of health effects needed in Texas Retrieved March 27, 2014, from <http://www.utexas.edu/news/2014/03/27/hydraulic-fracturing-texas/>.
- Vengosh, A., Jackson, R. B., Warner, N., Darrah, T. H., & Kondash, A. (2014). A critical review of the risks to water resources from unconventional shale gas development and hydraulic fracturing in the United States. *Environ. Sci. Technol.* Retrieved from doi:10.1021/es405118y
- Vukmanovic, O. (2011). UK firm says shale fracking caused earthquakes. *Reuters*. Retrieved from <http://www.reuters.com/article/2011/11/02/us-gas-fracking-idUSTRE7A160020111102>
- Walsh, B. (2014). The seismic link between fracking and earthquakes. *TIME*. Retrieved from <http://time.com/84225/fracking-and-earthquake-link/>
- Warner, N. R., Christie, C. A., Jackson, R. B., & Vengosh, A. (2013). Impacts of shale gas wastewater disposal on water quality in Western Pennsylvania. *Environ. Sci. Technol.*, 47(20), 11849–11857.