

EXPOSURE TO COMPLEX ENVIRONMENTAL HEALTH CHALLENGES:
AGENT ORANGE AND SODIUM DICHROMATE

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Complexity theory can inform risk management of complex environmental health challenges considering scientific uncertainty, politics, federal statutes, and legal decisions. American servicemembers face danger not only from the weaponry of hostile forces but from exposure to occupational and environmental hazards as well. Servicemembers were exposed to Agent Orange in Vietnam and exposed to sodium dichromate in Iraq. The military is a complex adaptive system operating within an uncertain and complex environment. The management of uncertainty and conflict is compounded by the unique characteristics of modern combat. Competing priorities among and for the benefit of numerous actors create challenges to enact policy change. These actors operate within organizations of varying degrees of innovation including the individual branches of the armed forces; the U.S. Departments of Defense and Veterans Affairs; the Congress; and the judiciary. A sense of urgency exists to identify policy interventions to address the potential for future exposure of service members to environmental and occupational hazards given emerging threats. Federal administrators require the flexibility to act swiftly in coordination with stakeholders in times of national emergency without compromising processes for safety, the environment, public health, fiscal responsibility, and national security. Complexity theory can help us understand how organizations function and encourage new perspectives working in both non-linear and non-vertical processes across agencies to create new relationships for transformational change. Shifting the paradigm of risk management to encourage the presumption of exposure with system response and engagement would allow leaders to respond collaboratively to meet the health care needs of servicemembers.

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Introduction

The application of complexity theory to risk management of complex environmental health challenges is examined. Complexity theory was first described to address self-organizing behaviors in relation to biological and physical sciences; complexity theory now is being applied to system science to understand complex adaptive social systems including public health.¹

Two case examples of military servicemembers' exposure to chemical hazards are presented. Servicemembers were exposed to Agent Orange 2,4-D, 2,4,5-T with contaminant 2,3,7,8-TCDD (herbicide agent orange) in Vietnam between 1962 and 1971 and sodium dichromate that contains hexavalent chromium (chromium VI, a known carcinogen) at the Qarmat Ali water treatment plant in Iraq in 2003.

The catalyst for this research was the health concerns raised in 2008 by Indiana National Guardsmen who provided security for Kellogg, Brown, and Root contractors restoring the water treatment facility at Qarmat Ali. The lack of Department of Veterans Affairs (VA) medical treatment options for the servicemembers resulted from the uncertainty of the potential occupational health risk of their exposure to sodium dichromate. The author of this dissertation was the Deputy Chief of Staff for Policy in the Office of Senator Evan Bayh at that time.

“Exposure to toxic chemicals is a threat no service member should have to face. It is our moral obligation to offer access to prompt, quality care. We should cut the red tape for these heroes.”²

The story of the National Guardsmen closely paralleled that of Vietnam veterans thirty years earlier. Although exposure to Agent Orange could not be confirmed, an Agent Orange Registry

¹ Stephen E. Marcus, Scott J. Leischow, Patricia I. Mabry, and Pamela I. Clark. *Systems Science: A Revolution in Public Health Policy Research*, 100 American Journal of Public Health 1161 (July 2010).

² *Senator Bayh Calls for VA Coverage for Troops Exposed to Chemical Hazards*. Press Release, October 21, 2009.

was created, and presumptive eligibility was provided by the VA for health care services for the veterans.

The author facilitated drafting legislation introduced by Senator Bayh in 2009, using lessons learned from Agent Orange, to respond to all “occupational and environmental health chemical hazards of particular concern” determined by the Secretary of the Department of Defense, to shift the evidentiary burden so veterans placed at risk did not bear the burden of proof if future health conditions developed, and to create a registry for all servicemembers exposed to hazardous chemicals. This legislation may be found in the Supplemental Materials.

Subsequently, as Chief Executive Officer of the American Academy of Nursing, the author launched the initiative “*Have you ever served in the military?*” This initiative encouraged the question be included in all health assessments for permanent records of veterans and to increase appropriate access to health care services to individuals who have served in the military, particularly those who may have been exposed to a chemical of concern. An overview of the initiative may be found in the Supplemental Materials.

The research presented in this dissertation was informed by the guidance of Robert Yin on the role of the case study as a systematic research tool³ and Kathleen Eisenhardt’s general theory-building case study approach to identify the unique patterns of each case.⁴ Relevant reports, articles, books, legislation, statutes, regulations, legal opinions, statements, testimonies, legislation, press releases, and other communications were examined.

The response of federal agencies, the Congress, and the judiciary to circumstances that require officials to manage risk when there is uncertainty about exposure and adverse health

³ Robert K. Yin. *The Case Study Crisis: Some Answers*. 26 Administrative Science Quarterly 58-65 (March 1981).

⁴ Kathleen M. Eisenhardt. *Building Theories from Case Study Research*, 14 Academy of Management Review, 532-550 (1989).

effects was studied. The management of uncertainty in the military is compounded by its unique characteristics, an increase in reserve components, and an increase in the reliance of contractors for site security.

Researching servicemembers' exposure to Agent Orange and sodium dichromate produces a snapshot for its applicability to risk management of future military exposures to chemicals of concern. The application of complexity theory could remove the boundaries of jurisdiction of the military operating in isolation when the next exposure occurs somewhere in the world.

The Defense Health Board said in 2008, "it is inevitable that military units will encounter potentially hazardous industrial sites during combat operations. The hazards encountered may pose risks of infectious disease, poisonings from industrial toxins, or injuries."⁵ The following three chapters offer new perspectives on how federal administrators can use lessons learned from servicemembers' exposures to Agent Orange and sodium dichromate to prepare for and manage the next risk more effectively.

⁵ Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric Schoomaker on Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant, DHB 2008-06, at 8.

Chapter 1

Exposure to Complex Environmental Health Challenges:

Agent Orange and Sodium Dichromate

Introduction

American military personnel face danger not only from the weaponry of hostile forces but from exposure to occupational and environmental hazards as well. In two notable cases—exposure to Agent Orange during the Vietnam War and sodium dichromate during Operation Iraqi Freedom—American military leadership neither identified the risks nor diagnosed or treated the effects of such exposure. A sense of urgency exists to identify policy interventions by the public and private sectors to address the potential for future exposure of service members to environmental and occupational hazards given emerging threats.¹ That exposure to Agent Orange and sodium dichromate was mishandled was a function of several readily identifiable factors.

Complexity theory² can inform risk management³ of complex environmental health challenges considering scientific uncertainty, politics, geographic environment, economic impact, and enacted statutes and legal decisions.

¹ The Department of Defense (DOD) in its unclassified synopsis of the *2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, 2018, at 2 cautions that “revisionist powers and rogue regimes are competing across all dimensions of power. They have increased efforts short of armed conflict by expanding coercion to new fronts, violating principles of sovereignty, exploiting ambiguity, and deliberately blurring the lines between civil and military goals.” Further, “states are the principal actors on the global stage, but non-state actors also threaten the security environment with increasingly sophisticated capabilities. Terrorists, trans-national criminal organizations, cyber hackers and other malicious non-state actors have transformed global affairs with increased capabilities of mass disruption” at 3.

² “The key concepts of complexity theory are self-organization, adaptation, upheavals at the edge of chaos, the unpredictability of the effects of small changes in initial conditions, and the existence of simplicity at some levels while chaos exists at others.” See Neil Pearce and Franco Merletti. *Complexity, simplicity, and epidemiology*, 35 International Journal of Epidemiology 515, 518 (2006).

³ Risk management is “the process of identifying, assessing, and controlling risks arising from operational factors and making decisions that balance risk cost with mission benefits.” See Department of the Army. Risk

First, the military is a complex adaptive system operating within an uncertain and complex environment. Competing priorities among and for the benefit of numerous actors create challenges to enact policy change. Some of the actors are soldiers who while deployed around the world have been exposed to hazardous chemicals of particular concern including Agent Orange and sodium dichromate. Other actors, whose decisions in the management of environmental health risks of the soldiers are manifested in complex feedback loops, are the leadership in the military and federal agencies. These actors operate within continuously changing organizations, each with varying degrees of innovation, such as the individual branches of the armed forces; the U.S. Departments of Defense (DoD) and Veterans Affairs (VA); the Congress; and the Judiciary.

Second, risk management is not as easy as merely presenting risk assessment information and determining to accept the risk or not. The public's perception of risk is viewed through the lens of their experience and association with known risks,⁴ is dependent on attitudes, beliefs, and values,⁵ and is interpreted through their knowledge of science.⁶ Conflicts between risks we ask individuals to consider versus national aggregate risks we ask society to assume to avoid potential harm must be resolved.⁷

Management. Army Techniques Publication No. 5-19. 14 April 2014.

https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/atp5_19.pdf. Also, "We have a long way to go in improving our risk management processes. Although we have expended massive amounts of time, money, and resources on scientific studies designed to identify and quantify risks, we have failed to expend the effort needed to learn how to manage the hazards that science is so good at identifying." See Paul Slovic. *Perceived Risk, Trust, and Democracy*. 13 Risk Analysis. (1993), at 680.

⁴ Vivianne H.M. Visschers, Ree M. Meertens, Wim F., Passchier, and Nanne K. deVries. *How Does the General Public Evaluate Risk Information? The Impact of Association and Other Risks*. 23 Risk Analysis 715, 718 (2007).

⁵ Lennart Sjoberg. *Factors in Risk Perception*, 20 Risk Analysis, 2000, at 9.

⁶ Elaine B. Arkin. *Translation of Risk Information for the Public: Message Development*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 124.

⁷ Dale Hattis. *Scientific Uncertainties and How They Affect Risk Communication*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 124.

Third, the expectation of scientific rigor in assessing risks to public health and the environment of military service members is limited by existing risk assessment methodologies.⁸ In addition, the legal definition of an adverse health effect is complicated by governing statutes passed by Congress, regulations promulgated by federal agencies, and judicial decisions on litigation under tort or contract law.⁹

Fourth, there exists a tension between the scientific process and the legal process. The nature of scientific inquiry is slow, evolves toward evidence, and carries a degree of uncertainty. The scientific process acknowledges that adverse effects are a constant at some level, and available resources impact risk management decisions. The legal system, on the other hand, “views the expression of scientific uncertainty, even in small amounts, as cause for alarm and deconstruction.”¹⁰ With the presumption of innocence by industry, the high burden of proof that regulatory agencies must demonstrate delays and obstructs reasonable environmental health decision making.

Lastly, the management of uncertainty and conflict in the scientific basis of environmental health issues in the military is compounded by the unique characteristics of modern combat. The environmental risk assessment of a location in a war zone before the troop’s arrival just may not be feasible to conduct given the timing of the mission. Strategies, as risk management options, are limited given the necessity to evaluate for both health and mission risks. Epidemiologic assessments are hampered by the content of DOD databases to identify

⁸ Dale Hattis, *Scientific Uncertainties and How They Affect Risk Communication*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 117.

⁹ Nancy S. Bryson. *How Science Informs Policy Decisions: The Legal Definition of “Adverse Health Effect.”* 10 Environmental Quality Management, Spring 2001, at 93.

¹⁰ National Academy of Sciences, Institute of Medicine. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press. at 32-33 (2009).

service members with environmental exposures and the magnitude of exposure.¹¹ The chain of command and the necessity for security create the unyielding presence of control among organizational dynamics. Also, the prolific use of private contractors in theatre to undertake what historically has been federal government roles limit access to important and critical data.

This article examines the application of complexity theory to the military environment in which servicemembers were exposed to Agent Orange in Vietnam and sodium dichromate in Iraq. Using lessons learned from risk management responses, new perspectives on how federal administrators can prepare for and manage the next risk more effectively are presented.

Systems Framework

Drivers of emerging health threats to service members are complex and multilayered requiring not only inter- and transdisciplinary research but enhanced tools to examine the dynamic and adaptive processes of interconnected systems. “Since the design, management, and control of complex adaptive systems can involve a challenging array of distributed and interacting agents, powerful feedback loops, large time delays, and counterintuitive system behavior, this may require innovative methodological strategies,” suggest Ross Hammond and Laurette Dube.¹² These strategies include the identification of the key system components, the drivers influencing the system components, and the linkages among systems including feedback loops.¹³

Complexity theory research is a technique that purports to explain how systems and organizations function. Jeffrey Goldstein, an editor launching the journal, *Emergence*:

¹¹ Jean-Paul Chretien, Katherine C. Chretien and Julie A. Pavlin. *Long-term Health Consequences of Military Service: A Proposal to Strengthen Surveillance and Research*. 131 Public Health Reports 834, 835 (2016).

¹² Ross Hammond and Laurette Dube. *A systems science perspective and transdisciplinary models for food and nutrition security*. 109 PNAS 12356, 12357 (2012).

¹³ Ross Hammond and Laurette Dube. *A systems science perspective and transdisciplinary models for food and nutrition security*. 109 PNAS 12356 (2012).

Complexity and Organization (E:CO) in 2004, claims that “complexity research has decidedly demonstrated that thriving organizations are better understood as complex, nonlinear, far-from-equilibrium, and in vital contact with multiple environments.”¹⁴ Organizations are no longer believed to be simple, linear, and independent systems tightly controlled to ensure stable environments. In their study linking complexity theory to core capabilities of continuously changing organizations, Shona Brown and Kathleen Eisenhardt concluded that “[c]ontinuously changing organizations are likely to be complex adaptive systems with semistructures that poise the organization on the edge of order and chaos and links in time that force simultaneous attention and linkage among past, present, and future.”¹⁵ In other words, complexity theory posits that systems are evolving continuously, are characterized by “partial order, and lie between the extremes of very rigid and highly chaotic organization.”¹⁶

To solve complicated health policy problems, system science borrows its methodologies from the physical and biological sciences among other disciplines to understand and generate simplified models of the real world. System science attempts to understand the interaction of numerous components and relationships within an environmental context of uncertainty to address a range of assumptions leading to informed policy decisions.¹⁷ For example, using a childhood obesity interventions framework, Terry Huang et al emphasized, a “systems approach can be of particular value in connecting and synthesizing the disparate threads of prevention and intervention programs and in helping to identify strategies for intervention sustainability,

¹⁴ Jeffrey Goldstein, Peter Allen and David Snowden. *Editors' introduction*. 6 E:CO at v (Fall 2004).

¹⁵ Shona L. Brown and Kathleen M. Eisenhardt. *The Art of Continuous Change: Linking Complexity Theory and Time-Paced Evolution in Relentlessly Shifting Organizations*. 42 Administrative Science Quarterly, March 1997, at 32.

¹⁶ Shona L. Brown and Kathleen M. Eisenhardt. *The Art of Continuous Change: Linking Complexity Theory and Time-Paced Evolution in Relentlessly Shifting Organizations*. 42 Administrative Science Quarterly, March 1997, at 28.

¹⁷ Patricia I. Mabry, Stephen E. Marcus, Pamela I. Clark, Scott J. Leischow, and David Mendez. *Systems Science: A Revolution in Public Health Policy Research*, 100 American Journal of Public Health 1161 (July 2010).

scalability, and reach.”¹⁸ The systems-based framework acknowledges the complexity of “factors to be studied together, incorporating linkages and feedbacks that cause changes in one area to be felt elsewhere in the system.”¹⁹ “Modern societies are increasingly ruled by the unwanted side effects of their differentiated subsystems, such as the economy, politics, law, media, and science,” concludes Julie Thompson Klein.²⁰ “Environmental problems exemplify the new relationship of interdisciplinarity and complexity.”²¹ Whereas interdisciplinarity may address solving a problem that necessitates input from multiple disciplines, complexity examines nonlinear and system dynamics.

Applying complexity theory to the multiple systems of linked networks responsible for risk management of the service members exposed to Agent Orange and sodium dichromate, opportunities for consensus building,²² intervention, innovation, and adaptiveness can be identified. Judith Innes and David Booher emphasize that “at the edge of chaos...innovation and dramatic shifts in activity patterns can occur, and systems can move to higher levels of performance. Such innovation, however, depends on information flows through linked networks of agents.”²³ Identifying potential exposure to occupational and environmental hazards, the

¹⁸ Terry T.-K. Huang, Brandon Grimm, and Ross A. Hammond. *A Systems-Based Typological Framework for Understanding the Sustainability, Scalability, and Reach of Childhood Obesity Interventions*. 40 *Children’s Health Care* 253, 255 (2011).

¹⁹ Terry T.-K. Huang, Brandon Grimm, and Ross A. Hammond. *A Systems-Based Typological Framework for Understanding the Sustainability, Scalability, and Reach of Childhood Obesity Interventions*. 40 *Children’s Health Care* 253, 254 (2011).

²⁰ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 *E:CO Special Double Issue* 2, 4 (Fall 2004).

²¹ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 *E:CO Special Double Issue* 2, 5 (Fall 2004). Klein recalls Robert Eisenstein’s characterization of “the shift in scientific research from the metaphor of a microscope to that of a kaleidoscope”.

²² On how consensus building can be used for complex policy tasks, See Judith E. Innes and David E. Booher. *Consensus Building and Complex Adaptive Systems*, 65 *APA Journal* 412, 413 (1999).

²³ Judith E. Innes and David E. Booher. *Consensus Building and Complex Adaptive Systems*, 65 *APA Journal* 412, 417 (1999).

processes among federal agencies, the Congress, and the Judiciary can be refined to respond in a timely manner to health care needs of service members.

The following section provides the historical context of servicemembers' exposure to Agent Orange in Vietnam and to sodium dichromate in Iraq.

Two Complex Cases: Exposure to Agent Orange and Sodium Dichromate History

Agent Orange

The number of U.S. Vietnam veterans exposed to Agent Orange is unknown. Data obtained by the National Academy of Sciences (NAS) indicates that in 2018, "VA estimated that approximately 5,978,000 Vietnam-era living veterans (deployed and non-deployed), defined dates of service from August 1964 to April 1975." NAS also reported that the results through 2000 of the Vietnam Experience Study showed that "mortality among the deployed veterans was approximately 9% higher than among the non-deployed veterans."²⁴

Although not likely all the approximately 2.8 million U.S. military personnel who served in Vietnam were exposed to Agent Orange, neither the exact exposure numbers nor the exact amount of individual exposure can be determined. "Army records from the Vietnam conflict are neither complete nor well organized. This results from the Army's rapid pullout from Vietnam."²⁵

²⁴ National Academy of Sciences, Engineering, and Medicine. 2018. Veterans and Agent Orange: Update 11 (2018). Washington, DC: The National Academies Press, at 2-2.

²⁵ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 5.

During the conflict, the Department of Defense “did not consider the herbicide toxic or dangerous to humans” and “took few precautions to prevent exposure.”²⁶ Consistent with the Army manuals describing herbicide orange as relatively nontoxic, “personnel subject to splashes from handling the herbicide were instructed to shower and change clothes at a convenient opportunity.”²⁷

Under Operation “Ranch Hand” between January 1962 and September 1971, approximately 20 million gallons of the herbicide Agent Orange were “stored, mixed, handled, and loaded into airplanes” by the U.S. Air Force to destroy 500,000 acres of crops and 5 million acres of forests in South Vietnam.²⁸ Agent Orange,²⁹ stored in barrels with orange bands, was a formulation of 2,4-Dichlorophenoxyacetic acid (2,4,-D) and 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T); 2,4,5-T contained the contaminant 2,3,7,8-tetrachloro-p-dibenzo-dioxin or TCDD (commonly called “dioxin”).³⁰ It now is known that dioxin because of its lipophilic character, is retained in human fatty tissue, is chemically stable, and is slow to metabolize. TCDD impacts complex cellular actions including binding of TCDD to the aromatic hydrocarbon (Ah) receptor

²⁶ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 1.

²⁷ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 3-4.

²⁸ The Aspen Institute. *Declaration and Plan of Action. Addressing the Legacy of Agent Orange in Vietnam*. U.S.-Vietnam Dialogue Group on Agent Orange/Dioxin 2010-2019, June 2010, at 4.

²⁹ Civilian application of herbicide orange was diluted and utilized at one to four pounds per acre; the military application of 107 million pounds over six million acres was undiluted and sprayed at 12 pounds of 2,4-D and 13.8 pounds of 2,4,5-T per acre. See Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 2.

³⁰ National Academies of Sciences, Engineering, and Medicine. 2018. *Veterans and Agent Orange: Update 11* (2018). Washington, D.C.: The National Academies Press, at 1-1.

that is an activator for gene transcription.³¹ In humans, the half-life of TCDD is “estimated to vary from 0.4 to more than 10 years.”³²

The International Agency for Research on Cancer (IARC) classified 2,3,7,8-TCDD as a Group 1, “known human carcinogen” in 1997; the U.S. Toxicology Program revised its classification based on new molecular and cellular information from “reasonably anticipated to be a human carcinogen” to “known to be a human carcinogen,” in 2001; and reaffirmed “no known ‘safe dose’ or ‘threshold’ below which dioxin will not cause cancer” in 2003.³³

In 1978, Congressman Ralph Metcalfe investigated the handling of herbicide exposure disability claims from Vietnam veterans and expressed concern to the U.S. General Accounting Office (GAO) on possible long-range adverse health effects. In his August 1978 letter to Metcalfe, the GAO Comptroller noted DOD’s rigid stance, “Defense officials believe that no firm link has been made between long-term adverse health effects and exposure to herbicides in Vietnam.” Further, the Comptroller highlighted that in 1974, the National Academy of Sciences concluded, “Further intensive studies are especially required with reference to the ecological distribution, the pharmacology mechanism of toxicity, possible mutagenicity, and carcinogenicity of TCDD and its possible teratogenicity in man.”³⁴

One year later after Senator Charles Percy expressed concern on behalf of Senate Permanent Subcommittee on Investigations, Comptroller General admitted, “the Department of Defense did not consider herbicide orange toxic or dangerous to humans and took few

³¹ Report on Carcinogens, Twelfth Edition (2011). <http://ntp.niehs.nih.gov/go/roc12>, at 396-397.

³² National Academies of Sciences, Engineering, and Medicine. 2018. *Veterans and Agent Orange*: Update 11 (2018). Washington, D.C.: The National Academies Press, at 4-3.

³³ Report on Carcinogens, Twelfth Edition (2001). <http://ntp.niehs.nih.gov/go/roc12>, at 396. Dioxin Homepage, <http://www.ejet.org/dioxin/>, at 1-2.

³⁴ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 5. <https://www.gao.gov/assets/130/123801.pdf>

precautions to prevent exposure to it.”³⁵ The Comptroller General recommended “the need to resolve veterans’ concerns over alleged health risks attributed to herbicides.”³⁶

In testing the remaining stocks of Agent Orange in 1971, TCDD contaminant levels were ranging “from less than 0.05 to 47 parts per million and averaging about 2 parts per million. The 1978 manufacturing standards for 2,4,5-T,” the GAO reported, “require TCDD levels be less than 0.1 part per million.”³⁷ In the 1980s, 2,4,5-T as an herbicide was phased out.

Later in 1978, a class-action lawsuit was filed on behalf of Vietnam veterans led by a helicopter crew chief, Paul Reutershan, who believed his abdominal cancer was caused by exposure to Agent Orange during Operation “Ranch Hand.”³⁸ The U.S. Veterans Administration now recognizes seven cancers including chronic B-cell leukemia, multiple myeloma, and Hodgkins disease and seven other illnesses including chloracne and Parkinson’s to provide presumptive eligibility for disability compensation for Veterans who served in the Republic of Vietnam.³⁹

Sodium Dichromate

More than thirty years later at the Qarmat Ali Water Treatment Plant in Basra, Iraq, in 2003, deployed service members provided escort and security to employees of Brown and Root Services, a division of Kellogg, Brown, and Root (KBR). KBR was under contract to restore the

³⁵ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 1.

³⁶ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 9.

³⁷ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 3. <https://www.gao.gov/assets/130/123801.pdf>

³⁸ Richard Severo. *Vietnam Veteran’s Family Vows to Continue His Fight*. New York Times, December 1978.

³⁹ U.S. Department of Veterans Affairs September 27, 2019. <https://www.va.gov/disability/eligibility/hazardous-materials-exposure/agent-orange/related-diseases/>.

plant to operative status. Approximately 830 service members, many from Oregon, West Virginia, South Carolina, and Indiana National Guard⁴⁰ units, potentially were exposed to sodium dichromate, a corrosion inhibitor in water.⁴¹

Sodium dichromate is an inorganic compound containing hexavalent chromium (chromium VI) known to be toxic and carcinogenic to humans.⁴² The route of exposure of hexavalent chromium (Na₂Cr₂O₇), the toxic component of sodium dichromate, is by inhalation, ingestion, or broken skin, and is readily absorbed into cells. Only a tiny amount of hexavalent chromium poses serious risk. Max Costa, Chair, Department of Environmental Medicine, at New York University School of Medicine, testified that translating EPA's acceptable cancer risk of one cancer in one million people would limit exposure to hexavalent chromium at merely 80 picograms per cubic meter or 8×10^{-5} ug per cubic meter, "so small that one could not begin to see it with the human eye."⁴³

Similar to the DOD's initial response to the armed forces exposure to Agent Orange, Ellen Embry, the U.S. Deputy Assistant Secretary of Defense, Force Health Protection and Readiness, testified in 2007 before Congress to the possible exposure of then-estimated 250 service members to sodium dichromate and polychlorinated biphenyls that "no specific abnormalities attributable to possible exposures were identified, and no long-term health effects are expected."⁴⁴

⁴⁰ 152nd Infantry Battalion, Indiana Army National Guard

⁴¹ U.S. Department of Veterans Affairs. *Qarmat Ali Water Treatment Facility*.

<https://www.publichealth.va.gov/exposures/qarmat-ali/>

⁴² Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker on Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant, DHB 2008-06 (December 19, 2008).

⁴³ Max Costa. *The Exposure at Qarmat Ali: Contractor Misconduct and the Safety of U.S. Troops in Iraq*. Testimony before the Senate Democratic Policy Committee Hearing. June 20, 2008, at 3.

⁴⁴ Ellen Embry, Deputy Assistant Secretary of Defense, Force Health Protection and Readiness, Department of Defense, before the Subcommittee on Defense, Appropriations Committee, United States House of Representatives, May 1, 2007, at 15.

A soldier reported “there was a coating of orange-colored powder throughout the facility. At times, it was so thick there were at least two inches of powder on my boots.”⁴⁵ Edward Blacke, former KBR Health, Safety and Environmental Coordinator in Qarmat Ali, testified in 2008 that he observed, “continuous bloody noses, spitting up of blood, coughing, irritation of the nose, eyes, throat and lungs, and shortness of breath.”⁴⁶

By 2011, the DOD had estimated that “nearly 1000 soldiers and U.S. Army civilian employees were exposed to sodium dichromate in the five months it took from the initial site visit until the military Command required personal protective equipment.”⁴⁷ The Inspector General for the DOD concluded that “KBR did not fully comply with applicable occupational safety and health standards, and the Task Force Restore Iraqi Oil (TF RIO)⁴⁸ failed to enforce contractor compliance.”⁴⁹ And, litigation was pending by approximately 150 service members against KBR and others; the medical costs for those exposed are unknown.⁵⁰

Risk Management

General Considerations

Institutional rules for risk management processes are grounded in statutory authority, regulatory authority, and judicial decisions. To address uncertainty,⁵¹ these rules change over

⁴⁵ Russell Powell. *The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq?* Testimony before the Senate Democratic Policy Committee Hearing, October 7, 2009, at 2.

⁴⁶ Edward Blacke. *The Exposure at Qarmat Ali: Contractor Misconduct and the Safety of U.S. Troops in Iraq.* Testimony before the Senate Democratic Policy Committee Hearing, June 20, 2008, at 2.

⁴⁷ Inspector General. United States Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II—Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure.* Report No. SPO-2011-009. September 28, 2011, at 5-6.

⁴⁸ The Task Force Restore Iraqi Oil (TF RIO) program was to restore Iraq’s oil industry infrastructure. The U.S. Corps of Engineers (USACE) was assigned the mission. USACE awarded KBR contract DAC A63-03-D-0005.

⁴⁹ Inspector General. United States Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II—Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure.* Report No. SPO-2011-009. September 28, 2011, at 12.

⁵⁰ Inspector General. United States Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II—Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure.* Report No. SPO-2011-009. September 28, 2011, at 11.

⁵¹ “Uncertainty is the imperfection in knowledge of the true value of a parameter for either an individual or a group.”

time, change across public health threats, and are not stable. The degree of uncertainty to reduce, the upper bounds of probability scenarios to test, the technical facts to research, and the process of communicating results are left to the policymakers. To reduce uncertainties, policymakers are put in the untenable position of often prioritizing risk assessments to be conducted on hazards with known effects but relatively low impact or on hazards with unknown effects but potentially high impact. It is important to note that risk communication is essential even if the scientific data is incomplete or alarming. Covello, Sandman, and Slovic underscore that “in science there is never complete certainty, since new evidence can always overturn previous beliefs.”⁵²

Federal administrators need the flexibility to act swiftly in coordinated fashion particularly in times of national emergency under the leadership of a designated agency and agent but without compromising processes for human safety, public health, fiscal responsibility, or national security. This, in turn, requires transparency as to the risks of chemicals, data produced by manufacturers on a product’s effect on health and the environment, the scientific protocols followed at every stage, the environmental assessments conducted, and manufacturer’s responsibility for hazards.

Military

Decisions of the armed forces are dependent on their specific mission; orders are delivered from the hierarchical top-level brass. Control is rigid and localized in a war theatre. Actors whose decisions in the management of environmental health risks manifest in complex feedback loops are the leadership in the federal agencies namely the U.S. Departments of

Institute of Medicine. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press. 25 (2009).

⁵² Vincent T. Covello, Peter M. Sandman, and Paul Slovic. *Appendices: Anticipating Objections to Explanation of Chemical Risks in Risk Communication, Risk Statistics, and Risk Comparisons: A Manual for Plant Managers in Effective Risk Communication: The Role and Responsibility of Government and Nongovernment Organizations*. Vincent T. Covello, David B. McCallum and Maria T. Pavlova. (1989).

Defense and Veterans Affairs; the Congress; and the judiciary. These actors traditionally manage risks within a unit system and closely follow fluctuations of information inputs; creative solutions are limited by real and assumed boundaries.

Modern warfare operations include armed forces from multiple nations and civilian contractors who may contribute to a chaotic environment by exercising their separate control and command responsibilities. Given a crisis, multiple rigid organizational structures and stakeholders within the U.S. government and outside each with their own policies, procedures, and techniques for risk assessment and incentives for risk management contribute to the range of unpredictable behaviors of the disparate actors. These organizational structures require simultaneous attention and chaos may be observed at the system level.

There were risk management processes in place when service members were exposed to Agent Orange and sodium dichromate. However, the processes were neither robust nor effective for the toxicity of the agents to which the members of the armed forces were exposed nor for the environment in which the armed forces were operating. The concerns raised by members of Congress to the handling of disability claims, the filing of the class action lawsuit claiming cancers and birth defects were caused by Agent Orange,⁵³ and the notification to the Coalition Joint Task Force 7 about the exposure to sodium dichromate acted as catalysts or drivers in the unstable environments prompting the retooling of risk management processes.

The U.S. Army Public Health Command released the 2013 Revision of the Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed

⁵³ The class consisted of those persons who were in the United States, New Zealand or Australian Armed Forces at any time from 1961 to 1972 who were injured while in or near Vietnam by exposure to Agent Orange or other phenoxy herbicides, including those composed in whole or in part of 2,4,5-trichlorophenoxyacetic acid or containing some amount of 2,3,7,8-tetrachlorodibenzo-p-dioxin. The class also includes spouses, parents, and children of the veterans born before January 1, 1984, directly or derivatively injured as a result of the exposure. In re "Agent Orange" Product Liability Litigation, 100 F.R.D. 718, 729 (E.D.N.Y.1983) (certifying class).

Military Personnel to “characterize operational risks from chemical exposures as consistently as possible by use of a standardized process that is both scientifically supportable and militarily feasible.”⁵⁴ These guidelines include a range of deployment scenarios from a single catastrophic release of a chemical to a temporary exposure to a continuous environmental exposure in air, water, or soil. Similarly, the exposures may be intermittent, continuous, or simultaneous.⁵⁵

Chemical Exposure Guidelines for Deployed Military Personnel are issued to provide military exposure guidelines to characterize health and mission risks in a deployment environment to chemical warfare agents and toxic industrial chemicals. Risk management decisions based on the military exposure guidelines are unique to the military population as chemical exposure data must be evaluated for both health and *mission* risks; the guidelines are a tool for a Commander to use for operational decisions.⁵⁶ Military exposure guidelines developed by the U.S. Army Public Health Command were adapted from existing federal standards, including that of the U.S. Environmental Protection Agency and the Agency for Toxic Substances and Disease Registry, and peer-reviewed toxicological estimates among others.⁵⁷ Certain assumptions are made namely that the military population including Active Duty, Reserve, and National Guard, is “healthy and fit.”⁵⁸ Although the guidelines assume no predisposing factors, the U.S. Army Public Health Command acknowledges that “with increased reliance on National Guard and Reservists, an increased number of older personnel are now

⁵⁴ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 2.

⁵⁵ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 4.

⁵⁶ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 21.

⁵⁷ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 10.

⁵⁸ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 6.

deployed,” and there may be individuals who are susceptible to chemical exposures.⁵⁹

Acknowledging genetic variability and individual susceptibility is essential. The military exposure guidelines represent conservative population thresholds and a single exposure rather than cumulative effects of multiple deployments.⁶⁰

Response to Agent Orange Exposure

The behavior of the military as an organization in its risk management efforts of Agent Orange was disjointed, haphazard, and uncoordinated. Not addressing the toxicity of the herbicide when deciding to utilize it for defoliation efforts as part of its mission, lack of record-keeping, controversy over data reliability of the evidence linking health risks to exposure, and the confusion over responsibility for managing the risk were disastrous.

Indeed, in response to questions, Richard Danzig, Principal Deputy Assistant Secretary of DOD, in September 1979, said, “[e]ven today, there is no valid scientific evidence to support a causal relationship between low dosage exposure and unspecific human diseases of delayed onset.”⁶¹ GAO cited Army manuals that “described herbicide orange as ‘relatively nontoxic to man or animals.’”⁶²

Although mission requests were approved by the military chain of command and South Vietnamese government, “most helicopter missions and all truck, boat, and hand spraying were

⁵⁹ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 17.

⁶⁰ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision, at 18.

⁶¹ Richard Danzig, Principal Deputy Assistant Secretary of Defense. Letter to William J. McCormick, Jr., Associate Director, Federal Personnel and Compensation Division, United States General Accounting Office, September 4, 1979, at 2.

⁶² Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 4.

conducted at the discretion of unit commanders.”⁶³ The chain of military command, the U.S. Embassy officials, members of the South Vietnamese government, the airmen in helicopters, and the soldiers on the ground were actors each operating in rigid control within their own leadership command yet together were contributing to the chaotic dynamics of a war environment.

Science now shows that variables influencing the degree of exposure include the rate of biodegradation of herbicide orange, the drift of the sprayings from the targeted areas, and ground troop locations. Containment of the drift of herbicide orange influenced by climate as well as the speed and altitude of the aircraft was determined only after examination of widespread crop damage extending from one-two kilometers.⁶⁴ Given the belief that herbicide orange was “relatively nontoxic to man or animals,” no special safety precautions were taken to avoid exposure outside of Air Force handlers being advised to use gloves and face shields. The time period DOD advised between spraying and defoliation was four to six weeks to ensure successful defoliation and safety of ground troops, not to protect service members from toxic exposure, but rather from gunfire from fighter surveillance aircraft. Even with DOD’s guidance, however, “chemical officers confirmed that no restrictions [actually] were placed on entering sprayed areas.”⁶⁵ Indeed, contrary to the DOD maintaining that “exposure was very unlikely since DOD personnel did not enter a sprayed area until defoliation was complete,” a time span of six weeks,

⁶³ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 4.

⁶⁴ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 6,7.

⁶⁵ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 5.

the GAO investigation revealed that troop commanders merely “were asked to keep troops clear of the area during the spraying mission.”⁶⁶

Numerous federal agencies shared responsibility for the oversight and risk of the exposure effects of TCDD. The Agent Orange Working Group designated in 1981 by the White House included the DOD, VA, Health Education and Welfare (HEW), Agriculture, and the Environmental Protection Agency.⁶⁷ In addition, the Departments of Agriculture, Interior, and HEW exercised its authority in April 1970 to suspend certain uses of 2,4,5-T in most herbicide applications recognizing that 2,4,5-T was a teratogen.⁶⁸ Each of these agencies, however, operated independently with their own leadership, unique statutorily mandated missions, and separate appropriated federal budgets, thereby creating an environment of frustration on the edge of chaos with little evidence of information feedback among the agencies to adapt to change nimbly.⁶⁹

As early as 1970, Congress mandated the DOD to seek the National Academy of Sciences to study the ecological and physiological effects of the use of herbicides in South Vietnam.⁷⁰ The NAS recommended in 1974 that “further intensive studies are especially required with reference to the ecological distribution, the pharmacology mechanism of toxicity, possible mutagenicity, and carcinogenicity of TCDD and its possible teratogenicity in man.”⁷¹

Despite the National Academy of Sciences recommendation for a long-term study, not only did

⁶⁶ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 5.

⁶⁷ U.S. Department of Veterans Affairs. *Agent Orange Review* (1983).

⁶⁸ U.S. Department of Veterans Affairs. *Vietnam Veterans and Agent Orange Exposure. Independent Study Course*, March 2002, at 3.

⁶⁹ Sidath Viranga Panangala and Douglas Reid Weimer. *Veterans Affairs: Health Care and Benefits for Veterans Exposed to Agent Orange*. Congressional Research Service. September 22, 2010, at 11.

⁷⁰ Public Law 91-441, October 7, 1970.

⁷¹ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 5.

the Department of Defense determine that no epidemiological study would be undertaken,⁷² they did not issue “any instructions to its medical facilities to monitor complaints of illness possibly resulting from herbicide exposure.”⁷³

In fact, there were no accurate DOD military records of service members’ deployment locations that would establish proximity to health risk. Finally, in 1978, the VA began compiling an Agent Orange Registry by offering medical exams to those who may have been exposed. Through 2018, 690,302 initial exams and 81,926 follow up exams had been provided.⁷⁴

The Agent Orange class-action lawsuit filed in 1979⁷⁵ on behalf of service members injured by exposure to Agent Orange and their families⁷⁶ sought relief through the judicial system against the major manufacturers of herbicides used in the Vietnam War after the victims had been neither recognized nor compensated for their injuries by the military or VA.

A \$180 million out of court settlement⁷⁷ was settled in 1984.⁷⁸ Nine years after the payment program was initiated, the fund was depleted; approximately 52,000 veterans received cash payments averaging about \$3,800. In 2003, the U.S. Supreme Court failed to broaden the settlement with a deadlocked vote.⁷⁹

⁷² U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 5.

⁷³ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 6.

⁷⁴ <https://www.publichealth.va.gov/exposures/publications/agent-orange/agent-orange-2018/ao-registry.asp>

⁷⁵ See *In re “Agent Orange” Product Liability Litigation*, 818 F.2d 145, 148-152 (2d Cir. 1987) (providing history of the litigation), *aff’d* 597 F.Supp. 740 (S.D.N.Y. 1984) (approving settlement between plaintiffs and chemical companies).

⁷⁶ The class consisted of those persons who were in the United States, New Zealand or Australian Armed Forces at any time from 1961 to 1972 who were injured while in or near Vietnam by exposure to Agent Orange or other phenoxy herbicides, including those composed in whole or in part of 2,4,5-trichlorophenoxyacetic acid or containing some amount of 2,3,7,8-tetrachlorodibenzo-p-dioxin. The class also includes spouses, parents, and children of the veterans born before January 1, 1984, directly or derivatively injured as a result of the exposure. *In re “Agent Orange” Product Liability Litigation*, 100 F.R.D. 718, 729 (E.D.N.Y.1983) (certifying class).

⁷⁷ U.S. Veterans Affairs, Compensation and Pension Service. Agent Orange Settlement Fund. https://www.benefits.va.gov/compensation/claims-postservice-agent_orange-settlement-settlementFund.asp

⁷⁸ “Pursuant to the stipulation of settlement, defendants have agreed to pay to the class \$180 million plus interest.” *In re Agent Orange Prod. Liab. Litig.*, 597 F. Supp. 740, 748 (E.D.N.Y. 1984), *aff’d* 818 F.2d 145 (2d Cir. 1987).

⁷⁹ Although Justice John Paul Stevens recused himself without reason, it was reported that his son with cancer died in 1996 at 46 years. <https://www.cbsnews.com/news/court-deadlocks-on-agent-orange/>

The result of this lawsuit was as a catalyst for Congress to enact legislation⁸⁰ authorizing the VA to conduct an epidemiological study, for the White House to establish the Interagency Work Group to Study Possible Long-Term Health Effects of Phenoxy Herbicides,⁸¹ and the VA to establish the Advisory Committee on Health-Related Effects of Herbicides.⁸²

This epidemiological study and Work Group were not successful. The government did not intend to include ground troops in their study of long-term medical affect linking only herbicide handlers and aircraft crewmembers to exposure, remarkably, even though the DOD acknowledged ground troops' exposure.⁸³ The VA failed in its efforts to design the research protocol on the long-term effects of dioxin; CDC was transferred the responsibility for leading the study. And, the CDC was burdened with its own challenges in acquiring exposure data from military records and self-reports. While an Agent Orange Validation Study was attempted, CDC found the military records lacking to conduct the large epidemiologic study. CDC efforts were halted in 1987 after advisory boards and panels concluded, "the Congressionally mandated Agent Orange Study was improbable."⁸⁴

Responsiveness to service members with policy changes that could address and support their health care needs was delayed by uncertainty. Attentiveness to symptoms of disease to confirm a service connected disability was delayed by the absence of documentation linking

⁸⁰ The Veterans Health Programs Extension and Improvement Act, P.L. 96-151.

⁸¹ The Interagency Work Group consisted of HHS (lead agency); White House Office of Policy Development; White House Office of Science and Technology Policy; Office of Management and Budget; Council of Economic Advisors; EPA; Departments of State, Agriculture, Labor, Veterans Administration, and ACTION. https://www.publichealth.va.gov/docs/agentorange/reviews/ao_newsletter_aug83.pdf.

⁸² Department of Veterans Affairs. Vietnam Veterans and Agent Orange Exposure. Independent Study Course. (March 2002), at 2.

⁸³ Comptroller General of the United States. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. Letter from Comptroller General of the U.S. Elmer B. Staats to Senator Charles Percy, Permanent Subcommittee on Investigations, Committee on Governmental Affairs. FPCD-80-23, November 16, 1979, at 9.

⁸⁴ Sidath V. Panangala. Veterans Affairs: *Health Care and Benefits for Veterans Exposed to Agent Orange*. CRS Report for Congress. RL34370, February 11, 2008, at 6 and 7.

proximity to the chemical agent⁸⁵ and science demonstrating causal effect between exposure and disease.^{86 87} “Epidemiologic studies on Agent Orange are historically burdened by the lack of reliable exposure data. The lack of accurate data remains a continued source of frustration for researchers, government officials, and Vietnam-era veterans seeking conclusive information on the health risks of exposure to Agent Orange.”⁸⁸

The institutional rules associated with risk management proved to be limiting factors restricting change. The various actors self-organized into their own silos with unique cultures, priorities, and resources creating barriers to changing the rules. Focused on the military mission, the DOD’s goal was on herbicide effectiveness at defoliation and crop destruction. Courts struggled to adjudicate numerous lawsuits; the settlement did not reach all veterans exposed; and Congressional legislators balked at billion dollar appropriations to the federal budget for claims.

In 1991, twenty years after exposure, the Agent Orange Act⁸⁹ was enacted by Congress to require the VA to determine the association between the presenting disabilities and an herbicide agent.⁹⁰ This legislation established for the first time the “presumption” of service connection with increased risk of diseases associated with herbicide exposure. As evidence of

⁸⁵ Comptroller General of the U.S. *U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange*. FPCD-80-23, November 16, 1979, at 1.

⁸⁶ “There are many questions regarding veterans’ health that cannot be adequately answered by examining superficially analogous exposures and outcomes in other populations. It is only through research on veterans themselves that the totality of the military service experience can be properly accounted for.” See National Academies of Sciences Engineering and Medicine. *Veterans and Agent Orange: Update 11*. Washington, D.C. (2018), at 12-14.

⁸⁷ “Different approaches have been used in estimating the exposure of Vietnam veterans and these studies generally rely on self-reported exposures, records-based exposure estimates, or biomarkers of TCDD exposure. Each of these approaches is limited in its ability to determine precisely the degree of individual exposure.” See National Academy of Sciences, Committee on the Assessment of Wartime Exposure to Herbicides in Vietnam. Institute of Medicine. *Characterizing Exposure of Veterans to Agent Orange and Other Herbicides Used in Vietnam*. National Academy Press, Washington, D.C. (1997) at 44.

⁸⁸ Sidath Viranga Panangala and Douglas Reid Weimer. *Veterans Affairs: Health Care and Benefits for Veterans Exposed to Agent Orange*. Congressional Research Service. September 22, 2010, at 11.

⁸⁹ P.L. 102-4. 38 U.S.C. 1116.

⁹⁰ Herbicide agent was defined as “a chemical in an herbicide used in support of the United States and allied military operations in the Republic of Vietnam during the period beginning on January 9, 1962, and ending on May 7, 1975.” 38 U.S.C. 1116(a)(3).

transformational policy change, the Agent Orange Act also mandated the NAS Institute of Medicine to undertake comprehensive biennial reviews of the evidence of health problems that may be linked to exposure to Agent Orange and other herbicides used during the Vietnam War to determine whether there is a statistical association between the suspect diseases and herbicide exposure, taking into account the strength of the scientific evidence.

As significant as the Agent Orange Act legislation was hailed, however, VA took until August 31, 2010, to promulgate its final regulation with publication in the Federal Register allowing presumption of exposure for veterans serving in Vietnam between January 9, 1962 and May 7, 1975.⁹¹ In announcing the new rule for health care and disability compensation benefits some thirty-five years after the end of the conflict, the VA Secretary Eric Shinseki remarked, “It was the right decision, and the President and I are proud to finally provide this group of Veterans the care and benefits they have long deserved.”⁹² Twenty-eight thousand claims were decided by the VA in the first six weeks of processing disability compensation applications based on the new regulation.⁹³

Ultimately, the executive branch through the VA managed the risk and ensured scalability and reach by continuing to promulgate additional regulations for presumptive eligibility for disability compensation to include new conditions based on scientific evidence reported by NAS. This coordination among Congress in enacting the Agent Orange Act, the NAS in investigating the statistical association between science and illness, and the VA in promulgating regulations led to the payment through August 2011 of over \$2.2 billion in

⁹¹ Federal Register. August 31, 2010 (75 (168). Page 53202-53216. Department of Veterans Affairs 38 CFR Par 3 RIN 2900-AN54 *Diseases Associated with Exposure to Certain Herbicide Agents*.

⁹² U.S. Department of Veterans Affairs. *VA Publishes Final Regulation to Aid Veterans Exposed to Agent Orange*. News Release, August 30, 2010.

⁹³ U.S. Department of Veterans Affairs. *VA Processes First Claims for New Agent Orange Presumptives*. December 10, 2010.

retroactive benefits to 89,000 veterans.⁹⁴ This is evidence of a non-linear system in vital contact with multiple environments responding to chaos.

The government and military's risk management response to exposure of Agent Orange demonstrated a gross failure over decades for leadership protecting their individual missions to react in a coordinated, comprehensive, and timely manner. This comprehensive effort was long delayed. It took the energy of the advocacy movement and elected officials on behalf of victims to shake the equilibrium of an inert system to produce transformational management of the exposure of service members to Agent Orange.

Response to Sodium Dichromate Exposure

The United States shifted from primarily a full-time active command force during the Vietnam War to a reserve component of a part-time active force. In 2010, 25 to 30 percent of the U.S Central Command forces was the Reserve Component.⁹⁵ Indeed, the National Guard soldiers at Qarmat Ali Water Treatment Plant were part-time, not full-time, soldiers who were deployed together as a unit in an environment not to fight a war but to serve as the security force for KBR, a private contractor working on restoring the water treatment plant at Basra, Iraq. This all-volunteer military capability and increase in reserve forces contribute to the chaotic behavioral dynamics of the sodium dichromate matter.

Coincident to the decrease in full-time active command force has been an increase in the reliance of contractors for site security and logistical support, tasks the Inspector General for Iraq Reconstruction admitted formerly were provided by active duty forces. The IG concluded that “contracting in a hostile/combat environment is much more difficult and far more vulnerable”

⁹⁴ U.S. Department of Veterans Affairs. Over \$2.2 Billion in Retroactive Agent Orange Benefits Paid to 89,000 Vietnam Veterans and Survivors for Presumptive Conditions. News Release, August 31, 2011.

⁹⁵ U.S. Department of Defense, *Quadrennial Defense Review*, 2010, at 93.

and there are “significant shortfalls in most aspects of contractor oversight.”⁹⁶ Although the dynamics surrounding the armed forces may be tightly monitored, the forces at work among the contractors’ activities are less certain. Congressman Earl Blumenauer, advocating for declassification of the KBR contract on behalf of Oregon national guardsmen exposed to sodium dichromate, said, “I remain concerned that KBR’s contract may be much more loosely drawn, removing incentives for the contractor to behave responsibly and exposing taxpayers to enormous liability and our troops to harm.”⁹⁷

With thousands of sites within Iraq, environmental risk assessments by the Army pre-deployment to sites other than those on “major bed down locations” were considered impracticable. Quoting a March 2009 letter from Army Secretary Pete Geren, U.S. Senator Evan Bayh testified, “Ordinarily, the Army would perform an environmental assessment of a site prior to deployment of service members or contractors to that site. In this case, however, the number of sites (approximately 4,000) over the geographic area of Iraq potentially needing occupational health assessments in the immediate aftermath of hostilities, combined with the need to restore critical infrastructure as soon as possible made this impracticable.”⁹⁸ The DOD Inspector General concluded that “KBR did not fully comply with applicable occupational safety and health standards required by the contract, and Task Force Restore Iraqi Oil failed to enforce contractor compliance.”⁹⁹ An environmental risk assessment of the Qarmat Ali site prior to the

⁹⁶ Stuart W. Bowen, Jr. Inspector General, Office of the Special Inspector General for Iraq Reconstruction, testimony before the Subcommittee on National Security and Foreign Affairs, Committee on Oversight and Government Reform, U.S. House of Representatives, June 29, 2010, at 2-3.

⁹⁷ Elena Schor. *Military Contractors Were Granted Legal Indemnity for Hazardous Substances*. New York Times, December 13, 2010.

⁹⁸ Evan Bayh, U.S. Senator, *The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq?* Testimony before the Senate Democratic Policy Committee, August 3, 2009.

⁹⁹ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 12.

service members' arrival was neither performed by the Army nor interpreted as required by KBR.

Linear communication of concerns raised and decisions by the contractors and the military operating within their own silos without feedback created a time delay in identifying and confirming exposure. On May 31, 2003, KBR representatives became aware of the use of sodium dichromate.¹⁰⁰ On August 7, 2003, samples of air and soil/sediment from various areas were collected by KBR; duplicate samples were collected two days later.¹⁰¹ The August 7 & 9, 2003, Team RIO Qarmat Ali Site Assessment Trip Memo and material safety data sheet documented the purpose of the trip to be "Limited Environmental Assessment of Soils Potentially Contaminated with Sodium Dichromate at the Qarmat Ali Water Treatment Plant." KBR personnel and KBR subcontractor personnel were advised that entry was restricted until laboratory analyses were received. An Environmental Health and Safety assessment was recommended to be completed to confirm "potential environmental health issues are identified and addressed."¹⁰² Also, minutes of a KBR staff meeting held August 8, 2003, included "serious health problem at water treatment plant with a chemical called Sodium Dichromate. Almost 60% of people now exhibit the symptoms." Although these are ominous notes, the minutes characterized "there is no reason for shutting down the water station."¹⁰³

¹⁰⁰ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 12.

¹⁰¹ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 41.

¹⁰² Qarmat Ali Site Assessment Memo, Team RIO August 7 & 9, 2003, Trip Description Qarmat Ali Water Treatment Plant. The Materials Safety Data Sheet on sodium dichromate accompanying Memo outlined major health hazards for inhalation.

¹⁰³ KBR Team Restore Iraq Oil (RIO), Minutes of Meeting, Meeting Number MOME03808, August 8, 2003. Minutes also indicated, "sodium dichromate could have been dumped on the ground for quite a long time. We do not know how deep it is but it looks like it is greater than 4 feet. Medical test every individual working in the area to assess level of exposure."

As evidence of complex communication feedback loops, U.S. Task Force Restore Iraqi Oil Contracting Officer officially was informed of the potential soil contamination August 8, 2003,¹⁰⁴ but it was not until almost five years later June 2008 when the Department of Veterans Affairs learned of the exposure.¹⁰⁵ KBR required their subcontractor employees working in some areas to wear Personal Protective Equipment (PPE) in August 2003;¹⁰⁶ the wearing of PPE by all coalition personnel was not required until October 17, 2003.¹⁰⁷ “On September 15, 2003, the Combined Forces Land Component Command Surgeon’s Office notified the U.S. Army Public Health Command (Provision) of the potential exposure.”¹⁰⁸ Although the U.S. soldiers were exposed months earlier, access to the site was not restricted to them until September 19, 2003.¹⁰⁹

DOD readily admits the need to improve its occupational and environmental health surveillance activities including monitoring and documentation of hazardous occupational and environmental incidents. “...the Services including our commanders on the ground, have learned their lessons well pertaining to the need to fully characterize deployed environmental settings for

¹⁰⁴ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 12.

¹⁰⁵ Eric K. Shinseki letter to John D. Rockefeller IV, October 8, 2009, at 1.

¹⁰⁶ Team Restore Iraq Oil (RIO), Minutes of August 7-9, 2003 Trip: Limited Environmental Assessment of Soils Potentially Contaminated with Sodium Dichromate at the Qarmat Ali Water Treatment Plant.

¹⁰⁷ Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. *Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 7.

¹⁰⁸ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I-Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel*. Report No. SPO-2010-006. September 17, 2010.

¹⁰⁹ Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. *Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 7.

possible exposures to hazardous materials and to ensure that the data is archived for future use.”¹¹⁰

After KBR health, safety, and environmental staff detected “elevated hexavalent chromium concentrations” at the Qarmat Ali plant, they “encapsulated various soil areas with a layer of liquid asphalt and loose gravel aggregate.”¹¹¹ This action, unfortunately, eliminated medical impact pre-encapsulation which could have demonstrated more accurate results. Indiana National Guard and Department of Army civilians on site received serum and red blood cell testing for whole chromium, urine testing, pulmonary function testing, and chest x-rays within 30 days of last potential exposure and within 30 days of remediation of the site after the end of potential exposure.¹¹² The U.S. Center for Health Promotion and Preventive Medicine Incident Response¹¹³ in October of 2003 initiated site sampling, soldier surveys about their time on site, and medical testing for Indiana Army Reserve National Guard and Department of Army civilians. The U.S. Center for Health Promotion and Preventive Medicine reported that “nearly all test results were below the detection limit” concluding “there was not a significant inhalation exposure from chromium VI.”¹¹⁴

¹¹⁰ Michael E. Kilpatrick. Deputy Director of Deployment Health Support Directorate. Statement before the House Committee on Government Reform, Subcommittee for National Security, Emerging Threats and International Relations, July 19, 2005, at 6.

¹¹¹ Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. *Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06(December 19, 2008), at 4. The Inspector General (Report No. SPO-2011-009. September 28, 2011) stated, “the decision by the USACHPPM assessment team not to provide medical exams to the entire available Qarmat Ali population in 2003 represents a lost opportunity for obtaining more complete knowledge of the possible medical impact of pre-encapsulation exposure.” at 22.

¹¹² Defense Health Board. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. *Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 3.

¹¹³ The Special Medical Augmentation Response Team-Preventive Medicine (SMART-PM) deployed consisted of industrial hygienists, occupational medicine physicians, and environmental scientists. See Coleen Baird Weese. *Evaluation of Exposure Incident at the Qarmat Ali Water Treatment Plant*. The Army Medical Department Journal (April-June 2009).

¹¹⁴ USACHPPM. Update on Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plan in 2003 (for Soldiers). Fact Sheet (33-002-0908), September 2008.

Learning lessons from the experience of Agent Orange was mixed. On the one hand, the government having the SMART-PM arrive soon after the notification of the incident shows a responsiveness to sodium dichromate exposure that was not evident with Agent Orange. On the other hand, even today, there is neither agreement as to the degree of exposure of the individual National Guard members nor the effects of the toxicity of sodium dichromate to those exposed. This is remarkable. It demonstrates the military's failure to learn from its experience with Agent Orange, and especially its ongoing failure to recognize the importance of critical medical records. Site location and exposure timelines are powerful drivers of access to both health care and epidemiology, and documenting that information is extraordinarily important. But with a rigid organization, inefficient processes, and significant time lapse, the medical records of the National Guard were not accessible and "remained scattered throughout the medical records system;" paper medical records were sent from the unit to the mobilization site and returned to the unit following deployment.¹¹⁵ Completeness of the medical records could not be assured with soldiers serving in multiple locations and redeployment with different units.

Absent accurate records to link service members' symptoms to the chemical hazard, a special Medical Surveillance Program was established for veterans with exam results tracked in the Gulf War Registry.¹¹⁶ "We have the names and contact information of all National Guard members present at Qarmat Ali. We have also verified the numbers of these Veterans who have

¹¹⁵ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 17, 22-23.

¹¹⁶ "The overall low participation rate in the VA medical surveillance program of 15% severely compromises any generalization from this limited number of participants to the entire cohort of potential exposed Veterans." See Paul Ciminera, Michael J. Superior, and Tim Bullman. *Findings from the Department of Veterans Affairs Qarmat Ali Medical Surveillance Program*. 181 *Military Medicine*. 307,310. (2016).

received a Gulf War Registry examination.”¹¹⁷ This learning from Agent Orange documents proximity to risk and health status.

It is unfortunate that the DOD and VA have been challenged with incremental rather than transformational change to coordinate across missions and agencies to modernize their separate health records.¹¹⁸ The Departments of DoD and VA fiercely have defended the privacy of their individual records preventing coordination across the mission and silos leading to sluggish incremental policy changes. “Inevitability does not mean easy transition.”¹¹⁹ The U.S. House of Representatives Committee on Veterans Affairs in 2013 delivered a mandate to President Obama, “Select a system, pick a path and move forward. We can no longer waste the time or money that will result from endless bureaucratic inaction.”¹²⁰ Finally, the VA is launching in spring 2020 the initial installation of the new Electronic Health Record Modernization (EHRM) program with interoperability with DOD and community care providers to enable the sharing of patient information eliminating the manual transfer of records. The completion date, however, is 2028.¹²¹

The tolerance of risk of the KBR military contractors and the United States military differ based on their mission and relationship to the environment. The DOD Inspector General in 2011 concluded that the DOD response to the contamination “lacked urgency and was incomplete. The delay may have occurred as a result of mission prioritization with the Command.” The former

¹¹⁷ U.S. Department of Veterans Affairs. Letter from Eric K. Shinseki to Senator John D. Rockefeller IV. October 8, 2009.

¹¹⁸ U.S. Government Accountability Office. *Electronic Health Records: DoD and VA Should Remove Barriers and Improve Efforts to Meet their Common System Needs*, February 2011.

¹¹⁹ Agency for Healthcare Research and Quality. A Robust Health Data Infrastructure. Publication No. 14-0041-EF, April 2014, at 1.

¹²⁰ Letter to President Barack Obama from Members of the House Veterans Committee, May 22, 2013.

¹²¹ Veterans ask, VA answers: Questions on electronic health record modernization-Vantage Point, January 23, 2020. <https://www.blogs.va.gov/VAntage/70571/veterans-ask-va-answers-questions-electronic-health-record-modernization/>

U.S. Army V Corps Commander explained, “Your focus changes completely, and you are either going to take your eye off the tactical fight in order to deal with the operational issues, or you are going to ignore the operational issues and stay involved in the tactical fight.”¹²² The KBR Health, Safety and Environmental Coordinator supporting Restore Iraqi Oil noted soil and air samples “showed extremely high levels of hexavalent chromium in the soil” yet low levels of chromium in the air, explained with tests being conducted not “during one of the frequent dust storms in which all of the materials on the ground became airborne.” The Coordinator believed “the plant was a highly dangerous and unsafe and contaminated facility;” he left his duties shortly thereafter.¹²³

Brown and Root Services was awarded the contract on March 8, 2003. On March 20, 2003, Task Order 3, “Emergency Response Tasks for Iraq Oil Reconstruction” was executed and was classified when published.¹²⁴ The “Administrative Contracting Officer had minimal, if any, opportunity to review the contract language once they deployed” and absent a classified computer system, discussions were precluded “between the Administrative Contracting Officer and the contractor concerning contract language.”¹²⁵ The DOD Inspector General concluded that the contract language was impractical.¹²⁶ The language also was misinterpreted; “Task Force

¹²² Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 16.

¹²³ Edward Blacke. *The Exposure at Qarmat Ali: Contractor Misconduct and the Safety of U.S. Troops in Iraq*. Testimony before the Senate Democratic Policy Committee Hearing, June 20, 2008.

¹²⁴ To increase transparency and contractor accountability on indemnification agreements, the National Defense Authorization Act of 2013, Section 865, requires certain DOD contract provisions to be reported to Congress. <https://www.wyden.senate.gov/news/press-releases/wyden-ndaa-amendment-to-hold-contractors-accountable-sent-to-the-president>.

¹²⁵ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 9.

¹²⁶ Task Order 3, paragraph 1.1.1: “No earlier than the day after the Ground Forces secure an Iraq Oil Infrastructure facility, contractor personnel shall be notified by ACO that benign conditions exist.” Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army*

Restore Iraqi Oil and KBR considered facilities to be ready for the contractor to begin work if they were free of military hazards interpreting “benign” to mean “safe to operate from a security standpoint.” This indicated all parties disregarded the “industrial” part of “environmental hazards” included in Task Order 3.”¹²⁷

Numerous legal challenges have been filed on behalf of service members seeking damages based on privately concealing risk and negligence among other allegations. These include:

- Forty-seven Indiana National Guardsmen filed a federal lawsuit alleging KBR, Inc. privately concealed risk and “exposing them to a substantially heightened risk of cancer and other life-threatening illnesses.” Although plaintiffs argued that they would return to “Indiana, where they would subsequently experience health problems, such as cancer and kidney damage,” the court granted defendants’ motion to dismiss for lack of personal jurisdiction.¹²⁸
- Following a three-week U.S. District Court trial, twelve Oregon National Guardsmen were awarded \$85 million; each was to receive \$850,000 in non-economic damages and \$6.5 million in punitive damages for “reckless and outrageous indifference.”¹²⁹ KBR was successful in its appeal of the \$85 million jury verdict by the 9th U.S. Circuit Court of Appeals arguing the trial court did not have personal jurisdiction; the case was referred back to Oregon district court.¹³⁰

and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 7.

¹²⁷ Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 8.

¹²⁸ *McManaway v. KBR, Inc.*, 695 F. Supp. 2d 883, 2010 WL 724599 (S.D. Ind. 2010).

¹²⁹ *Bixby v. KBR, Inc.*, 2013 WL 1789792 (D. Or. Apr. 26, 2013), *aff'd*, 2013 WL 12204397 (D. Or. June 4, 2013), and *rev'd and remanded*, 603 Fed. Appx. 605 (9th Cir. 2015).

¹³⁰ *Bixby v. KBR, Inc.*, 603 Fed. Appx. 605, 606 (9th Cir. 2015).

- In turn, KBR filed suit against the United States in U.S. Court of Federal Claims, alleging the indemnification clause in its contract was to protect KBR against “unusually hazardous risks” in Iraq; therefore, the government should be liable for the judgment along with their attorney’s fees.¹³¹

Congressional legislation was introduced, recognizing that future exposures are likely to occur, to advocate for medical evaluations of service members, to investigate the association between science and illness, and to increase accountability and transparency in defense contracts. In 2009, Senator Evan Bayh introduced the Health Care for Veterans Exposed to Chemical Hazards Act¹³² guided by government’s response to Agent Orange in Vietnam to shift the evidentiary burden to receive medical care and to authorize a scientific review of the evidence linking all future exposures of “occupational and environmental health chemical hazards of particular concern” to adverse health effects. In addition, in 2012, Senator Ron Wyden authored a provision adopted in the National Defense Authorization Act to require the DOD “to justify to Congress the need for indemnification” clauses in DOD contracts.¹³³

The Defense Health Board in its external review to address the potential sodium dichromate exposure said, “minimizing illness and injury from these sources or from the concomitant battle hazards requires not only the usual industrial hygiene approach, but also a

¹³¹ Kellogg Brown & Root Servs., Inc. v. United States, 115 Fed. Cl. 46 (2014). While the Court of Claims dismissed this lawsuit on grounds that it lacked jurisdiction over the claims presented, the Armed Forces Board of Contract Appeals subsequently held that KBR was entitled to indemnification. In re Kellogg Brown & Root Services, Inc., Nos. 59357 and 59358, Opin. on Applt’s Mot. for Partial Summy. Jgt. (A.F.B.C.A. Aug. 13, 2015).

¹³² S. 1779, 111th Congress (October 14, 2009).

¹³³ *The Wyden-Authored Provision was Included in the Final House-Senate Conference Agreement and Passed by Both Houses.* Press Release. December 21, 2012.

judicious approach that balances the costs and benefits of incurring exposure at an industrial site and avoiding hazards of the battle environment.”¹³⁴

Shifting Paradigm

In spite of the sense of urgency to determine the association between potential exposure and disease incidence, change is inhibited by organizational policies, culture, political climate, and limited government resources, to say nothing of the scientific realities around the state of knowledge and technology.¹³⁵

New approaches to risk management by the executive branch should be developed for transformational change. Authorizing a scientific review of the evidence linking exposure to chemicals of particular concern to adverse health effects, establishing a registry of service members potentially harmed, shifting the burden of evidence from the injured to the government, and requiring front line commanders to report hazardous material exposure to their non-deployed headquarters should be considered.

The legislative branch could impact risk management as well. Rather than continue to legislate relief from harm by name of the war, geographic location of incident, calendar years, or health consequence/disease that excludes service members from eligibility to benefits, new legislative language should recognize that risk is inherent with military service. Legislation should provide the flexibility federal administrators require to act swiftly in coordination with stakeholders in times of national emergency without compromising processes for human safety, environmental threats, public health, fiscal responsibility, enforcement, and national security.

¹³⁴ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 8.

¹³⁵ Pamela A. Mischen and Stephen K. Jackson. *Complexity Theory and Public Administration: The Role of Organizations and Organizational Networks in Policy Implementation*. Paper presented on May 26, 2007 at the 2007 Conference of the Public Administration Theory in Harrisburg, PA. at 14.

Federal courts have a role to play in risk management. The Judicial branch must assess Congressional legislative intent, the Executive branch's management of risk, and the scientific evidence from experts. Courts play an important role in determining reasonableness. Courts wrestle with determining compensation for health and environmental harms, deciding causation, and evaluating scientific evidence competently.¹³⁶ Science must be translated within the confines of statutory authority and administrative regulation leaving some stakeholders dissatisfied with the result.¹³⁷ All of this requires the judiciary to keep up to date with scientific knowledge in order to conclude which scientific evidence is valid and to balance risks with benefits.

Reforms in the executive and judicial branches are needed. Only the Congress, however, can clarify these questions from the public health perspective through enacting or amending legislation to articulate the role of the government, manufacturers, administrators, contractors, and the taxpayers to ensure risk is fairly shared in the United States.

Environmental challenges should be explored openly rather than trying to assign blame and sanction; and strategies for intervention could be distributed over the system. A veteran's own report of exposure and inclusion on a registry, for example, should be sufficient proof to receive medical evaluations unless there is evidence to the contrary. Moving away from a performance management approach of blame and sanction removes risk management out of the adversarial and costly judicial environment.

Considering the challenges experienced with the exposure to Agent Orange and sodium dichromate, policy recommendations are identified. Implementation of these recommendations listed from greatest impact could shift the paradigm from managerial control to monitoring

¹³⁶ Peter S. Menell. *The Limitations of Legal Institutions for Addressing Environmental Risks*. 5 Journal of Economic Perspectives 93, 100 (Summer 1991).

¹³⁷ Milton Russell and Michael Gruber. *Risk Assessment in Environmental Policy-Making*. 236 Science (April 17, 1987), at 286.

information; from rigid and localized control to control distributed over the system; and from blame and sanction to problems explored openly:

- Establish a single uniform contracting process for use during contingency operations¹³⁸ with a new integrated office and a working group from relevant federal agencies for planning and execution.¹³⁹
- Develop and require joint planning in operational settings among the armed forces, contractors, and Army Corps of Engineers to ensure prompt identification and comprehensive mitigation of environmental risks.¹⁴⁰
- Ensure classification of documents balances the need for security with timely dissemination to meet health care needs of service members and other stakeholders, to facilitate communication, and to reduce distrust.¹⁴¹
- Condense the implementation schedule from 2028 to 2025 for the Electronic Health Record Modernization (EHRM) program's replacement of the current Veterans Health Information Systems and Technology Architecture (VistA) system.

¹³⁸ “The Contingency Support Plan for Repair and Continuity of Operations of the Iraqi Energy Infrastructure, dated January 31, 2003, stated the mission was to support the Commander, U.S. Central Command in the assessment of damage, repair, maintenance, resumption and/or continuity of the operations of the oil infrastructure of Iraq.” Inspector General. U.S. Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II-Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure*. Report No. SPO-2011-009. September 28, 2011, at 7.

¹³⁹ Stuart W. Bowen, Jr. Inspector General, Office of the Special Inspector General for Iraq Reconstruction, testimony before the Subcommittee on National Security and Foreign Affairs, Committee on Oversight and Government Reform, U.S. House of Representatives, June 29, 2010

¹⁴⁰ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 3.

¹⁴¹ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 3, 9.

- Enact legislation that provides a veteran's inclusion on a registry to be recognized as sufficient proof to receive medical care barring evidence to the contrary shifting the evidentiary burden to the federal government.¹⁴²
- Require the inclusion in EHRM all deployment date(s), location, and job assigned during deployment; potential exposures to chemicals of concern; and status of health information generated as a result of exposure.¹⁴³
- Require DOD to create, keep current, and permanently maintain registries of all service members who are deployed. The registries should include date(s), location, and job assigned during deployment; potential exposures to chemicals of concern; and status of health information generated as a result of exposure.¹⁴⁴
- Re-examine and revise the military exposure guidelines to reflect multiple deployments and to recognize variability of the general population who serve in the armed forces.¹⁴⁵
- Require the Secretary of DOD to enter into agreements with the NAS for each incident of exposure that the Secretary of DOD determines is of particular concern to assess the strength concerning the association between the exposure to such hazard and acute and long-term health consequences of such exposure.
- Require the U.S. Army Public Health Command (Provision) to assess and confirm that individuals with a potential exposure have access to one primary contact to receive

¹⁴² Evan Bayh, U.S. Senator, *The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq?* Testimony before the Senate Democratic Policy Committee, August 3, 2009

¹⁴³ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 11.

¹⁴⁴ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 12.

¹⁴⁵ U.S. Army Public Health Command. *Environmental Health Risk Assessment and Chemical Exposure Guidelines for Deployed Military Personnel*. Technical Guide 230, 2013 Revision

information on the nature of the exposure, to participate in appropriate medical surveillance programs, and to be referred to the proper specialty service.¹⁴⁶ Also, consider the use of innovative technology worn during deployment to absorb contaminants for frequent monitoring and documentation.

- Enact legislation at the state level to require all hospitals to ask the question, “*Have you ever served in the military?*” to ensure service members receive timely diagnoses and appropriate health care.¹⁴⁷
- Review and revise competencies for hazard recognition training, comprehensive investigations, and risk communications for commanders.¹⁴⁸
- Conduct an assessment to assure expertise exists in epidemiology and industrial toxicology among DOD and VA professionals, and identify individuals with specific and broad spectrum of expertise to facilitate access to consultation on risk assessment and risk management to relevant federal agencies.¹⁴⁹
- Re-examine the Military Claims Act¹⁵⁰ and the Federal Tort Claims Act¹⁵¹ to consider contractor participation in military deployments.¹⁵²

¹⁴⁶ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008) at 11.

¹⁴⁷ *Have you ever served in the military?* is an initiative of the American Academy of Nursing.
<http://www.haveyoueverserved.com/about.html>

¹⁴⁸ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 12.

¹⁴⁹ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008), at 3.

¹⁵⁰ 10 U.S.C. §2733 (2000).

¹⁵¹ 28 U.S.C. §§1346, 2680 (2000).

¹⁵² William Spyro Speros. *Friend-Of-A-Friendly Fire: A Future Tort Issue of Contractors on the Battlefield*, 35 *Public Contract Law Journal*, 297. (Winter 2006)

Conclusions

“It is inevitable that military units will encounter potentially hazardous industrial sites during combat operations. The hazards encountered may pose risks of infectious disease, poisonings from industrial toxins, or injuries.”¹⁵³

Environmental challenges that the military as a complex organization must confront and resolve cannot be broken down into discreet compartments to be addressed by individual disciplines. Given the timing of the mission, environmental risk assessments in a war zone may not be conducted; access to important and critical data may be hindered because of the prolific use of private contractors; and the evaluation for both health and mission risks limit risk management options. In an environment in which our national security may depend on timely and accurate decisions, relationships among agents and positive feedback in interactions are essential.

Determining the strategy for risk communication to inform the public about a potential risk while tolerating their fear is a challenge for public officials.¹⁵⁴ For the public to accept risk, public officials have an enormous task to ensure that their policies can be characterized as credible and fair. The perception of risk depends on trust that the information provided is evidence based, accurate, thorough, and honest. The perception of risk is dependent on whether it is considered voluntary or involuntary.¹⁵⁵ Public officials have a particular challenge of communicating risk associated with policy options during emergencies and when balancing

¹⁵³ Defense Health Board. *Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant*, DHB 2008-06 (December 19, 2008) at 8.

¹⁵⁴ Peter M. Sandman. *Crisis Communication Best Practices: Some Quibbles and Additions*. 34 *Journal of Applied Communication Research* 257, 258 (August 2006).

¹⁵⁵ Christopher J. Daggett. *The Role of Risk Communication in Environmental Gridlock in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS*, (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 32.

options that are neither strictly beneficial nor strictly harmful. The “goal is not to change people’s opinions about controversial environmental issues. The goal is to change the way we discuss these issues, make the discussions accurately reflect the risks we face and the available options, and enable us to make effective decisions,”¹⁵⁶ For the public, however, to determine their own tolerance of risk, they must have uncertainties acknowledged.¹⁵⁷ “Scientists must be willing to take a larger role in explaining the risks to the public, including the uncertainties inherent in any risk assessment.”¹⁵⁸

Congressional legislation, federal statutes, and executive courage may not yet be calibrated appropriately to provide the flexibility federal administrators require when acting swiftly in times of national emergency without compromising processes for human safety, fiscal responsibility, and national security. A new model for risk management for service members who have been exposed to complex occupational and environmental chemicals applying complexity theory may be required. Advancing beyond a “multiple-single uncertainty factor system” that assumes “estimates of health protection benefit can be juxtaposed with the costs of health protection measures,” is necessary.¹⁵⁹ The complexity of knowledge begs for non-linear understanding.

Complexity theory can help us understand how organizations function and encourage new perspectives working in both non-linear and non-vertical processes across agencies to create

¹⁵⁶ Christopher J. Daggett. *The Role of Risk Communication in Environmental Gridlock* in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS, (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 35.

¹⁵⁷ Vincent T. Covello, Peter M. Sandman, and Paul Slovic. *Risk Communication, Risk Statistics, and Risk Comparisons: A Manual for Plant Managers* in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS, (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 329.

¹⁵⁸ William Ruckelshaus. *Science, Risk and Public Policy*. 221 Science 1026, 1028 (September 9, 1983).

¹⁵⁹ Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at 4.

new relationships for transformational change. Agents' behavioral responses are dependent on past experience. However, adaptation and evolution, indeed, are possible as greater receptivity to smaller procedural changes could result in larger impacts. Recognizing that stakeholders in the public policy process approach risk management differently, the infrastructure that enable the executive judicial and legislative branches and their agents to respond appropriately to chemical exposure demands reform. Creating an environment that promotes innovation and rapid problem solving is essential. "As energy flows between agents, conditions change, and create a state of non-equilibrium. This dissipative transfer of energy allows for movement, interaction and reaction to the environment."¹⁶⁰

Joint risk management planning efforts must be refined anticipating the next emergency when neither medical expertise nor chemical mixture experience is available to assess risk, recordkeeping is lacking, proof of exposure is questionable, and the relationship of the chemical hazard and the health effect is not certain. Such new model would establish a registry of those potentially harmed, an independent entity that could conduct a scientific review of the evidence linking certain medical conditions to exposure, and a shift of burden of evidence from the injured to the government. The development of uniform standards for electronic exchange of health information among the U.S. Departments of Defense, Veterans Affairs, and Health and Human Services and community health care providers would facilitate not only the provision of health care but enhance the identification of emerging diseases and health threats.¹⁶¹

¹⁶⁰ Pamela A. Mischen and Stephen K. Jackson. *Complexity Theory and Public Administration: The Role of Organizations and Organizational Networks in Policy Implementation*. Paper presented on May 26, 2007 at the 2007 Conference of the Public Administration Theory in Harrisburg, PA. at 18.

¹⁶¹ Michael E. Kilpatrick. Statement before the House Committee on Government Reform, Subcommittee for National Security, Emerging Threats and International Relations, July 19, 2005, at 6, 13, 17.

The military is influenced by its hierarchy of agents or actors whose behavior and interactions act as the catalyst for the organization to self-organize. However, agents may be restricted by limiting mechanisms that diminish possibilities for change within or external to its networks.¹⁶² “Each population has its own history, culture, and socioeconomic structures.”¹⁶³ The military as an institution is unique in that all decisions of the armed forces are dependent on its specific mission. As such, the risk management processes are an integral component of this unique complex adaptive system.

“Risk Management is not an add-on feature to the decision-making process but rather a fully integrated element of planning and executing operations...Risk management helps us preserve combat power and retain the flexibility for bold decisive action. Proper risk management is a combat multiplier that we can ill afford to squander.”

General D.J. Reimer, Chief of Staff Army, 1995 (DA 1998)¹⁶⁴

¹⁶² Pamela A. Mischen. *Complexity Theory and Public Administration: The Role of Organizations and Organizational Networks in Policy Implementation*. Paper Presented on May 26, 2007, at the 2007 Conference of the Public Administration Theory Network in Harrisburg, Pennsylvania, at 14.

¹⁶³ Neil Pearce and Franco Merletti. *Complexity, simplicity, and epidemiology*. 35 International Journal of Epidemiology 515, 516 (2006).

¹⁶⁴ U.S. Army Center for Health Promotion and Preventive Medicine. *Chemical Exposure Guidelines for Deployed Military Personnel*. USACHPPM Technical Guide 230, January 2002, at 3.

Chapter 2

Scientific Uncertainty:

Balancing tolerance of risk and the responsibility of harm

Introduction

Scientific uncertainty¹ is translated according to institutional rules among the executive, legislative, and judicial branches of the federal government. “Scientific evidence can be used to define research, promote health, and inform the legal process. There is tension in the use of science when there is uncertainty as to whether policy-makers take a precautionary approach or a passive approach.”² Although policy decision making is guided by science, the context in which the science is interpreted must be identified.³

This paper examines the response of federal agencies to scientific uncertainty. Military servicemembers’ exposure to two chemicals—2,4-D, 2,4,5-T with contaminant 2,3,7,8-TCDD (herbicide agent orange) in Vietnam between 1961 and 1972 and sodium dichromate at Qarmat Ali, Iraq, in 2003, are presented as examples of complex circumstances that require officials to manage risk when the relationship between exposure and adverse health effects were unknown. Influential government actors act as catalysts to respond to a crisis, amplify a policy message, promulgate regulations, or deliver opinions. These actors include the executive branch or administration, Congressional offices and committees, and the judiciary. Table 1 summarizes the

¹ Uncertainty can be classified by type: “In this report, the committee classified the various types of uncertainty into three categories: (1) statistical variability and heterogeneity, (2) model and parameter uncertainty, and (3) deep uncertainty.” National Academy of Sciences, Institute of Medicine. 2013. *Environmental Decisions in the Face of Uncertainty*. Washington, D.C.: The National Academies Press, at 4.

² David Eaton. *Closing Comments*, in National Academy of Sciences, Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at 54.

³ National Academy of Sciences, Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at xi-xii.

Agent Orange institutional activities reframing risk management to servicemembers' exposure to Agent Orange in Vietnam; Table 2 summarizes the institutional activities reframing risk management to servicemembers' exposure to sodium dichromate at Qarmat Ali in Iraq in 2003.

There is an expectation by the public of scientific rigor in assessing risks to health including in the population of military service members on deployment. The military as a complex adaptive system "has argued that scientists should take national security into account in assessing risk" when the military uses certain chemicals. The National Academy of Sciences (NAS), on the other hand, concludes "the use of economics to undermine objective scientific evaluation is inappropriate. The only truly scientific decisions are ones reached on the basis of the weight of the evidence."⁴

Legal actors have the challenge both to understand the limitations of science and to translate data appropriately.⁵ "Legal cases involving environmental issues are increasingly calling for the recognition that some finite rates of adverse effects will remain even after implementation of reasonably feasible control measures."⁶

Drivers of environmental and public health threats are complex and multilayered requiring not only inter- and transdisciplinary research but new tools and modeling techniques to examine the dynamic and adaptive processes of interconnected systems.⁷ There are a "growing number of problems 'without a discipline' Julie Thompson Klein said.⁸ The challenges of

⁴ Rena Steinzor. *The Use and Misuse of Science in Decision Making*, in National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 29.

⁵ Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 140.

⁶ National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 4.

⁷ Ross Hammond and Laurette Dube. *A systems science perspective and transdisciplinary models for food and nutrition security*, 109 PNAS, 12356-12363 (July 31, 2012).

⁸ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 E:CO Special Double Issue, Nos.1-2 2004, at 4.

complicated environmental problems driving the implementation of risk management processes require the ability to research how biological systems interact with their physical environments. In addition, risk management processes require an examination of economics, the law, and society as well. Klein summarizes that “new forms of knowledge, institutional structure and problem solving require a new dialogue of science and humanities.”⁹ In addition to problems without a discipline, Klein concludes that “in a complex problem domain,” challenges may not necessarily be “reducible to a single dimension.”¹⁰ At the macro-level, “political transformations have effects on the science system,” Klein emphasizes.¹¹ In fact, Klein references Robert Eisenstein’s characterization of scientific research as changing from that of a microscope to that of a *kaleidoscope*.¹²

Shifting the paradigm of risk management to encourage the presumption of exposure with whole system response and engagement would allow leaders to respond collaboratively to national emergencies. Of particular interest to resolving scientific uncertainty is how complexity theory can inform this transformative change to risk management. The creation of new relationships across the federal branches of government would provide flexibility to be responsive to serious environmental concerns within a complex adaptive system such as the military.¹³

The management of uncertainty and conflict among environmental health issues in the military is compounded by its unique characteristics. Both health and mission risks impact risk

⁹ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 E:CO Special Double Issue Nos.1-2 2004, at 6.

¹⁰ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 E:CO Special Double Issue Nos.1-2 2004, at 6.

¹¹ Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 E:CO Special Double Issue Nos.1-2 2004, at 6.

¹² Julie Thompson Klein. *Interdisciplinarity and complexity: An evolving relationship*. 6 E:CO Special Double Issue Nos.1-2 2004, at 5.

¹³ Cheryl G. Sullivan. *Exposure to Complex Environmental Health Challenges: Agent Orange and Sodium Dichromate*, Indiana Health Law Review (Spring 2020), in press.

management strategies. The chain of command and the necessity for security are manifested in control within organizational dynamics.

Role of Science

Risks are assessed by scientists using high quality data to estimate the association between exposure to a chemical or substance of concern within a population exposed and incidence of disease or illness. Risk management uses such assessments across multiple disciplines, regulatory timetable, and resources for decisions to manage the risk.¹⁴

“The goal of sound decision making is to ensure that science is the underlying backbone of policy.”¹⁵ How science relates to evidence has been debated. “Science may be a tool less for finding the answer than for revealing the next question to study and research; evidence may be a tool less for making the decision than for informing the context in which the decision is to be made.”¹⁶

The European Union, however, advocates in the face of uncertainty a precautionary approach of the need for action. Considered “a moral and political principle,” the precautionary principle “should be applied whenever the ‘scientific data are insufficient, inconclusive, or uncertain, and where a preliminary scientific evaluation shows that potentially dangerous effects for the environment and human, animal or plant health can be reasonably feared.’”¹⁷ In the U.S.,

¹⁴ William Ruckelshaus. *Science, Risk, and Public Policy*. 221 *Science*, New Series, Sep. 9, 1983, at 1027

¹⁵ National Academy of Sciences, Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at xi.

¹⁶ National Academy of Sciences, Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at 3.

¹⁷ National Academy of Sciences, Institute of Medicine. 2009. *Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary*. Washington, DC: The National Academies Press, at 3.

economic actors participate in collaborative activities to develop regulatory strategies. “With rare exceptions, U.S. law balances precaution against other considerations, most importantly cost.”¹⁸

The application of science to policy may be questioned by legal entities including the courts. “The culture of law and science are vastly different and at times clash with one another, which puts pressure on science when it is applied in the legal setting.”¹⁹ Communication about the dynamic status of evidence and the recognition of the importance of transparency is essential. “Explaining the scientific process may include applying different standards of proof in legal settings, so that the expression of uncertainty by a scientist does not mean the end of a case.”²⁰

Although William Ruckelshaus, the first Administrator of the Environmental Protection Agency, cautioned that risk assessments should be based on rigorous scientific analysis and evidence to yield consensus,²¹ in the policy arena even scientific knowledge now is suspect. Indeed, when questioned about the review and modification of testimony of a Centers for Disease Control and Prevention official, John Marburger, the former White House science advisor, responded, “Science has become so important in our society and enjoys such high prestige that everybody tries to use it to support their views. Everybody tries to claim a scientific basis for whatever it is they’re trying to sell. And so, it’s inevitable that science is seized on for not just political purposes, but any advocacy purposes.”²²

¹⁸ John S. Applegate. *The Precautionary Preference: An American Perspective on the Precautionary Principle*, 6 Human and Ecological Risk Assessment, 413, 438 (2000).

¹⁹ National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 5.

²⁰ Kenneth Olden. *Rationale for Revisiting an Environmental Health Decision: The National Toxicology Program*, in National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 33.

²¹ William Ruckelshaus. *Science, Risk, and Public Policy*. 221 Science, New Series, Sep. 9, 1983, at 1027.

²² Margaret Kriz. *Keeping the Science Straight*, National Journal, December 1, 2007, at 56.

The NAS said that “uncertainty is always present in data and analysis, and decision making is invariably based on a combination of well-understood and less-well-understood information.”²³ Federal agencies approach uncertainties using various tools, techniques and methods to evaluate health risks for policy or regulatory decisions. As uncertainties are reduced through research and further evidence is weighed, policy decisions and interventions can be modified.²⁴

Uncertainty should not be confused with variability. Variability refers to diversity among populations and life-stages that may be disproportionately exposed or have characteristics of biological susceptibility. While uncertainty can be improved with refined data collection and more thorough research and investigation, variability cannot be reduced, only better characterized.²⁵

John Kingdon in his book, Agendas, Alternatives, and Public Policies found that the public awareness of an issue, development of knowledge, and political events can impact public policy agenda setting processes.²⁶ At critical times, the coupling of these streams results in policy alternatives.²⁷ “Policy windows are opened either by the appearance of compelling problems or by happenings in the political stream,” Kingdon said.²⁸ Although interest groups may contribute to policy alternatives, policy decisions are made by officials when they determine adequate data has been gathered.

²³ National Academy of Sciences, Institute of Medicine. 2013. *Environmental Decisions in the Face of Uncertainty*. Washington, D.C.: The National Academies Press, at 20.

²⁴ National Academy of Sciences, Institute of Medicine. 2013. *Environmental Decisions in the Face of Uncertainty*. Washington, D.C.: The National Academies Press, at 107-108.

²⁵ Environmental Protection Agency. *An examination of EPA Risk Assessment Principles and Practices*. EPA/100/B-04/001 (March 2004), at 32-33, 42.

²⁶ John Kingdon. (1984) *Agenda, Alternatives, and Public Policies*. Boston: Public Policies. Pearson Education, Inc. at 16-18.

²⁷ John Kingdon. (1984) *Agenda, Alternatives, and Public Policies*. Boston: Public Policies. Pearson Education, Inc. at 20.

²⁸ John Kingdon. (1984) *Agenda, Alternatives, and Public Policies*. Boston: Public Policies. Pearson Education, Inc. at 194.

Actors may interpret and apply scientific information to justify societal goals. “The fundamental challenge of using science in the policy arena is to ensure that political judgments match societal goals and remain accountable to the public, while scientific judgments match our best understanding of the natural world and remain accountable to the relevant scientific community.”²⁹

The decision on whether a risk is acceptable is left to the public. “As the scientific community continues to study the links between exposure and disease, the public is confronted with a barrage of mixed messages about risks.”³⁰ The perceived level of unknown risk is associated with known risks and prior knowledge. Risk communication, therefore, should be tailored to the target audience for a more accurate risk perception.³¹

However, the degree of uncertainty to reduce, the upper bounds of probability scenarios to test, the technical facts to research, and the process of communicating results are left to the policymakers. To reduce uncertainties, policymakers are put in the untenable position of often prioritizing risk assessments to be conducted on hazards with known effects but relatively low impact or on hazards with unknown effects but potentially high impact. J. Holdren was cited as cautioning analysts not to “confuse things that are countable with the things that count.”³²

The consideration of risks within the risk-benefit framework is problematic given the range of attitudes toward both risks and benefits. “Social, philosophical, ethical and economic

²⁹ Holly Doremus. *Using Science in a Political World. The Importance of Transparency in Natural Resource Regulation, in Rescuing Science from Politics.* (Wendy Wagner and Rena Steinzor, 2006), at 143.

³⁰ Tracy J. Woodruff, Thomas A. Burke, and Lauren Zeise. *The Need for Better Public Health Decisions on Chemicals Released into our Environment.* 30 *Health Affairs* 957, 965 (May 2011).

³¹ Vivianne H.M. Visschers, Ree M. Meertens, Wim F., Passchier, and Nanne K. DeVries. *How Does the General Public Evaluate Risk Information? The Impact of Associations with Other Risks.* 27 *Risk Analysis* 715, 726 (2007).

³² Dale Hattis. *Scientific Uncertainties and How They Affect Risk Communication*, in *Effective Risk Communication: The Role and Responsibility of Government and Nongovernment Organizations.* (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 122.

questions” complicate communication on health risks.³³ Accountability and control may drive the debate about risk as the public concludes whether risk is being shared equitably and whether the choice to accept the risk is being offered.³⁴ Conflicts between risks we ask individuals to consider versus national aggregate risks we ask society to assume to avoid potential harm are important considerations within a value framework.³⁵

Military

Service-related environmental exposures from military experiences can result in delayed and long-term health effects. There are challenges, however, to studying the health consequences of specific exposures. These include uncertainty about servicemembers’ exposure because of poor recordkeeping on troop location; length of time between exposure and manifestation of health effects; delayed communication with servicemembers, and resources available for epidemiological studies. In addition, the DOD and VA interoperable electronic health record while promising to share medical records between agencies for continuity of care, does not capture non-VA medical care.³⁶

Vietnam veterans were not able to confirm the linkage of specific diseases with herbicide exposure, and federal agencies mandated to conduct epidemiological studies were unsuccessful lacking required data. The Congress required the National Academy of Sciences, Institute of Medicine, to examine the statistical association with herbicide exposure accessing relevant

³³ Arthur C. Upton. *Communicating with the Public on Health Risks*, in. EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova ,1989), at 28.

³⁴ Vincent T. Covello, Peter M. Sandman, and Paul Slovic. *Risk Communication, Risk Statistics, and Risk Comparisons*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova ,1989), at 6.

³⁵ Dale Hattis. *Scientific Uncertainties and How They Affect Risk Communication*, in EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS. (Vincent T. Covello, David B. McCallum and Maria T. Pavlova ,1989), at 124.

³⁶ Jean-Paul Chretien, Katherine C. Chretien, and Julie A. Pavlin. *Long-term Health Consequences of Military Service: A Proposal to Strengthen Surveillance and Research*. 13 Public Health Reports, 834-838 (Nov/Dec 2016).

databases. “The unique mandate of Veterans and Agent Orange committees to evaluate association rather than causation means that the rigor of the evidence required to support a finding of statistical association is weaker than what is required to support causality.”³⁷

Inadequate preparation by the DOD and contractors of the Qarmat Ali site to ensure it was cleared of environmental hazards contributed to the uncertainty of exposure. Army Secretary Pete Geren responded to United States Senator Evan Bayh, “Ordinarily, the Army would perform an environmental assessment of a site prior to employment of service members or contractors to that site. In this case, however, the number of sites (approximately 4,000) over the geographic area of Iraq potentially needing occupational health assessments in the immediate aftermath of hostilities, combined with the need to restore critical infrastructure as soon as possible made this impracticable.”³⁸ The DOD Inspector General concluded, “Pre-war operations and post-war vandalism resulted in sodium dichromate contamination over parts of the facility.”³⁹

Examining the institutional rules for the executive, legislative, and judicial branches is applicable to the understanding of how scientific uncertainty impacts policy decision making.

Executive Branch

Federal agencies implement statutory authority by taking administrative actions and promulgating regulations. The availability and accuracy of scientific information influence risk assessments and risk management.

³⁷ National Academy of Sciences. Veterans and Agent Orange. Update 11 (2018). Washington, D.C.: The National Academies Press, at 1-3.

³⁸ Testimony of Evan Bayh at Senate Oversight Hearing. The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq? August 3, 2009.

³⁹ Inspector General. United States Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I—Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel. Report No. SPO-2010-006. September 17, 2010, at 2.

The analysis of data is subject to the reliability of the data and the credibility of its documentation. “Because some aspects of interpreting uncertainty are subjective, different risk assessors, regulators, and observers who approach the use of risk assessments and uncertainty analyses from different perspectives might have different interpretations of the results.”⁴⁰

“Governments must act as ‘master jugglers’ as they allocate agenda space to the increasingly complex set of issues that clamor for policymakers’ attention.”⁴¹ It is apparent that federal agencies must not only juggle their own strategic plan initiatives, but juggle the congressional mandated problem solutions as well.

The intensity of risk management is impacted by the urgency of the decision making, lack of consensus among actors, and opportunities to revise strategic approaches. “Deep uncertainty often occurs in situations in which the time horizon for the decision is unusually long or when there is no prior record that is relevant for analyzing a problem following a major unanticipated event,” the NAS states.⁴² Both the exposure to Agent Orange and the exposure to sodium dichromate are examples of deep uncertainty.

Strategies to address exposure to Agent Orange and sodium dichromate evolved very slowly over years. Absent scale and toxicity data at the time of exposure, the science around the specific exposure was refined, and uncertainties of the occupational chemical of concern were diminished. DOD and VA officials recognized that the health challenges of servicemembers *could* be correlated with assumed exposure, conducted specific medical evaluations and tests for abnormalities in individuals or among common disease categories, confirmed presumptive

⁴⁰ National Academy of Sciences, Institute of Medicine. 2013. Environmental Decisions in the Face of Uncertainty. Washington, D.C.: The National Academies Press, at 29.

⁴¹ Frank R. Baumgartner, Christian Breunig, Christoffer Green-Pedersen Bryan D. Jones, Peter B Mortensen, Michiel Nuytemans, and Stefaan Walgrave. *Punctuated Equilibrium in Comparative Perspective*. 53 American Journal of Political Science 603 (July 2009).

⁴² National Academy of Sciences, Institute of Medicine. 2013. Environmental Decisions in the Face of Uncertainty. Washington, D.C.: The National Academies Press, at 41.

diagnoses for which benefits were approved, and evaluated armed forces and contractor actions related to exposure.

Agent Orange

Science and public health are in conflict when establishing the burden of proof for a toxic chemical. “Scientists, as a result of their training, do not exceed the limits of their data, which places chemicals in the ‘innocent until the data shows otherwise’ category. However, those in public health, when faced with uncertainty, would prefer to err on the side of protecting health.”⁴³ Generating chemical information for hazard assessment is difficult. “Toxic chemicals...pose particularly challenging regulatory problems, because much of the necessary information is complex, uncertain, and expensive to obtain.” Also, “additional uncertainty arises from the lack of understanding of the fundamental mechanisms of toxicity for certain diseases, notably cancer.”⁴⁴

Focused on military mission, rather than health impact, the DOD’s initial assessments were targeted to herbicides effectiveness at defoliation and crop destruction in Vietnam. Based on the prevailing knowledge that the domestic use of herbicide orange was not dangerous, pilots in C-123 cargo planes and herbicide handlers did not take safety precautions working “in fatigue pants and tee shirts or no shirts.”⁴⁵

Several barriers to effectively addressing scientific uncertainty in the exposure of servicemembers to Agent Orange are identified. The Army could not identify those at risk for

⁴³ David Eaton. *Closing Comments in National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 53.*

⁴⁴ John S. Applegate. *The Government Role in Scientific Research: Who Should Bridge the Data Gap in Chemical Regulation? in Rescuing Science from Politics, Regulation and the Distortion of Scientific Research. New York: Cambridge University Press (Wendy Wagner and Rena Steinzor, 2006), at 260 and 255.*

⁴⁵ Comptroller General of the U.S. U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange. FPCD-80-23, November 16, 1979, at 4.

health challenges due to the incomplete military records to document possible exposure,⁴⁶ and the absence of positive association between exposure to specific herbicides and specific diseases could not confirm a service-connected disability.

To respond to the lack of an official roster, the VA launched the Agent Orange Registry⁴⁷ in 1978. Veterans who choose to register receive a physical exam, laboratory tests, and questions relevant to history of exposure. “Veterans and Agent Orange committees have treated Vietnam veteran status as a proxy for herbicide exposure when more specific exposure information is not available.”⁴⁸

Frustration that health conditions would not be addressed resulted from the rapid depletion in 1994 of the \$180 million fund created under a 1985 settlement for 50,000 veterans,⁴⁹ and the thirty-five-year time lapse for VA to promulgate the regulations⁵⁰ for health care and disability compensation benefits for the presumption of exposure to herbicides.⁵¹ “By helping Veterans overcome evidentiary requirements that might otherwise present significant challenges, this ‘presumption’ simplifies and speeds up the application process and ensures that Veterans receive the benefits they deserve.”⁵² New claims were expected from more than 150,000 veterans and their survivors along with reviews for 90,000 veterans with previously denied VA claims.⁵³

⁴⁶ Comptroller General of the U.S. U.S. Ground Troops in South Vietnam Were in Areas Sprayed with Herbicide Orange. FPCD-80-23, November 16, 1979.

⁴⁷ <https://www.va.gov/disability/eligibility/hazardous-materials-exposure/agent-orange/registry-health-exam/>.

⁴⁸ National Academy of Sciences. *Veterans and Agent Orange*. Update 11 (2018). Washington, D.C.: The National Academies Press, at 2-7.

⁴⁹ Agent Orange Settlement. <http://www.agent-orange-lawsuite.com/settlement.html>.

⁵⁰ Federal Register. August 31, 2010 (75 (168). Page 53202-53216. Department of Veterans Affairs 38 CFR Par 3 RIN 2900-AN54 Diseases Associated with Exposure to Certain Herbicide Agents.

⁵¹ “Veterans who served in Vietnam anytime during the period beginning January 9, 1962, and ending on May 7, 1975, are presumed to have been exposed to herbicides.” Department of Veterans Affairs. *VA Publishes Final Regulation to Aid Veterans Exposed to Agent Orange*. News Release, August 30, 2010.

⁵² Department of Veterans Affairs. *VA Publishes Final Regulation to Aid Veterans Exposed to Agent Orange*. News Release, August 30, 2010.

⁵³ Department of Veterans Affairs. *VA Publishes Final Regulation to Aid Veterans Exposed to Agent Orange*. News Release, August 30, 2010.

The cost to serve Veterans under the new regulation was anticipated to be \$42 billion over ten years.⁵⁴

The DOD initiated an epidemiologic Air Force Health Study in 1982 in response to its commitment to Congress “to determine whether exposure to herbicides including Agent Orange, had adverse health effects on these veterans.”⁵⁵ The study population was chosen among 1,242 who participated in the spraying of herbicides, referred to as Ranch Hands, matched to comparison participants identified from among 24,971 veterans not occupationally exposed to herbicides.⁵⁶ The follow up study results reported in 2000 found a 47 percent increase in adult-onset diabetes that correlated with Air Force veterans with the greatest herbicide exposure. The study also concluded “at the end of 15 years of follow-up, the Ranch Hand Study has found no consistent evidence that dioxin exposure is related to cancer.”⁵⁷ To maintain the epidemiologic data from the Air Force Health Study that ended in 2006, the John Warner National Defense Authorization Act of 2007⁵⁸ required the study records be transferred from the Air Force to the NAS Institute of Medicine with a report on the transfer made to the Armed Services Committees of Congress “based on the scientific merit of maintaining herbicide exposure records.”⁵⁹

Sodium Dichromate

Mathematical models are developed to conduct exposure and toxicity assessments to describe the process the chemical of concern undergoes, and the pathways taken from the source to the toxic endpoint. Empirical models define the relationship of exposure and response.

⁵⁴ Washington Post. *VA details changes for Agent Orange claims*. August 30, 2010

⁵⁵ National Academy of Sciences. *Veterans and Agent Orange*. Update 11 (2018). Washington, D.C.: The National Academies Press, at 5-7.

⁵⁶ National Academy of Sciences. *Veterans and Agent Orange*. Update 11 (2018). Washington, D.C.: The National Academies Press, at 5-7.

⁵⁷ U.S. Department of Defense. *Air Force Study Strengthens Link between Agent Orange and Diabetes*. Press Release, No 152-00. March 29, 2000.

⁵⁸ P.L. 109-364.

⁵⁹ Sidath Viranga Panangala. *Veterans Affairs: Health Care and Benefits for Veterans Exposed to Agent Orange*. Congressional Research Service RL34370, February 11, 2008, at 7.

Measurement errors, random sampling errors, and use of surrogate data rather than direct analysis contribute to the uncertainty in all risk assessments.⁶⁰ In addition, model uncertainties, while difficult to quantify, are inherent in risk assessment and may occur because variables may have been excluded, reality was oversimplified, or correlations between the chemical of concern's structure and biological activity was incorrectly assumed.⁶¹

At Qarmat Ali, National Guardsmen provided security for the Kellogg, Brown, and Root, Inc. (KBR) contractors working on the water treatment facility. The Materials Safety Data Sheet on sodium dichromate accompanying the August 7,9, 2003 Team Task Force Restore Iraqi Oil Qarmat Ali Site Assessment Memo outlined major health hazards for inhalation, skin contact, eye contact, and ingestion for both short- and long-term exposure. Chest pain, difficulty breathing, headache, lung and liver damage, cancer, burns, digestive disorders, and death were indicated as potential health effects.⁶² In addition, the August 8, 2003, KBR Team Task Force Restore Iraqi Oil meeting minutes included, “we do not know how deep it is, but it looks like it is greater than 4 feet.” Although medical tests for people working in the area were advised, the minutes stated, “there is no reason for shutting down the water station.”⁶³

The DOD Inspector General concluded in 2011 that “KBR officials were aware of sodium dichromate contamination at the site in early June 2003. They officially notified the

⁶⁰ Environmental Protection Agency. An examination of EPA Risk Assessment Principles and Practices. EPA/100/B-04/001 (March 2004), at 31.

⁶¹ Environmental Protection Agency. An examination of EPA Risk Assessment Principles and Practices. EPA/100/B-04/001 (March 2004), at 32.

⁶² *Qarmat Ali Site Assessment Memo, Team RIO August 7 & 9, 2003*, Trip Description Qarmat Ali Water Treatment Plant.

⁶³ *KBR Team RIO Meeting Minutes*, MOME030808, August 8, 2003.

administrative contracting officer, as part of the process to conduct site mitigation, on August 8, 2003.”⁶⁴

Regardless of the uncertainty of the concentration of sodium dichromate to which the servicemembers were exposed, the U.S. Center for Health Promotion and Preventive Medicine initiated a deployment occupational and environmental health survey and operational risk assessment at the end of September 2003 at the request of the Combined Forces Land Component Command Surgeon.⁶⁵ “The U.S. Center for Health Promotion and Preventive Medicine published a classified report of their findings on January 15, 2004, and released an unclassified version (redacted) on January 10, 2009.”⁶⁶

Five years after the U.S. Center for Health Promotion and Preventive Medicine conducted its on-site health survey and risk assessment concluding “a low to negligible overall long-term health risk,”⁶⁷ the Surgeon General of the Army on October 6, 2008, charged the Defense Health Board “to assess the adequacy of the occupational medicine standard of practice” conducted by U.S. Center for Health Promotion and Preventive Medicine.⁶⁸ Although the Defense Health Board concluded the assessment was appropriate, and “testing of whole blood

⁶⁴ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 15.

⁶⁵ “Conducted physical exams of 129 Indiana ARNG soldiers and 10 TF RIO personnel who were on-site at the time of the evaluation; provided questionnaires to 52 Oregon RNG soldiers and 53 South Carolina ARNG soldiers who were still in the area of responsibility, but no longer serving at the site during the evaluation; and provided health risk communication to all of the soldiers contacted directly by the team or by questionnaire.” Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 17-18.

⁶⁶ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 18.

⁶⁷ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 19.

⁶⁸ Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant. DHB 2008-06. December 19, 2008, at 2.

chromium levels were consistent with published results for the general U.S. population,”⁶⁹ the Defense Health Board recommended a registry be initiated with identifiers including information on potential exposure and personal health information generated from the investigation be entered into the service and medical record.⁷⁰ The DOD responded that identifiers and “testing information were archived along with the assessment report in the Deployment Occupational and Environmental Health Readiness System Data Portal.”⁷¹

Two DOD Inspector General reports were issued at the request of the U.S Senate Armed Services Committee. In its first report, *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel*,⁷² the DOD concluded that while the “Army conducted adequate efforts to identify and contact military and DOD civilian personnel in a reasonably timely manner, subsequent to a request from Congress in June 2008, ...in the absence of complete personnel, duty and other relevant records for individuals who had served near Qarmat Ali in 2003, it was not possible to determine with precision which exposed individuals may not have been identified, contacted, and offered medical care.”⁷³ Specifically, the report noted challenges in locating servicemembers including

⁶⁹ Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. DHB 2008-06. December 19, 2008, at 1.

⁷⁰ Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. DHB 2008-06. December 19, 2008, at 2

⁷¹ Letter from Pete Geren, Secretary of the Army to U.S. Senator Evan Bayh, March 3, 2009.

⁷² Inspector General. United States Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I—Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel*. Report No. SPO-2010-006. September 17, 2010.

⁷³ Inspector General. United States Department of Defense. *Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I—Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel*. Report No. SPO-2010-006. September 17, 2010, at i.

the lapse of five years between exposure and contact attempts; also, many of the National Guardsmen had left service or moved.⁷⁴

In its second report, Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure,⁷⁵ the Inspector General concluded that “the U.S. Center for Health Promotion and Preventive Medicine decision to limit full physicals to a portion of the potentially exposed population created a lost opportunity for medical recognition and documentation of symptoms of acute, short-term chromium (VI) exposure.”⁷⁶ The findings of the Inspector General to actions taken from April 2003 to January 2004 were blunt: The contract language was impractical including an Army change in the contract scope of work for an adequate environmental assessment among all the actors. “DOD military, civilian, and contractor personnel did not effectively address environmental hazards found prior to beginning work to restore to service the water treatment plant at Qarmat Ali, Iraq in 2003.” Oversight of contractors for activities previously conducted by servicemembers may be “reduced due to security concerns or the nature of the program being implemented.”⁷⁷ Also, the lack of accessibility to DOD deployment medical records created a challenge to contact tracking the servicemembers.

“The DOD response to identified sodium dichromate contamination at the Qarmat Ali facility in 2003 lacked urgency and was incomplete.” The DOD further stated, “service members and DOD civilian employees were unintentionally exposed to toxic chemicals and the U.S.

⁷⁴ Inspector General. United States Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I—Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel. Report No. SPO-2010-006. September 17, 2010, at 7.

⁷⁵ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011.

⁷⁶ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 20.

⁷⁷ Testimony of Stuart w. Bowen, Jr. Inspector General, Office of the Special Inspector General for Iraq Reconstruction at House Committee on Oversight and Government Reform. Subcontracting in Combat Zones: who are our Subcontractors? June 29, 2010.

Government was made vulnerable to potential health care liabilities for individuals exposed to contamination.”⁷⁸

The VA was able to augment the Persian Gulf War Registry⁷⁹ to include servicemembers deployed at Qarmat Ali to provide VA health care including periodic examinations “looking for indications of health outcomes that may be related to indications for hexavalent chromium.”⁸⁰ Such a registry is comparable to that “the Occupational Safety and Health Administration would require for a population of industrial workers who were exposed to chromates.”⁸¹

The Qarmat Ali Medical Surveillance Program was initiated by the VA in July 2010 as a new way to systematically “monitor the health of Veterans potentially exposed to an environmental toxicant during deployment.” Of the 830 Veterans offered enrollment in the program, 135 Veterans received medical surveillance exams for hexavalent chromium exposure that will be repeated every five years.⁸² A retrospective review of medical records of 124 of these Veterans determined that “the lack of severe nasal abnormalities specific to chromium exposure (e.g., nasal septal perforation) in the VA cohort support a limited peak exposure.” However, the researchers cautioned, “the overall low participation rate in the VA medical surveillance program

⁷⁸ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at *i*.

⁷⁹ “The VA Persian Gulf War Registry was established by P.L. 102-585, “Persian Gulf War Veterans Health Status Act,” November, 1992...to identify possible diseases resulting from U.S. military personnel service in certain areas of Southwest Asia.” in Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 23.

⁸⁰ Letter from Eric K. Shinseki to Senator John D. Rockefeller IV. October 8, 2009.

⁸¹ Inspector General. U.S Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part II--Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009. September 28, 2011, at 22.

⁸² U.S. Department of Veterans Affairs. 2012-13 Report of the Department of Veterans Affairs Gulf War Veterans’ Illnesses Task Force to the Secretary of Veterans Affairs, at 32.

of 15% severely compromises any generalization from this limited number of participants to the entire cohort of potentially exposed Veterans.”⁸³

Recognizing that there has been an increase in reserve components and an increase in the reliance of contractors for site security, both abrupt policy changes to the military structure, the U.S. Department of Defense readily admits the need to improve its occupational and environmental health surveillance activities. These include monitoring, documentation of hazardous occupational and environmental agents, and data archived long-term. In his testimony in 2005 before the House Committee on Government Reform, Subcommittee for National Security, Emerging Threats and International Relations, Dr. Michael Kilpatrick, Deputy Director of Deployment Health Support Directorate, said, “...the Services including our commanders on the ground, have learned their lessons well pertaining the need to fully characterize deployed environmental settings for possible exposure to hazardous materials and to ensure that the data is archived for future use.”⁸⁴

The application of scientific knowledge is limited by access to individuals with expertise in environmental and occupational chemicals of particular concern. Access to experts in industrial toxicology and epidemiology are essential.⁸⁵

Congress

Accountability is necessary to ensure that statutory language enacted by Congress is implemented and funds appropriated consistent with legislative goals. Agencies must be transparent in their decision making including the promulgation of regulatory requirements to

⁸³ Paul Ciminera, Michael J. Superior, and Tim Bullman. *Findings from the Department of Veterans Affairs Qarmat Ali Medical Surveillance Program*. 181 *Military Medicine* 307, 310 (April 2016).

⁸⁴ Michael E. Kilpatrick. Statement before the House Committee on Government Reform, Subcommittee for National Security Emerging Threats and International Relations, July 19, 2005, at 6.

⁸⁵ Defense Health Board. Memorandum for Surgeon General of the Arm, LTG Eric B. Schoomaker. Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant, DHB 2008-06, at 3.

assure the public interest is maintained.⁸⁶ “Scientists might also expect that when policy makers are confronted with important questions regarding scientific evidence, they will utilize a ‘weight of the evidence’ approach, viewing available data as a composite and reaching conclusions only after considering the strengths and weaknesses of all of the individual pieces of research.”⁸⁷

Federal agencies must be responsive to numerous actors including taxpayers, interest groups, and congressional offices each with their own priorities, timelines, and problem solutions. “Governments must act as ‘master jugglers’ as they allocate agenda space to the increasingly complex set of issues that clamor for policymakers’ attention.”⁸⁸

Agent Orange

The political transformations affecting the science were evident in the government’s response to Agent Orange. Enactment of legislation by Congress facilitated the promulgation of administrative rules by the VA so veterans who were exposed to Agent Orange could receive health care that they previously were unable to access.

As early as 1970, Congress mandated the Department of Defense seek the National Academy of Sciences to study the ecological and physiological effects of the use of herbicides in South Vietnam.⁸⁹ The National Academy of Sciences recommended in 1974 that “further intensive studies are especially required with reference to the ecological distribution, the pharmacology mechanism of toxicity, possible mutagenicity, and carcinogenicity of TCDD and its possible teratogenicity in man.”⁹⁰ Despite the National Academy of Sciences recommendation

⁸⁶ Holly Doremus. *Using Science in a Political World: The Importance of Transparency in Natural Resource Regulation, in Rescuing Science from Politics.* (Wendy Wagner and Rena Steinzor, 2006), at 144-145.

⁸⁷ Wendy Wagner and Rena Steinzor. *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research.* Center for Progressive Reform Publication. August 2006, at 3.

⁸⁸ Frank R. Baumgartner, Christian Breunig, Christoffer Green-Pedersen, Bryan D. Jones, Peter B. Mortensen, Michiel Nuytemans, and Stefaan Walgrave. *Punctuated Equilibrium in Comparative Perspective.* 53 *American Journal of Political Science* 603 (July 2009).

⁸⁹ Public Law 91-441, October 7, 1970.

⁹⁰ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 5.

for a long-term study, not only did the Department of Defense determine that no epidemiological study would be undertaken,⁹¹ they did not issue “any instructions to its medical facilities to monitor complaints of illness possibly resulting from herbicide exposure.”⁹²

Absent effective risk management strategies and swift action from the executive branch, significant legislation was enacted by Congress to address scientific uncertainty and health risk. The Veterans’ Dioxin and Radiation Exposure Compensation Standards Act⁹³ enacted in 1984 mandated the VA to promulgate regulations for veteran disability compensation; however, the veterans were required “to provide proof of a service-connection that established the link between herbicide exposure and disease onset.”⁹⁴

In addition, the Agent Orange Act,⁹⁵ enacted in 1991 allowed presumption of service connection to suspect diseases and mandated the Institute of Medicine to evaluate biennially scientific information on health effects of exposure. “This legislation did not provide a list of specific diseases and conditions suspected of being associated with herbicide exposure. Instead, a list was developed on the basis of diseases and conditions that had been mentioned in the scientific literature.”⁹⁶ The charge to the Institute of Medicine is to determine “whether a statistical association with herbicide exposure exists, the increased risk of disease among those exposed to herbicides during service, and whether there exists a plausible biological mechanism or other evidence of a causal relationship between the herbicide exposure and the disease.”⁹⁷ The Institute of Medicine undertakes a “comprehensive search of relevant databases, including

⁹¹ U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 5.

⁹² U.S. General Accounting Office. *Use of Agent Orange in Vietnam* (CED-78-158), August 16, 1978, at 6.

⁹³ P.L.98-542.

⁹⁴ Sidath Viranga Panangala. *Veterans Affairs: Health Care and Benefits for Veterans Exposed to agent Orange*. Congressional Research Service RL34370, February 11, 2008, at 2.

⁹⁵ 38 U.S.C. 1116; P.L 102-4.

⁹⁶ National Academy of Sciences. *Veterans and Agent Orange*. Washington, D.C.: The National Academies Press. (November 2018), at S-3.

⁹⁷ National Academy of Sciences. *Veterans and Agent Orange*. Consensus Study Report Update 11 (November 2018).

databases covering epidemiologic, biologic, medical, toxicologic, chemical, historical, and regulatory information.”⁹⁸ The Veterans Education and Benefits Expansion Act⁹⁹ in 2001 extended the Institute of Medicine biennial updates.

The Veterans’ Health Care Eligibility Reform Act of 1996¹⁰⁰ in its substantial revision of veterans’ benefits permitted health care to be obtained “unless the VA has determined that the condition did not result from exposure to Agent Orange or the condition has been identified by the Institute of Medicine as having ‘limited/suggestive’ evidence of no association between the occurrence of the disease and exposure to a herbicide.”¹⁰¹

To provide medically necessary health care and benefits for children of Vietnam veterans born with certain birth defects including spina bifida, several pieces of legislation were enacted. These include the Veterans Benefits and Health Care Improvement Act of 2000,¹⁰² the Veterans Benefit Act of 2003,¹⁰³ and the Veterans’ Mental Health and Other Care Improvements Act of 2008.¹⁰⁴

Sodium Dichromate

Elected officials use their authority to mandate policy change to address scientific uncertainty when urgency is not perceived by federal agencies. “Policy should be informed by

⁹⁸ National Academy of Sciences. *Veterans and Agent Orange*. Washington, D.C.: The National Academies Press. (November 2018), at S-4.

⁹⁹ P.L. 107-103.

¹⁰⁰ P.L. 104-262.

¹⁰¹ Sidath Viranga Panangala. *Veterans Affairs: Health Care and Benefits for Veterans Exposed to Agent Orange*. Congressional Research Service RL34370, February 11, 2008, at 2.

¹⁰² P.L. 106-419.

¹⁰³ P.L. 108-183.

¹⁰⁴ P.L. 110-387.

the best science possible, yet in some situations consensus cannot be reached. The absence of consensus does not mean there is insufficient evidence to warrant caution and regulation.”¹⁰⁵

Medical exams in 2003 were not provided to all servicemembers assigned to Qarmat Ali as “the emphasis was on acute, short-term effects.”¹⁰⁶ The U.S. Army Center for Health Promotion and Preventive Medicine could not extrapolate test results to the other Guard members who served on site. The “Environmental Protection Agency told us that modeling pre-mitigation conditions would be very difficult, and that the science to determine the effects of chemical exposures was not sufficiently developed.”¹⁰⁷ The DOD Inspector General in 2011 concluded, “As a result of inadequate preparation by the Army and KBR, servicemembers and DOD civilian employees who served at Qarmat Ali were exposed to sodium dichromate and may suffer chronic health effects.”¹⁰⁸

In response to a letter in September 2008 from Senator Evan Bayh, Secretary of the Army Pete Geren, appointed a senior level Army Review Panel to “address policy and procedures, review actions taken to identify and follow up on exposed individuals, and examine U.S. Army Center for Health Promotion and Preventive Medicine contract oversight.” The senior level review led to the Surgeon General of the Army requesting the Defense Health Board review of

¹⁰⁵ National Academy of Sciences, Institute of Medicine. 2009. Environmental Health Sciences Decision Making: Risk Management, Evidence, and Ethics: Workshop Summary. Washington, DC: The National Academies Press, at 37.

¹⁰⁶ Inspector General, U.S. Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009, September 28, 2011, at 18-19.

¹⁰⁷ Inspector General, U.S. Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009, September 28, 2011, at 35.

¹⁰⁸ Inspector General, U.S. Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009, September 28, 2011, at 10.

the 2003 environmental health assessment. Fourteen recommendations for process improvement were issued by the Defense Health Board.¹⁰⁹

Congressional legislation, the *Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act*¹¹⁰ was introduced March 19, 2009, by Senator Evan Bayh and cosponsored with Senators Dorgan, Wyden, Byrd, Lugar, Rockefeller and Merkley to ensure health care “for U.S. soldiers exposed to toxic chemicals during wartime military service.” Modeled after the government’s response to Agent Orange, the legislation shifts the evidentiary burden so veterans do not bear the burden of proof if future health conditions develop, “scientific reviews of the evidence linking exposure to adverse health effects” are authorized, and medical registries are established for at-risk veterans to ensure medical examinations and laboratory tests are provided.¹¹¹

After two Senate Democratic Policy Committee hearings on the assessment of environmental conditions and the response of DOD to the exposure, seven U.S. Senators on August 11, 2009, requested the DOD Inspector General to open “a formal investigation into the exposure of U.S. soldiers to sodium dichromate, a potentially deadly carcinogen, at the Qarmat Ali water injection facility in Iraq in 2003.”¹¹² Questions raised by the Senators included, “*Did the Army fail to clear sodium dichromate from the Qarmat Ali water injection facility before authorizing KBR to enter the site? USACHPPM did not begin testing soldiers at the facility until October 1, 2003, which was more than five months after the exposures began. Should*

¹⁰⁹ Inspector General. United States Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Part I—Evaluation of Efforts to Identify, Contact, and Provide Access to Care for Personnel. Report No. SPO-2010-006. September 17, 2010, at 10.

¹¹⁰ S. 642.

¹¹¹ Senator Evan Bayh. *Indiana Soldiers Exposed to Toxic Chemicals in Iraq Deserve Expanded VA Care*. Press Release, August 3, 2009.

¹¹² Letter of Senators Byron L. Dorgan, Evan Bayh, Robert Byrd, John D. Rockefeller IV, Ron Wyden, Jeff Merkley, and Sheldon Whitehouse to Gordon S. Heddell, Office of the Inspector General, U.S. Department of Defense. August 11, 2009.

*USACHPPM have started testing soldiers at the site within days of when the conditions and symptoms started to be reported?”*¹¹³ In addition, the Chair and Ranking Member of the U.S. Senate Armed Services Committee wrote to Secretary of Defense Robert Gates on September 15, 2009, to request that Gates “evaluate the adequacy and timelines of the Department’s efforts to date, including actions undertaken jointly with the Department of Veterans Affairs.”¹¹⁴

When the VA responded to an Iraq war veteran stationed at Qarmat Ali that it had “not determined that a positive association exists between exposure to sodium dichromate and the subsequent development of any chronic health problems,”¹¹⁵ members of Congress advocated for urgent medical care for troops exposed to hazardous chemicals. “By all standards, the response by the Department of Defense and the Department of Veterans Affairs to this issue has been unsatisfactory. It took more than five years and a hearing by this committee for the Army to begin to notify those exposed at Qarmat Ali.”¹¹⁶

Subsequent legislation was introduced by Senator Bayh and co-sponsored by Senators Lugar, Dorgan, Rockefeller, Byrd, Wyden, and Merkley, the *Health Care for Veterans Exposed to Chemical Hazards Act of 2009*,¹¹⁷ to cover “all members of the armed forces who have been exposed to *any* environmental chemical hazard, not just sodium dichromate. The legislation recognizes a new set of risks that soldiers face today throughout the world.”¹¹⁸

¹¹³ Inspector General, U.S. Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009, September 28, 2011, at 29.

¹¹⁴ Letter of Senators John McCain and Carl Levin to Robert M. Gates, Secretary of Defense. September 15, 2009.

¹¹⁵ Testimony of Evan Bayh at Senate oversight hearing. *The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq?* August 3, 2009.

¹¹⁶ Testimony of Evan Bayh at Senate oversight hearing. *The Exposure at Qarmat Ali: Did the Army Fail to Protect U.S. Soldiers Serving in Iraq?* August 3, 2009.

¹¹⁷ S. 1779.

¹¹⁸ Evan Bayh. *Senator Bayh Calls for VA Coverage for Troops Exposed to Chemical Hazards*. Press Release. October 21, 2009.

Judiciary

The role of science in the legal process continues to evolve. How this role is managed effectively is important as scientific information advances while the nature of law changes.¹¹⁹ The judiciary responds to alleged injuries from plaintiffs translating Congressional intent of statutes, scientific evidence, and administrative actions.

Federal agencies and offices each have their own regulatory authorizations, administrative priorities, and resources. A lack of consistency across agencies complicate risk assessment and risk management processes. “Such inconsistencies create ineffective risk decisions, communication failures, and the inefficient use of resources intended to address risks to human health.”¹²⁰ These processes produce the data on which courts rely. The judicial branch weighs Congressional legislative intent, the executive branch’s management of risk, and the scientific evidence from experts. Courts must wrestle with determining compensation for environmental harms even though challenged to determine causation. “The common law system is poorly structured to evaluate scientific information competently, consistently, and efficiently.”¹²¹

Scientific uncertainty creates limitations for the law. “Failure to understand the limitations of science create tremendous distortions when we try to make law more scientific or to let scientists solve our legal issues.”¹²² “Science is dependent on measurement. Law is not.”¹²³

The deconstruction¹²⁴ of scientific research to diminish credibility may undermine objective science. “Rather than incorporating science into policy dispassionately and using

¹¹⁹ Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 153.

¹²⁰ Cindy G. Jardine, Steve E. Hrudey, John H. Shortreed, Lorraine Craig, Daniel Krewski, Chris Furgal, and Stephen McColl. *Risk Management Frameworks for Human Health and Environmental Risks*. 6 *Journal of Toxicology and Environmental Health, Part B*, (2003), 569, 572.

¹²¹ Peter S. Menell. *The Limitations of Legal Institutions for Addressing Environmental Risks*. 5 *Journal of Economic Perspectives*, (Summer 1991), at 93,100.

¹²² Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 140.

¹²³ Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 160.

research to further a quest for truth, the legal system makes most decisions through an adversarial process driven by affected parties who interpret and re-interpret the science to prove that they should ‘win.’ ”¹²⁵ “It is the changing nature of law that makes science such a bad fit for legal doctrines.”¹²⁶

The risk assessment and risk management processes of the DOD and VA were scrutinized by the judiciary as servicemembers sought relief for their injuries from Agent Orange and sodium dichromate.

Agent Orange

Judicial cases related to Agent Orange can be summarized “by two lines of cases. *Nehmer* claims involve which diseases are presumed to be caused by exposure to Agent Orange, and *Haas* claims involved which veterans have been presumptively exposed to the herbicide.”¹²⁷ Following the promulgation of a rule by the VA under the Veterans’ Dioxin and Radiation Exposure Compensation Standards Act¹²⁸ that narrowly allowed only chloracne to be linked with Agent Orange exposure, the legislative intent of Congress was questioned. In its opinion, the U.S. District Court for the Northern District of California invalidated the promulgated rule requiring that the denied benefit claims had to be set aside. In its opinion, the court ordered a significant statistical association standard be applied.¹²⁹ With the enactment in 1991 of the Agent Orange Act, new VA regulations were promulgated, and the court readjudicated previously

¹²⁴ “Deconstruction means taking apart a piece of research by questioning choices made about research methodologies, even though these choices are accepted by the vast majority of scientists as suitable resolutions of non-essential research questions.” Wendy Wagner and Rena Steinzor. *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research*. Center for Progressive Reform Publication. August 2006, at 3.

¹²⁵ Wendy Wagner and Rena Steinzor. *Rescuing Science from Politics: Regulation and the Distortion of Scientific Research*. Center for Progressive Reform Publication, August 2006, at 2.

¹²⁶ Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 152.

¹²⁷ *Veterans Exposed to Agent Orange: Legislative History, Litigation, and Current Issues*. Congressional Research Service R 43790, November 18, 2014, at 7.

¹²⁸ P.L. 98-542.

¹²⁹ *Nehmer v. U.S. Veterans’ Admin.*, 712 F. Supp. 1420 (N.D. Cal. 1989).

denied claims. As a result of the VA limiting its acceptance of claims to those alleging health challenges to be Agent Orange related, the court once more clarified the broader intent.^{130 131}

The VA did not interpret its responsibility to continue to identify additional conditions and diseases newly associated by scientific evidence with veterans' exposure to Agent Orange with the Congressional extension of the sunset date of the Agent Orange Act to 2015. A motion for clarification was filed by the plaintiffs, and in 2007, the U.S. Court of Appeals for the Ninth Circuit¹³² required VA to readjudicate claims and provide retroactive benefits to veterans and to veterans' estates of deceased members.¹³³

VA wrestled with the uncertainty of not only what diseases to cover, but also the veterans eligible by geographic area in which they served. The case of *Haas v. Nicholson*¹³⁴ was filed representing a veteran who served on a U.S. vessel off the coast of Vietnam. Claiming he was entitled to a presumptive service connection, Haas appealed the Board of Veterans' Appeals denial that he must "set foot on land."¹³⁵ After years of judicial review, in January 2019, the U.S. Court of Appeals for the Federal Circuit ruled that the Agent Orange Act, indeed, included those veterans who served on ships. "The intent of Congress is clear from its use of the term 'in the Republic of Vietnam' which all available international law unambiguously confirms includes its territorial sea."¹³⁶ The Administration in 2019 agreed not to pursue a U.S. Supreme Court appeal. "Beginning January 1, 2020, veterans who served as far as 12 nautical miles from the

¹³⁰ *Nehmer v. U.S. Veterans' Admin.*, 32 F. Supp. 2d 1182-1183 (N.D. Cal 1999).

¹³¹ *Veterans Exposed to Agent Orange: Legislative History, Litigation, and Current Issues*. Congressional Research Service R 43790, November 18, 2014, at 8.

¹³² *Nehmer v. U.S. Department of Veterans Affairs*, 494 F. 3d 846 (9th Cir. 2007).

¹³³ *Veterans Exposed to Agent Orange: Legislative History, Litigation, and Current Issues*. Congressional Research Service R 43790, November 18, 2014, at 9.

¹³⁴ *Haas v. Nicholson*, 20 Vet. App. 257, 260 (2006).

¹³⁵ *Veterans Exposed to Agent Orange: Legislative History, Litigation, and Current Issues*. Congressional Research Service R 43790, November 18, 2014, at 10.

¹³⁶ Tony Mauro. *Justice Department will not Challenge Benefits for Blue Water Navy Vets*. National Law Journal, August 26, 2019.

shore of Vietnam are presumed to have been exposed to herbicide such as Agent Orange.”¹³⁷ It is believed tens of thousands of “blue water” Navy veterans or their survivors may now be eligible for the VA benefits under the Agent Orange Act.

Sodium Dichromate

Courts review epidemiological evidence to establish general causation for negligent conduct or breach of duty to determine tort liability. “While science cannot tell us how to craft an appropriate legal rule, science can play an important role in testing the assumptions underlying legal rules as the legal system develops those rules.”¹³⁸

Servicemembers are plaintiffs believed harmed by KBR in their exposure to sodium dichromate at Qarmat Ali. In 2012, a jury delivered a verdict of negligence in the U.S. District Court in Portland, Oregon, awarding Oregon Army National Guard soldiers \$850,000 in non-economic damages and \$6.5 million in punitive damages. One of the plaintiffs, Guardsman Rocky Bixby said, “It wasn’t about the money, it was about them never doing this again to another soldier.”¹³⁹ KBR’s lead trial attorney commented, “KBR took its direction from the US Army. In June 2003, they discussed sodium dichromate and the potential health hazards and the U.S. Army told KBR to cordon off the area around the chemical injection building, which KBR did. The U.S. Army...told KBR it was not authorized to take soil samples.”¹⁴⁰ The verdict was upheld by U.S. Magistrate Judge Paul Papak citing the trial evidence “supports plaintiffs’ allegation that the trial defendants both misrepresented the extent of the risk of chemical hazards at Qarmat Ali and failed to disclose the actual extent of that risk to any trial plaintiff....Taking all of KBR’s contrary evidence into account, I conclude that the preponderance of the evidence

¹³⁷ <https://www.benefits.va.gov/benefits/blue-water-navy.asp>.

¹³⁸ Robin Feldman. 2009. *The Role of Science in Law*. New York: Oxford University Press, Inc. at 174.

¹³⁹ *Iraq War contractor ordered to pay National Guardsmen \$85M over toxic chemical exposure*. NBC News wire. November 3, 2012

¹⁴⁰ *KBR appeals \$85 million sodium dichromate verdict*. www.thelancet.com/respiratory Vol. 1, October 2013.

supports plaintiffs' allegation that at all material times the trial defendants were aware of the sodium dichromate hazard at Qarmat Ali."¹⁴¹ However, on appeal, the case returned to the Oregon district court.¹⁴² In 2015, six years after the original case was filed, a three-judge panel, in addressing only the question of jurisdiction, overturned the \$85 million verdict.

Although 47 members of the Indiana National Guard in 2010 filed suit against KBR, Inc alleging "defendants knew of the presence of sodium dichromate and failed to alert Plaintiffs, causing them injury and exposing them to a substantially heightened risk of cancer and other life-threatening illnesses," the court dismissed the case for lack of personal jurisdiction. "While the effects of that injury may ultimately be felt by Plaintiffs in Indiana (or any other state in which they reside), the tort does not relocate from Iraq to Indiana."¹⁴³

Incentives for agents' actions may be driven by the legal process. Indemnity provisions in Pentagon contracts with private military contractors undertaking "unusually hazardous" risks shift liability from a contractor to the DOD. Enacted through Executive Order 10789¹⁴⁴ by President Nixon in 1971, the order authorizes agencies of the government to exercise certain contracting authority in connection with national-defense activities. The DOD Inspector General concluded, "KBR did not fully comply with occupational safety and health standards required by the contract, and Task Force Restore Iraqi Oil failed to enforce contractor compliance. As a result, a greater number of servicemembers and DOD civilian employees were exposed to sodium dichromate, and for longer periods, increasing the potential for chronic health effects and future liabilities."¹⁴⁵

¹⁴¹ Bixby v. KBR, Inc., 2013 WL 1789792 (D. Or. Apr. 26, 2013), aff'd, 2013 WL 12204397 (D. Or. June 4, 2013).

¹⁴² Bixby v. KBR, Inc., 603 Fed.Appx. 605,606 (9th Cir. 2015),

¹⁴³ McManaway v. KBR, Inc., 695 F. Supp. 2d 883, 2010 WL 724599 (S. D. Ind. 2010).

¹⁴⁴ <https://www.archives.gov/federal-register/codification/executive-order/10789.html>

¹⁴⁵ Inspector General, U.S. Department of Defense. Exposure to Sodium Dichromate at Qarmat Ali Iraq in 2003: Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure. Report No. SPO-2011-009, September 28, 2011, at *i*.

As the DOD relies more heavily on contractors as part of the “Department’s Total Force”¹⁴⁶ for services previously provided by the military, the opportunity for tort liability increases. Contractors, on the other hand, “have asserted state tort law claims against them are preempted under the Federal Tort Claims Act” as the contractors were working consistent with government’s precise specifications.¹⁴⁷ The *Feres* doctrine “bars service members from bringing suit against the U.S. government for injuries that arise ‘out of or are in the course of activity incident to service’.”¹⁴⁸ Contractors, too, have advocated for immunity under *Feres*. In addition, contractors claim charges by the servicemembers were nonjusticiable under the political question doctrine. Based on separation of powers of the federal government, courts “should refrain from deciding questions that the Constitution has entrusted to other branches of the government.”¹⁴⁹ In a 2017 *McManaway v. KBR, Inc.* appeal from the United States District Court for the Southern District of Texas to the United States Court of Appeals for the Fifth Circuit, the court found that “the political question doctrine does not prevent courts from entertaining every claim involving alleged military wrongdoing.”¹⁵⁰

Conclusions

Despite the sense of urgency to determine the association between exposure to toxic chemicals and disease incidence, limited government resources as well as scientific realities around the state of knowledge and technology may limit or prevent risk assessments from being

¹⁴⁶ U.S. Department of Defense. Quadrennial Defense Review Report. February 6, 2006, at 75.

¹⁴⁷ Vivian Chu and Kate Manuel. Tort Suits Against Federal Contractors: An Overview of the Legal Issues. Congressional Research Service. R41755. April 7, 2011, at 1.

¹⁴⁸ Vivian Chu and Kate Manuel. Tort Suits Against Federal Contractors: An Overview of the Legal Issues. Congressional Research Service. R41755. April 7, 2011, at 1.

¹⁴⁹ Vivian Chu and Kate Manuel. Tort Suits Against Federal Contractors: An Overview of the Legal Issues. Congressional Research Service. R41755. April 7, 2011, at 8.

¹⁵⁰ *McManaway v. KBR, Inc.*, 852 F.3d 444 (2017).

conducted. The National Research Council cautions that scientific judgements and policy choices may be based “where risk to human health can only be inferred.”¹⁵¹

Absent data on adverse health effects, however, policymakers should not conclude no risk. The health risk assessment is approached separate from political and economic impact. Response to scientific uncertainty should be with temporary measures, not inaction. “In the absence of full data to describe related health risks, decisions could be made based on chemical structure and to other indicators of chemical toxicity.”¹⁵²

Policy making should consider both hazard assessment and risk characterization when setting priorities for action. Hazard assessment examines the qualitative judgment about the strength of evidence associating exposure to a toxic chemical while risk characterization is a “synopsis of all the information that contributes to the conclusion about the nature of the risk” evaluating the “magnitudes of the uncertainties involved and the major assumptions” used.¹⁵³

Informed options including the costs of regulation and the benefits to avoid legal burdens impact policy decisions particularly for vulnerable populations. “The cost of managing a health risk does not affect the magnitude of the risk, but it may affect the choice of risk management options”¹⁵⁴ Incentives to generate unbiased research under public protocols for effective regulation to benefit the public good are required. “Generous public funding of research is therefore an essential prerequisite for advancements in scientific knowledge.”¹⁵⁵

¹⁵¹ Milton Russell and Michael Gruber, *Risk Assessment I Environmental Policy-Making*, 236 Science 286 (Apr. 17, 1987).

¹⁵² Tracy J. Woodruff, Thomas A. Burke, and Lauren Zeise. *The Need for Better Public Health Decisions on Chemicals Released into our Environment*, 30 Health Affairs 957, 964 (May 2011).

¹⁵³ Milton Russell and Michael Gruber. *Risk Assessment I Environmental Policy-Making*. 236 Science 286 (Apr. 17, 1987).

¹⁵⁴ Tracy J. Woodruff, Thomas A. Burke, and Lauren Zeise. *The Need for Better Public Health Decisions on Chemicals Released into our Environment*, Health Affairs 957, 964 (May 2011).

¹⁵⁵ John S. Applegate. *The Government Role in Scientific Research: Who Should Bridge the Data Gap in Chemical Regulation?* in *Rescuing Science from Politics, Regulation and the Distortion of Scientific Research*. (Wendy Wagner and Rena Steinzor, 2006), at 256 and 278.

Processes in policy development are “dynamic, fluid, and loosely joined.”¹⁵⁶ Policy formation in the executive branch is dependent not only on substantive expertise but also on relationships with legislative leaders and stakeholders.¹⁵⁷ The public’s values and concerns must be addressed in risk communication while officials must present a balanced approach to the risk.¹⁵⁸

The texture for liability and injury compensation is laid down by Congress, translated by the executive branch, and gaps filled in by the courts. Only the Congress, however, can clarify these questions from the public health perspective through enacting additional legislation to articulate the role of the government, manufacturers, suppliers, sellers, administrators, volunteers, and the taxpayers to ensure risk is fairly shared in the United States. In an environment in which our national security may depend on timely and accurate decisions, relationships at the federal level should be frictionless.

The Defense Health Board cautioned “it is inevitable that military units will encounter potentially hazardous industrial sites during combat operations. The hazards encountered may pose risks of infectious disease, poisonings from industrial toxins, or injuries. Minimizing illness and injury from these sources or from the concomitant battle hazards requires not only the usual industrial hygiene approach, but also a judicious approach that balances the costs and benefits of incurring exposure at an industrial site and avoiding hazards of the battle environment.”¹⁵⁹

¹⁵⁶ John Kingdon. (1984) *Agenda, Alternatives, and Boston: Public Policies*. Pearson Education, Inc. at 230.

¹⁵⁷ John Kingdon. (1984) *Agenda, Alternatives, and Boston: Public Policies*. Pearson Education, Inc. at 33.

¹⁵⁸ Vincent T. Covello, David B. McCallum, and Maria T. Pavlova. *Principles and Guidelines for Improving Risk Communication in* EFFECTIVE RISK COMMUNICATION: THE ROLE AND RESPONSIBILITY OF GOVERNMENT AND NONGOVERNMENT ORGANIZATIONS, (Vincent T. Covello, David B. McCallum and Maria T. Pavlova, 1989), at 9.

¹⁵⁹ Defense Health Board Review of the U.S. Army Center for Health Promotion and Preventive Medicine Assessment of Sodium Dichromate Exposure at Qarmat Ali Water Treatment Plant. Memorandum for Surgeon General of the Army, LTG Eric B. Schoomaker. DHB 2008-06. December 19, 2008, at 8.

Pearce and Merletti remind us that generals no longer have the luxury to “fight the last war.”¹⁶⁰ The military must continue to adapt and evolve. Part of that evolution may require less tightly controlled behavior, greater interaction with actors outside of the military silos, and enhanced receptivity to smaller procedural changes that could result in larger impacts as scientific uncertainties are reduced.

¹⁶⁰ Neil Pearce and Franco Merletti. *Complexity, simplicity, and epidemiology*. 35 International Journal of Epidemiology, 515, 518 (January 16, 2006).

Table 1. INSTITUTIONAL PROCESSES REFRAMING RISK MANAGEMENT FOR AGENT ORANGE		
EXECUTIVE	JUDICIAL	LEGISLATIVE
		1970. P.L. 91-441 required DOD to seek NAS study of herbicides.
1978. Agent Orange Registry established for eligibility for medical history, physical exams and lab tests.		
1979. White House called for Interagency Work Group to study Possible Long-Term Health Effects of Phenoxy Herbicides and Associated Dioxins.	1979. Agent Orange class action lawsuit filed.	1979. Veterans Health Programs Extension and Improvement Act. P.L. 96-151. Authorized the VA to conduct epidemiological study.
1981. White House established Agent Orange Working Group. VA established Advisory Committee on Health-Related Effects of Herbicides.		1981. Veterans' Health Care, Training and Small Business Loan Act. P.L. 97-72. Recognized veterans report of exposure to receive health care for chloracne.
1982. Epidemiological research transferred to CDC		
		1984. Veterans' Dioxin and Radiation Exposure Compensation Standards Act. P.L. 98-542. Required VA to develop regulations for disability compensation.
	1985. Out of court AO settlement between companies and veterans \$180 million fund.	
1987. CDC epidemiological research study halted w/out data availability.		
	1988. Court of Appeals for Veterans Claims created to conduct independent judicial review of VA decisions.	
	1989. US District Ct Northern District of CA ordered VA to redo rule under more generous standard and readjudicate denied claims.	
1991. Regulation promulgated to implement Agent Orange Act of 1991.		1991. Agent Orange Act. 38 U.S.C. 1116. P.L.102-4. Authorized IOM scientific review of evidence and presumption of service connection with occurrence of disease.
	1994 \$180 m fund depleted with only 50,000 receiving small compensation.	

Table 1. (continued)
INSTITUTIONAL PROCESSES REFRAMING RISK MANAGEMENT
FOR AGENT ORANGE

EXECUTIVE	JUDICIAL	LEGISLATIVE
		<p>1996. Veterans' Health Care Eligibility Reform Act. P.L. 104-262. Authorized medical care for exposure to Agent Orange unless IOM had "limited/suggestive" evidence of no association to exposure.</p>
	<p>2003. June 9 Supreme Court deadlocked vote. Allowed wider representation of 1985 settlement.</p>	<p>2003. Veterans Benefits Act. P.L. 108-183. Expanded benefits for children born with spina bifida.</p>
		<p>2007. John Warner National Defense Authorization Act. P.L. 109-364. Required AFHS records be transferred from the Air Force to IOM.</p>
<p>2010. Federal Register: August 31, 2010 (Volume 75, Number 168), pages 53202-53216) allowing for presumption of exposure to herbicides. Amended regulations added three new AO presumptive conditions; over \$2.2 billion was paid to 89,000 veterans.</p>		

**Table 2.
INSTITUTIONAL PROCESSES REFRAMING RISK MANAGEMENT
FOR SODIUM DICHROMATE**

EXECUTIVE	JUDICIAL	LEGISLATIVE
2003: U.S. Dept of Defense issued KBR contract DAAA09-02-D-0007 under LOGCAP program, governed by Task Order 3, to restore Qarmat Ali Water Treatment Plant, an Iraq Oil Infrastructure facility.		
2004. U.S. Dept of Defense established Deployment Health Risk Communications Working Group to develop fact sheets on deployment health risks.		
2005. GAO issued draft report <i>Defense Health Care: Improvements Needed in Occupational and Environmental Health Surveillance to Address Immediate and Long-Term Issues.</i>		
2008. U.S. Dept of Defense issued the Health Board Review of Sodium Dichromate Exposure at the Qarmat Ali Water Injection Facility.	2008, Dec. 3: U.S. District Court for the Southern District of Indiana. Plaintiffs v. KBR, Inc. seeking damages based on privately concealing risk and negligence.	
		2009. S. 642: Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act introduced. S. 1779: Health Care for Veterans Exposed to Chemical Hazards Act of 2009.
2010. Inspector General, U.S. DOD issued <i>Exposure to sodium Dichromate at Qarmat Ali Iraq: Evaluation of Efforts to Identify, Contact, and Provide Access to care for Personnel.</i>	2010, Dec. 14: Ninth Circuit Court of Appeals dismissed KBR's appeal of immunity from lawsuit allowing lawsuit by Oregon national guard to go to trial by jury.	
2011. Inspector General, U.S. DOD issued <i>Evaluation of Army and Contractor Actions Related to Hazardous Industrial Exposure.</i>		
	2012, Nov. 2: U.S. District Court for Oregon. Plaintiff (Rocky Bixby) v. KBR, first suit and issued verdict of negligence for illnesses; contractor to pay \$85 million to 12 Oregon soldiers.	

Chapter 3

Policy Implementation

In the end, Tipping Points are a reaffirmation of the potential for change and the power of intelligent action. Look at the world around you. It may seem like an immovable, implacable place. It is not. With the slightest push—in just the right place—it can be tipped.¹

An overview and compilation of professional work relevant to and impacted by research on servicemembers' exposure to Agent Orange and sodium dichromate are presented. Cheryl G. Sullivan was the Chief Executive Officer for the American Academy of Nursing in Washington, D.C. 2010-2018. Sullivan launched the Academy initiative *Have you ever served in the military?*¹ in partnership with the National Association of State Departments of Veterans Affairs and in commitment to the White House's Joining Forces campaign to improve the health of veterans. Sullivan also was the Deputy Chief of Staff for Policy for U.S. Senator Evan Bayh 2005-2010. As the primary advisor to the Senator on policy, Sullivan was responsible for policy development for federal legislation and for policy documentation. Legislation drafted with the Senator included the *Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act of 2009* introduced in the 111th Congress by the Senator on March 19, 2009, and the *Health Care for Veterans Exposed to Chemical Hazards Act of 2009* introduced on October 14, 2009.

Have you ever served in the military?

On April 11, 2012, the American Academy of Nursing (Academy) pledged with 26 other nursing organizations to create an initiative with Joining Forces, a priority of then First Lady

¹ Malcolm Gladwell. *The Tipping Point*. Little, Brown & Company, Boston. 2000, at 259.

Michelle Obama and Dr. Jill Biden on how to recognize critical health issues and ensure high quality care for veterans. To fulfill its pledge, Sullivan on behalf of the Academy launched the initiative entitled *Have you Ever Served in the Military?* on September 2, 2013, in Nashville, Tennessee, with the endorsement of the National Association of State Directors of Veterans Affairs at its national conference. Ten State Directors of Veterans Affairs initially committed their states to receive tool kits to facilitate veterans' access to appropriate health care services; these included Connecticut, New York, Illinois, Idaho, New Jersey, New Hampshire, Texas, Rhode Island, Washington, and California.

The purpose of the initiative is to encourage all nurses to ask all patients the simple question, "*Have you ever served in the military?*" Changing the way nurses and other health care providers conduct health assessments of individuals, facilitates appropriate diagnoses and earlier treatment. "Fifty-six percent of community providers don't routinely ask their patients about being a current or former member of the armed forces or a family member," said Harold Kudler, Associate Director, VA Mid-Atlantic Health Care Network.²

The specific objectives of the Academy's initiative, *Have you ever served in the military?* are to:

- Increase appropriate access to health care services to individuals who have served in the military;
- Increase provider awareness of service-connected healthcare issues;
- Increase the number of nurses and other providers in the private sector screening patients for military service and completing military service histories;

² *Leading Nursing Organization to Improve Quality of Veterans' Healthcare.* Press Release, September 3, 2013. <http://haveyoueverserved.com/news>.

- Increase referrals to specialized services for further diagnostic testing, care and treatment with VA and/or other appropriate private sector providers; and
- Encourage the question be included in all health assessments and answer documented in the electronic health record.

Background on Opportunity for Academy to Address the Need

The mission of the American Academy of Nursing is to serve the public and nursing profession by advancing health policy and practice through the generation, synthesis, and dissemination of nursing knowledge.³ Academy fellows hold a broad range of leadership positions including university professors; research scientists; hospital chief executives and vice presidents; university deans; clinicians in practice, hospital, community and home health care settings; and political appointees or government staff at the state and federal levels. Fellows are selected from among their peers and represent the intellectual capital of the nursing profession.

The nationwide initiative Joining Forces was launched by First Lady Michelle Obama and Dr. Jill Biden in January 2011 as a call to the public and private sector to strengthen service members, veterans and their families through wellness, education, and employment opportunities.⁴ Early the next year, leaders of national nursing organizations including the CEO of the Academy and nursing schools were encouraged to pledge to work cooperatively with Joining Forces on behalf of veterans and their families. Those organizations who committed to signing the pledge, were invited to send their President or CEO as a leadership representative to meet with Michelle Obama and Jill Biden at the University of Pennsylvania on April 12, 2012.⁵ Sullivan represented the American Academy of Nursing at the meeting.

³ www.AANnet.org.

⁴ The White House, Office of the First Lady. <http://www.whitehouse.gov/joiningforces/about>.

⁵ The White House, Office of the First Lady. America's Nurses Join Forces with the First Lady and Dr. Biden to support Veterans and Military Families. Press release, April 11, 2012.

Academy Fellow Linda Schwartz, then Commissioner of Connecticut Department of Veterans Affairs (and later appointed by President Obama to be the Assistant Secretary for Policy and Planning of the U.S. Department of Veterans Affairs), proposed to Sullivan the approach underway in the state of Connecticut of encouraging all health providers, particularly nurses, to ask patients the simple question, “*Have you ever served in the military?*” Building on Sullivan’s research on the challenges of servicemembers exposed to Agent Orange and sodium dichromate, the Congressional legislation previously drafted on *Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act of 2009*, and the Joining Forces pledge, the Academy’s campaign to encourage health care providers to ask about their patients’ military background was launched with the Board of Directors’ approval.

Funding for *Have you ever served in the military?*

Under Sullivan’s leadership, \$276,016 was awarded from public and private grants. Funders included the Bob Woodruff Foundation, the Military Order of the Purple Heart, the Veterans Support Foundation, the Chamberlain College of Nursing, and the Connecticut Department of Veterans’ Affairs. The funding was used to develop and disseminate the clinician pocket card to guide providers on common military health risks, to launch the mobile optimized website, and for outreach to government officials at the federal and state levels.

Initiative Overview

The December 2017 detailed overview of the American Academy of Nursing’s, *Have You ever Served in the Military?* initiative is provided in the Supplemental Materials.

“We can do this. In every community, every day, we can find concrete ways to show our military families the respect and gratitude that each of us holds for them in our hearts. They deserve our support long after the welcome home ceremonies are over. You don’t have to come

from a military family, have a base in your community, or be an expert in military issues to make a difference. Every American can do something.” Michelle Obama and Jill Biden⁶

Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act of 2009

Health Care for Veterans Exposed to Chemical Hazards Act of 2009

Indiana Senator Evan Bayh introduced in the 111th Congress S. 642, *Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act of 2009* on March 19, 2009 and S. 1779, *Health Care for Veterans Exposed to Chemical Hazards Act of 2009* on October 14, 2009. Cheryl G. Sullivan was the Deputy Chief of Staff for Policy for Senator Bayh.

Background on Opportunity

The legislation was in response to health problems of National Guardsmen from Indiana, Oregon, West Virginia and South Carolina who were exposed to sodium dichromate at the Qarmat Ali water treatment plant in Basrah, Iraq in 2003. Senator Evan Bayh from the State of Indiana and a member of the U. S. Senate Armed Services Committee, expressed outrage that “it took more than five years and a hearing by the committee for the army to begin to notify those exposed at Qarmat Ali. Even more unsettling is the continued reluctance of the VA to provide care to soldiers who are suffering painful injuries because of their exposure to this toxic chemical.”⁷

In researching the issues of the sodium dichromate exposure, similarities in risk assessment and risk management to the Agent Orange exposure became apparent. The Senator in September 2008 requested Secretary of Defense Robert Gates to “further investigate whether members of the Indiana National Guard were properly tested for hexavalent chromium exposure

⁶ The White House. *Strengthening our Military Families*. January 14, 2011.

⁷ Senator Evan Bayh. *Indiana Soldiers Exposed to Toxic Chemicals in Iraq Deserve Expanded VA Care*. Press Release, August 3, 2009.

during 2003 tour of duty at the Qarmat Ali Water Treatment Plant in Iraq.”⁸ In response, the Secretary of the Army Pete Geren responded that the “Army Review Panel will address these policy and procedures for hazardous exposure and post deployment health assessment. It will review the actions taken to identify and follow up on the military and DoD personnel who may have been exposed, including the members of the Indiana Army National Guard. Finally, the Panel will determine whether the U.S. Army Corps of Engineers exercised appropriate contract administration and oversight of Kellogg, Brown, and Root Services.”⁹

Senate Legislation

The legislation “is guided by our government’s response to Agent Orange in Vietnam, when we shifted the evidentiary burden so veterans placed at risk did not bear the burden of proof if future health conditions developed.”¹⁰ The components of the legislation include a registry for servicemembers exposed to hazardous chemicals, an authorization for scientific reviews of evidence by the Institute of Medicine linking exposure to adverse health effects, and a veterans’ own report of exposure barring evidence to the contrary as sufficient proof to receive appropriate health care. In addition, it requires notification to the servicemember who may have been exposed in the line of duty as well as to the commanding officer of the unit to which such member belonged at the time of exposure.

S. 642 and S. 1779 introduced in the 111th Congress are provided in the Supplemental Materials.

⁸ Evan Bayh. Letter to Robert Gates, September 12, 2008.

⁹ Pete Geren. Letter to Evan Bayh. September 22, 2008.

¹⁰ Senator Evan Bayh. *Indiana Soldiers Exposed to Toxic Chemicals in Iraq Deserve Expanded VA Care*. Press Release, August 3, 2009.

SUPPLEMENTAL MATERIALS



AMERICAN ACADEMY OF NURSING *Have You Ever Served in the Military?* December 2017

Have You Ever Served in the Military? was launched in September 2013 as the Academy's commitment to First Lady Michelle Obama's Joining Forces campaign. Established in collaboration with the National Association of State Directors of Veterans Affairs, the initiative seeks to improve Veteran health by encouraging private providers to ask for and document their patients' military histories and to empower Veterans to speak up and share their service histories with their providers. The goal of the initiative is for the question *Have You Ever Served in the Military?* to be asked by civilian providers in all 50 states to improve the health of America's Veterans.

Objectives: The objectives of the initiative are to:

- a. Increase appropriate access to health care services to individuals who have served in the military;
- b. Increase provider awareness of service-connected health-care issues;
- c. Increase the number of nurses and other providers in the private sector screening patients for military service and completing military service histories;
- d. Increase referrals to specialized services for further diagnostic testing, care and treatment with VA and/or other appropriate private sector providers.
- e. Encourage the question be included in all health assessments and answer documented in the electronic health record.

Background: With approximately 69% of Veterans receiving care from private practitioners who often lack knowledge of their patients' service history and the unique health risks associated with that service, the Academy identified a significant gap in care that required immediate attention. Asking and answering the question, *Have you or has someone close to you ever served in the military?*, results in valuable health information being included in a patient's medical record and decreases the time of diagnosis, the initiation of treatment, and referral to the VA or other specialized providers.

Often, Veterans themselves are unaware of some of the risk factors and related illnesses caused by exposure to occupational and environmental hazards. Because eligibility for care in the VA Health Care System is based on service related disabilities and illnesses that have been deemed to be related to military service or income levels, it is critical that Veterans be timely identified by health care providers, have complete and accurate military history records taken, and obtain comprehensive medical examinations which may reveal a disability or illness which requires special attention and care, as well as potentially qualify them for assistance from the VA.

Toolkit. The primary means of achieving and implementing this fundamental improvement in Veterans' health has been through the dissemination of the Academy designed clinician pocket card. The pocket card

gives nurses and other providers a road map to follow in order to improve Veteran care. The first essential step in this process is knowing to ask the question, *Have You Ever Served in the Military?*

AMERICAN ACADEMY OF NURSING
transforming health policy and practice through nursing knowledge

**MILITARY HEALTH HISTORY
POCKET CARD FOR CLINICIANS**

HAVE YOU EVER SERVED?

www.HAVEYOUEVERSERVED.COM

Have You Ever Served in the Military?
 Managed and designed by the American Academy of Nursing, *Have You Ever Served in the Military?* is an awareness initiative to improve veterans' health. The initiative is the Academy's commitment to First Lady Michelle Obama and Dr. Jill Biden's Joining Forces campaign. *Have You Ever Served in the Military?* will fundamentally change the manner in which nurses and other health care providers conduct health assessments of individuals who have served in the uniformed military.

Nurses—health care's equivalent to the boots on the ground—are uniquely positioned to facilitate this change and ensure that vital information is obtained and recorded to improve the health care provided to our veterans and their families.

To learn how you can be more involved, visit HaveYouEverServed.com.

INITIATIVE SPONSORS:

ROB WOODRUFF FOUNDATION
 CHAMBERLAIN College of Nursing
 VETERANS SUPPORT
 AMERICAN ACADEMY OF NURSING

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Suicide Risk
 Certain observable cues (affective and behavioral) should prompt the clinician to remain alert to the possible presence of suicidal ideation:
 • shame • profound social withdrawal
 • humiliation • neglecting personal welfare
 • irrational thinking • deteriorating physical appearance
 • feeling trapped
 • paranoia • feeling like there's no way out
 • agitation • feeling that life is not worth living
 • anxiety • feeling like there is no purpose in life
 • insomnia • feelings of failure or decreased performance
 • irritability • despair • sense of hopelessness or desperation

Common Military Health Risks

Radiation Exposure/Nuclear Weapons (WWII: Amchitka, Alaska; Hiroshima, Nagasaki; POW in Japan, Korea; sub-mariners exposed to nasopharyngeal radium treatment; Gulf Wars; Bosnia; Afghanistan): High risk for cancer.

Agent Orange Exposure (Korea & Vietnam): High risk for cancers including respiratory and prostate cancers, chloracne, type 2 diabetes, ischemic heart disease, soft tissue sarcoma, peripheral neuropathy, spina bifida in veterans' biological children.

Camp Lejeune Water Contamination (January 1, 1957–December 31, 1987): Veterans and families stationed at Camp Lejeune exposed to chemical contaminants in the groundwater and wells are at risk for the following cancers (bladder, blood dyscrasia, breast, esophageal, kidney, leukemia, lung, multiple myeloma, myelodysplastic syndromes, non-Hodgkin's lymphoma) and conditions (female infertility, hepatic steatosis, miscarriage, renal toxicity, scleroderma).

Hepatitis C (Vietnam): Transfusions prior to 1992, battlefield exposures to blood and human fluids, group use of needles, razors, toothbrushes, and other personal items.

Exposure to Open Air Burn Pits (Vietnam, Iraq, Afghanistan): High risk for respiratory illnesses and wide variety of cancers, including leukemia.

Gulf War Syndrome (Gulf Wars): Characterized by fibromyalgia, chronic fatigue syndrome, headaches, gastrointestinal problems, cognitive impairment and pain, high rates of brain and testicular cancers, and neurodegenerative diseases (ALS, MS).

Depleted Uranium (Gulf Wars, Bosnia, Afghanistan): Inhaled or ingested microfine particles (heavy metal toxicity). Risk for respiratory and kidney diseases.

Infectious Diseases (Iraq & Afghanistan): Malaria, typhoid fever, viral hepatitis, leishmaniasis, TB, rabies resulting from animal bites.

General Areas of Concern for All Veterans

Post-Traumatic Stress
 • Have you ever experienced a traumatic or stressful event which caused you to believe your life or the lives of those around you were in danger?
 • Experiencing trauma-related thoughts or feelings?
 • Having nightmares, vivid memories or flashbacks of the event?
 • Feeling anxious, jittery?
 • Experiencing a sense of panic that something bad is about to happen?
 • Having difficulty sleeping or concentrating?

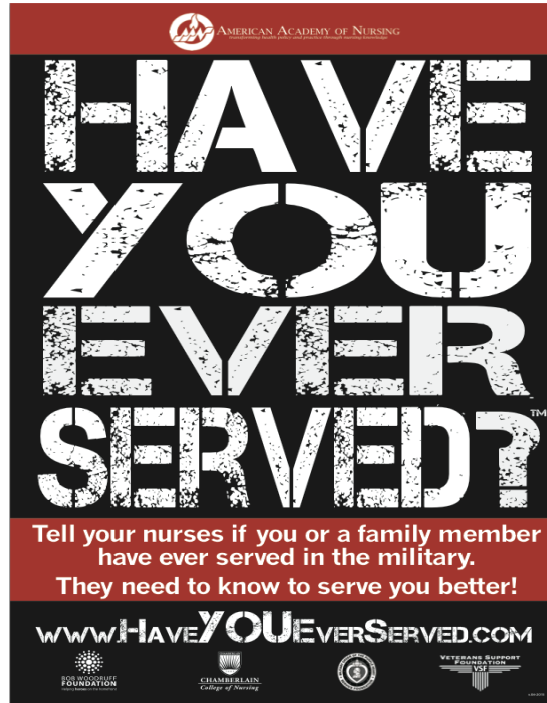
Military Sexual Trauma
 • During military service did you receive unwanted or unwanted sexual attention, such as touching, pressure for sexual favors or sexual remarks?
 • Did anyone ever use force or threat of force to have sexual contact with you against your will?
 • Did you report the incidents to your command and/or military or civilian authorities?

Blast Concussions/Traumatic Brain Injury
 • During your service, did you experience ...
 • heavy artillery fire, vehicular or aircraft accidents, explosions (improvised explosive devices, rocket-propelled grenades, land mines, grenades), or fragment or bullet wounds above the shoulders?
 • Did you have any of these symptoms immediately afterwards ...
 • loss of consciousness or being knocked out, being dazed or seeing stars, not remembering the event, or diagnosis of concussion or head injury?

Veterans Crisis Line
 1-800-273-8255 PRESS 1

The initiative has been successful in educating providers on the importance of asking this question. When a patient answers in the affirmative, the pocket card then guides the nurse/provider through a series of questions that ultimately leads to critical information, previously unknown, being included in the patient's medical record. From this juncture, appropriate care or referrals to specialized services through the VA or the private sector may be made to meet the health needs of the Veteran.

In addition to the clinician pockets cards, the Academy has designed a poster (please see below), a Veteran information card, and a power point presentation.



Web Site and Mobile Optimized Website. The Academy's website, www.HaveYouEverServed.com, provides important information about the initiative for both Veterans and health providers, from samples of the clinician pocket cards, to links to helpful referral services such as the Veterans' Crisis Line, Military Records, and State Directors of Veterans' Affairs. A mobile optimized website is being refined with links to the Academy's website so that Veterans and providers may view the information together during a visit, or at other convenient times throughout the day when a question arises.

Outreach to Federal Government.

The Academy has been working with the U.S. Public Health Service, CDC, NIOSH to ensure the inclusion of military history in the Occupational Data for Health (ODH) Information Model for electronic health information systems. In addition, in April of 2017, the Academy contacted Donald Rucker, MD, the National Coordinator for the Office of the National Coordinator for Health Information Technology at the U.S. Department of Health and Human Services urging the inclusion of military service in electronic health records.

Outreach to State Governments.

In 2015, the Academy provided sixty-four nurses serving as elected state legislators with information on *Have You Ever Served in the Military?* The Connecticut State Legislature's enactment of Public Law No. 14-141, effective October 1, 2014, requiring hospitals to ask every patient admitted whether he or she is a Veteran, was brought to their attention by providing a copy of the legislation.

Accomplishments: *Have You Ever Served in the Military?* has been launched in all 50 states and disseminated to thousands of providers and individuals/organizations focused on Veteran care, including:

- 143 CNOs in health systems,
- 792 leaders of community mental health centers,
- 28 VetSuccess on campus coordinators,
- 85 C/SNA leadership in all states,
- 4429 CNO's of FQHC's,
- 161 Indian Health Service facilities,
- 14 Indian Health Service Regional Directors,
- 49 nursing organizations' CEOs and Presidents,
- 2422 fellows of the Academy.

Knowing that Veteran health care concerns are not addressed solely within the confines of an exam room, the Academy has collaborated with individuals and organizations in a position to amplify the importance of *Have You Ever Served in the Military?*, including:

- Commissioners of State Departments of Veteran Affairs
- State elected officials who are nurses
- White House Joining Forces contacts
- Federal VA office contacts
- U.S. Department of Health and Human Services
- National Institute of Occupational Safety and Health

Outreach. In addition to the Academy's nationwide dissemination to identified providers and organizations, approximately 9000 clinician pocket cards and other initiative materials have been provided to individuals and organizations representing nurse practitioners, medical centers, primary care providers, mental health providers, nursing schools, physicians, Veteran advocacy organizations, Veteran care facilities, Veteran research organizations, state boards of nursing, and state legislators. Below is a sample of recipients:

- Daun I. Barrett, RN, Griffin Hospital, Connecticut
- Penelope R. Buschman, MS, RN, PMHCNS-BC, FAAN, Assistant Professor of Nursing at CUMC, Director of the Psychiatric Nurse Practitioner Program, Columbia University School of Nursing New York
- Corinne Chacon, Director of Community Initiatives, State Senator Jose Rodriguez, Texas
- John Cordova, RN, Men in Nursing, California
- Sasha E. Eckley, RN, Patient Care Services/Mental Health, Iowa City VA Health Care System, Iowa
- Robyn Hawley, LCSW, Catholic Charities, Director of Behavioral Health, Archdiocese of Hartford, Connecticut
- Katheren Koehn, MA, RN, Executive Director, Minnesota Organization of Registered Nurses, Minnesota

- Mildred Kowalski, RN, PhD, Nurse Researcher, Morristown Medical Center, New Jersey
- Maureen A. Merkl, MSN, RN, CCNS, CEN, CRRN, CCM, Federal recovery Coordinator, Walter Reed National Military Medical Center, Maryland
- Robert E. Obana, Executive Director/CEO, NCIRE – The Veterans Health Research Institute, California
- Pamela Rasada, RN, PHN, California ICV-Health Work Group, Interagency Council on Veterans, California
- Amanda L. Schuh, C.N.P., Psychiatric Nurse Practitioner, Outpatient Psychiatry, Mayo Clinic Health System, Minnesota
- Kimberly Adams Tufts, ND, WHNP-BC, FAAN, Old Dominion University, School of Nursing, Virginia
- Nancy Vosbrink, Community Educator, Hospice and Palliative Care of St. Lawrence Valley, New York

In addition, a number of states have asked that the clinician pocket cards be personalized with its specific outreach information. The Academy was pleased to provide personalized cards to the following states:

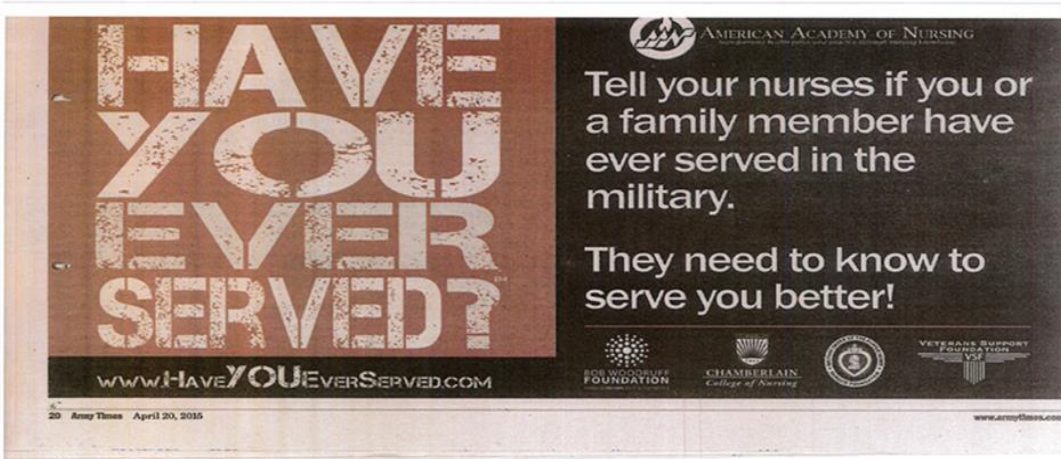
- California
- Connecticut
- Idaho
- Illinois
- New Hampshire
- New Jersey
- New York
- Rhode Island
- Texas
- Washington

Many organizations also reached out to the Academy requesting an Academy fellow speak on behalf of the initiative. These include:

- The State of California through the Interagency Council on Veterans (ICV), an organization established by the Executive Order of Governor Brown, has expressed much interest in further partnering with the Academy on the initiative. Academy fellow Mary Sullivan presented at its April meeting.
- The Health Workforce Initiative of the California Community College Economic and Workforce Development Program extended an invitation for an Academy Fellow to speak at its “Men in Nursing” Conference on May 16-17, 2014, in Garden Grove, CA. Fellow William Bester, inducted into the Academy October 2014, presented.
- The Director of Administration for the Missouri Coalition of Community Mental Health Centers in Jefferson City requested an Academy speaker to meet with the clinical directors of the community mental health centers on July 23, 2014.

- Dr. Linda Schwartz, VA Assistant Secretary for Policy and Planning, and fellow of the Academy, presented *Have You Ever Served in the Military?* before an audience of approximately 200 individuals including RN's, NP's, MD's, social workers and mental health professionals from the UAB Hospital, the VA Hospital in Birmingham, and other medical clinics and practices in Central Alabama.
- The DBHDD's Jail Diversion Trauma Recovery Program with Priority to Veterans and in partnership with Georgia's Judicial Council/Administrative Office of the Courts' Annual Accountability Courts Conference requested a speaker for September 14-17, 2014; presented by fellow Peggy Wilmoth.

The Academy also placed print ads in 700 community newspapers with a combined circulation of over 11 million; the Army Times newspaper in April 2015 (circulation 80,000); the United States Naval Academy's *Shipmate* magazine November/December 2016 Issue (circulation 53,000); and the United States Merchant Marine Academy's *Kings Pointer* magazine Fall 2016 Homecoming Issue (circulation 18,000).



Additional articles featuring *Have You Ever Served in the Military?* have appeared in various publications including:

- A January 23, 2015 article appearing in dcmilitary.com, entitled, 'Have You Ever Served' A simple Question with Far-Reaching Impact.
- The New York Times published a letter from the Academy president (Diana Mason) and the past president of the National Association of State Directors of Veteran Affairs (Linda Schwartz) on May 22, 2014. They noted the importance of making clinicians and Veterans aware of service-related health risks.
- The Hartford Courant and C-HIT published an article (<http://c-hit.org/2014/06/19/to-improve-patient-care-ct-hospitals-will-ask-are-you-a-veteran/>) discussing a new CT law to take effect Oct. 1, 2014 and *Have You Ever Served in the Military?*

- The Connection Newspapers published an article “Health Initiative Focuses on Veterans” by Ashley Simpson on December 2, 2014, highlighting Chamberlain College of Nursing in Arlington, VA teaching health care providers to ask about patients’ military backgrounds.
- The American Nurse Today published in its March 2014 magazine, “A Powerful Question: Have you ever served in the military?” by Pamela F. Cipriano, President of the ANA.

National Advisory Council. Within a short period of time, *Have You Ever Served in the Military?* has raised civilian provider awareness of Veterans health issues to new heights. To ensure continued progress and success, the Academy launched a National Advisory Council in 2015 charged with providing guidance, direction, and public awareness of the goals and objectives for *Have You Ever Served in the Military?*

Blog Archives

Leading Nursing Organization to Improve Quality of Veterans' Healthcare

Have you ever served in the military? is a simple but very important question that nurses and other healthcare providers will now be asking their patients. Military service members may have been exposed to environments that could lead to adverse health risks—risks that healthcare providers need to know to serve veterans better.

On Labor Day, Cheryl Sullivan, the CEO of the American Academy of Nursing, announced at the National Association of State Directors of Veterans Affairs (NASDVA) conference a new awareness campaign to improve the health of veterans. The campaign, "*Have you ever served in the military?*," encourages healthcare providers to ask about their patients' military background.

"This single question, 'Have you ever served in the military?'," asserts Linda Schwartz, a fellow in the Academy and commissioner of the Connecticut Department of Veteran's Affairs, "can be the key to timely and adequate assessments, diagnosis, and treatment."

Less than 20% of all veterans receive care within the VA healthcare system. Harold Kudler, MD, associate director, VA Mid-Atlantic Health Care Network Mental Illness Research, Education and Clinical Center, noted that "56% of community providers don't routinely ask their patients about being a current or former member of the armed forces or a family member." While VA healthcare providers may be familiar to military-related occupational and environmental hazards, many civilian healthcare providers may not be fully aware. Through *Have you ever served in the military?*, the American Academy of Nursing seeks to address these major gaps in veterans' healthcare.

NASDVA, which represents all US states and territories, endorsed *Have you ever served in the military?*. The NASDVA resolution states that this campaign "will ultimately raise the quality of health assessments and, most importantly, appropriate diagnosis and treatment of the military members." (<http://bit.ly/AAN-NASDVA>)

Have You Ever Served in the Military? represents the Academy's commitment to former First Lady Michelle Obama and Dr. Jill Biden's Joining Forces campaign, which mobilized all sectors of the community to support Veterans and their families. Nurses, healthcare's equivalent to the boots on the ground, are uniquely positioned to facilitate a fundamental change in care which ensures vital military service information is obtained and recorded in order to improve the quality of healthcare provided to our Veterans and their families.

One example of a Veteran health risk not common to civilians: Veterans returning from Iraq and Afghanistan, who worked or slept near open-air burn pits, may have been exposed to multiple toxins. These toxins can lead to an increased risk for respiratory illnesses and a variety of cancers, including leukemia.

Nurses and other healthcare providers are given a pocket card listing the most common health concerns linked to military service, as well as questions the provider should ask the Veteran or his or her family member in order to obtain a more complete military medical history. This information assists providers in identifying possible health factors or illnesses related to service, and decreases the time between diagnosis and treatment.

In 2013, the Academy, with the endorsement and assistance of the National Association of State Directors of Veterans Affairs (NASDVA), launched *Have You Ever Served in the Military?* in 10 states: Alabama, California, Connecticut, Florida, Illinois, New Jersey, Ohio, Texas, Virginia, and Washington. By April 2015, *Have You Ever Served in the Military?* was rolled out in all 50 states.

#

For more information, visit www.HaveYouEverServed.com.

About the Academy

The American Academy of Nursing (www.AANnet.org) serves the public and the nursing profession by advancing health policy and practice through the generation, synthesis, and dissemination of nursing knowledge. The Academy's more than 2,000 fellows are nursing's most accomplished leaders in education, management, practice, and research. They have been recognized for their extraordinary contributions to nursing and health care. Over 75 Academy fellows have served or currently serve in the uniformed military.

111TH CONGRESS
1ST SESSION

S. 642

To require the Secretary of Defense to establish registries of members and former members of the Armed Forces exposed in the line of duty to occupational and environmental health chemical hazards, to amend title 38, United States Code, to provide health care to veterans exposed to such hazards, and for other purposes.

IN THE SENATE OF THE UNITED STATES

MARCH 19, 2009

Mr. BAYH (for himself, Mr. MERKLEY, Mr. BYRD, Mr. DOBGAN, Mr. WYDEN, and Mr. LUGAR) introduced the following bill; which was read twice and referred to the Committee on Armed Services

A BILL

To require the Secretary of Defense to establish registries of members and former members of the Armed Forces exposed in the line of duty to occupational and environmental health chemical hazards, to amend title 38, United States Code, to provide health care to veterans exposed to such hazards, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

1 **SECTION 1. SHORT TITLE.**

2 This Act may be cited as the “Health Care for Mem-
3 bers of the Armed Forces Exposed to Chemical Hazards
4 Act of 2009”.

5 **SEC. 2. ESTABLISHMENT OF REGISTRIES OF MEMBERS AND**
6 **FORMER MEMBERS OF THE ARMED FORCES**
7 **EXPOSED IN LINE OF DUTY TO OCCUPA-**
8 **TIONAL AND ENVIRONMENTAL HEALTH**
9 **CHEMICAL HAZARDS.**

10 (a) **ESTABLISHMENT.**—For each occupational and
11 environmental health chemical hazard of particular con-
12 cern, the Secretary of Defense shall establish and admin-
13 ister a registry of members and former members of the
14 Armed Forces who were exposed in the line of duty to
15 such hazard on or after September 11, 2001.

16 (b) **REGISTRATION.**—For every member and former
17 member of the Armed Forces who was exposed in the line
18 of duty to a hazard described in subsection (a), the Sec-
19 retary shall—

20 (1) register such member or former member in
21 such registry; and

22 (2) collect such information about such member
23 or former member as the Secretary considers appro-
24 priate for purposes of establishing and administering
25 such registry.

1 (c) NOTIFICATION.—In the case that the Secretary
2 learns that a member or former member of the Armed
3 Forces may have been exposed in the line of duty to a
4 hazard described in subsection (a), the Secretary shall—

5 (1) notify of such exposure—

6 (A) such member or former member;

7 (B) the commanding officer of the unit to
8 which such member or former member belonged
9 at the time of such exposure; and

10 (C) in the case of a member of the Na-
11 tional Guard, the Adjutant General of the State
12 concerned; and

13 (2) inform such member or former member that
14 such member or former member may be included in
15 the registry required by subsection (a) for such haz-
16 ard.

17 (d) EXAMINATION.—Not later than 30 days after the
18 date on which the Secretary becomes aware of an exposure
19 of a member or former member of the Armed Forces to
20 a hazard described in subsection (a) and annually there-
21 after, the Secretary shall provide such member or former
22 member—

23 (1) a complete physical and medical examina-
24 tion;

1 (2) consultation and counseling with respect to
2 the results of such physical and examination; and

3 (3) a copy of the documentation of such expo-
4 sure in the member's or former member's medical
5 record maintained by the Department of Defense.

6 (e) OCCUPATIONAL AND ENVIRONMENTAL HEALTH
7 CHEMICAL HAZARD OF PARTICULAR CONCERN DE-
8 FINED.—In this section, the term “occupational and envi-
9 ronmental health chemical hazard of particular concern”
10 means an occupational and environmental health chemical
11 hazard that the Secretary of Defense determines is of par-
12 ticular concern after considering appropriate guidelines
13 and standards for exposure, including the following:

14 (1) The military exposure guidelines specified in
15 the January 2002 Chemical Exposure Guidelines for
16 Deployed Military Personnel, United States Army
17 Center for Health Promotion and Preventive Medi-
18 cine Technical Guide 230 (or any successor technical
19 guide that establishes military exposure guidelines
20 for the assessment of the significance of field expo-
21 sures to occupational and environmental health
22 chemical hazards during deployments).

23 (2) Occupational and environmental health
24 chemical exposure standards promulgated by the Oc-
25 cupational Safety and Health Administration.

1 **SEC. 3. SCIENTIFIC REVIEW OF ASSOCIATION OF INCI-**
2 **DENTS OF EXPOSURE TO OCCUPATIONAL**
3 **AND ENVIRONMENTAL HEALTH CHEMICAL**
4 **HAZARDS WITH HEALTH CONSEQUENCES.**

5 (a) AGREEMENT.—

6 (1) IN GENERAL.—The Secretary of Defense
7 shall seek to enter into an agreement with the Insti-
8 tute of Medicine of the National Academies for the
9 Institute of Medicine to perform the services covered
10 by this section.

11 (2) TIMING.—The Secretary shall seek to enter
12 into the agreement described in paragraph (1) not
13 later than two months after the date of the enact-
14 ment of this Act.

15 (b) REVIEW OF SCIENTIFIC EVIDENCE.—Under an
16 agreement between the Secretary of Defense and the Insti-
17 tute of Medicine under this section, the Institute of Medi-
18 cine shall, for each incident of exposure involving one or
19 more members of the Armed Forces reported in a registry
20 established under section 2(a) to an occupational and envi-
21 ronmental health chemical hazard of particular concern,
22 review and summarize the scientific evidence, and assess
23 the strength thereof, concerning the association between
24 the exposure to such hazard and acute and long-term
25 health consequences of such exposure.

1 (c) SCIENTIFIC DETERMINATIONS CONCERNING
2 HEALTH CONSEQUENCES.—

3 (1) IN GENERAL.—For each incident of expo-
4 sure reviewed under subsection (b), the Institute of
5 Medicine shall determine (to the extent that avail-
6 able scientific data permit meaningful determina-
7 tions)—

8 (A) whether a statistical association with
9 the acute and long-term health consequences
10 exists, taking into account the strength of the
11 scientific evidence and the appropriateness of
12 the statistical and epidemiological methods used
13 to detect the association; and

14 (B) whether there exists a plausible bio-
15 logical mechanism or other evidence of a causal
16 relationship between the occupational and envi-
17 ronmental health chemical hazard and the
18 health consequences.

19 (2) DISCUSSION AND REASONING.—The Insti-
20 tute of Medicine shall include in its reports under
21 subsection (f) a full discussion of the scientific evi-
22 dence and reasoning that led to its conclusions
23 under this subsection.

24 (d) RECOMMENDATIONS FOR ADDITIONAL SCI-
25 ENTIFIC STUDIES.—

1 (1) IN GENERAL.—The Institute of Medicine
2 shall make any recommendations it has for addi-
3 tional scientific studies to resolve areas of continuing
4 scientific uncertainty relating to exposure to occupa-
5 tional and environmental health chemical hazards of
6 particular concern.

7 (2) CONSIDERATIONS.—In making rec-
8 ommendations for further study, the Institute of
9 Medicine shall consider the following:

10 (A) The scientific information that is cur-
11 rently available.

12 (B) The value and relevance of the infor-
13 mation that could result from additional stud-
14 ies.

15 (e) SUBSEQUENT REVIEWS.—The agreement under
16 subsection (a) shall require the Institute of Medicine—

17 (1) to conduct periodically as comprehensive a
18 review as is practicable of the evidence referred to
19 in subsection (b) that has become available since the
20 last review of such evidence under this section; and

21 (2) to make its determinations and estimates on
22 the basis of the results of such review and all other
23 reviews conducted for the purposes of this section.

24 (f) REPORTS.—

25 (1) REPORTS TO CONGRESS.—

1 (A) IN GENERAL.—The agreement under
2 subsection (a) shall require the Institute of
3 Medicine to submit, not later than the end of
4 the 18-month period beginning on the date of
5 the enactment of this Act and not less fre-
6 quently than once every two years thereafter, to
7 the appropriate committees of Congress a re-
8 port on the activities of the Institute of Medi-
9 cine under the agreement.

10 (B) CONTENTS.—The report described in
11 subparagraph (A) shall include the following:

12 (i) The determinations and discussion
13 referred to in subsection (c).

14 (ii) Any recommendations of the Insti-
15 tute of Medicine under subsection (d).

16 (2) REPORTS TO SECRETARY OF DEFENSE.—
17 The agreement under subsection (a) shall require
18 the Institute of Medicine, in the case that the Insti-
19 tute of Medicine makes any conclusive determination
20 under subsection (c)(1) with respect to any incident
21 of exposure studied under subsection (b), to submit,
22 not later than 30 days after the date of such deter-
23 mination, to the Secretary of Defense a report de-
24 scribing such determination.

1 (g) NOTICE TO MEMBERS AND FORMER MEMBERS
2 OF THE ARMED FORCES.—The Secretary of Defense shall
3 notify members and former members of the Armed Forces
4 listed in a registry established under section 2(a) for expo-
5 sure to an occupational and environmental health chemical
6 hazard of particular concern of—

7 (1) any conclusive determinations made with re-
8 spect to such exposure under subsection (c)(1); and

9 (2) any other significant developments in re-
10 search on the health consequences of exposure to
11 such hazard.

12 (h) LIMITATION ON AUTHORITY.—The agreement
13 under this section shall be effective for a fiscal year to
14 the extent that appropriations are available to carry out
15 the agreement.

16 (i) SUNSET.—This section shall cease to be effective
17 10 years after the last day of the fiscal year in which the
18 Institute of Medicine submits to the Secretary of Defense
19 the first report under subsection (f).

20 (j) ALTERNATIVE CONTRACT SCIENTIFIC ORGANIZA-
21 TION.—

22 (1) IN GENERAL.—If the Secretary of Defense
23 is unable within the time period prescribed in sub-
24 section (a)(2) to enter into an agreement described
25 in subsection (a)(1) with the Institute of Medicine

1 on terms acceptable to the Secretary, the Secretary
2 shall seek to enter into such an agreement with an-
3 other appropriate scientific organization that—

- 4 (A) is not part of the Government;
- 5 (B) operates as a not-for-profit entity; and
- 6 (C) has expertise and objectivity com-
7 parable to that of the Institute of Medicine.

8 (2) TREATMENT.—If the Secretary enters into
9 an agreement with another organization as described
10 in paragraph (1), any reference in this section to the
11 Institute of Medicine shall be treated as a reference
12 to the other organization.

13 (k) DEFINITIONS.—In this section:

14 (1) APPROPRIATE COMMITTEES OF CON-
15 GRESS.—The term “appropriate committees of Con-
16 gress” means—

17 (A) the Committee on Armed Services, the
18 Committee on Veterans’ Affairs, and the Com-
19 mittee on Appropriations of the Senate; and

20 (B) the Committee on Armed Services, the
21 Committee on Veterans’ Affairs, and the Com-
22 mittee on Appropriations of the House of Rep-
23 resentatives.

24 (2) OCCUPATIONAL AND ENVIRONMENTAL
25 HEALTH CHEMICAL HAZARD OF PARTICULAR CON-

1 CERN.—The term “occupational and environmental
2 health chemical hazard of particular concern” means
3 an occupational and environmental health chemical
4 hazard that the Secretary of Defense determines is
5 of particular concern after considering appropriate
6 guidelines and standards for exposure, including the
7 following:

8 (A) The military exposure guidelines speci-
9 fied in the January 2002 Chemical Exposure
10 Guidelines for Deployed Military Personnel,
11 United States Army Center for Health Pro-
12 motion and Preventive Medicine Technical
13 Guide 230 (or any successor technical guide
14 that establishes military exposure guidelines for
15 the assessment of the significance of field expo-
16 sures to occupational and environmental health
17 chemical hazards during deployments).

18 (B) Occupational and environmental health
19 chemical exposure standards promulgated by
20 the Occupational Safety and Health Adminis-
21 tration.

1 SEC. 4. REVISION IN AUTHORITIES FOR PROVISION OF
2 HEALTH CARE FOR CERTAIN VETERANS EX-
3 POSED TO OCCUPATIONAL AND ENVIRON-
4 MENTAL HEALTH CHEMICAL HAZARDS.

5 (a) AUTHORIZED INPATIENT CARE.—Section
6 1710(e) of title 38, United States Code, is amended—

7 (1) in paragraph (1), by adding at the end the
8 following:

9 “(F) A veteran who was exposed in the line of duty
10 to an occupational and environmental health chemical haz-
11 ard of particular concern is eligible (subject to paragraph
12 (2)) for hospital care, medical services, and nursing home
13 care under subsection (a)(2)(F) for any disability, not-
14 withstanding that there is insufficient medical evidence to
15 conclude that such disability may be associated with such
16 exposure.”;

17 (2) in paragraph (2), by adding at the end the
18 following:

19 “(C) In the case of a veteran described in paragraph
20 (1)(F), hospital care, medical services, and nursing home
21 care may not be provided under subsection (a)(2)(F) with
22 respect to—

23 “(i) a disability that is found, in accordance
24 with guidelines issued by the Under Secretary for
25 Health, to have resulted from a cause other than an
26 exposure described in paragraph (1)(F); or

•S 642 IS

1 “(ii) a health effect for which the National
2 Academy of Sciences, in a report issued in accord-
3 ance with section 3 of the Health Care for Members
4 of the Armed Forces Exposed to Chemical Hazards
5 Act of 2009, has determined that there is limited or
6 suggestive evidence of the lack of a positive associa-
7 tion between occurrence of the health consequences
8 in humans and exposure to an occupational and en-
9 vironmental health chemical hazard of particular
10 concern.”; and

11 (3) in paragraph (4), by adding at the end the
12 following:

13 “(C) The term ‘occupational and environmental
14 health chemical hazard of particular concern’ means
15 an occupational and environmental health chemical
16 hazard that the Secretary of Defense determines is
17 of particular concern after considering appropriate
18 guidelines and standards for exposure, including the
19 following:

20 “(i) The military exposure guidelines speci-
21 fied in the January 2002 Chemical Exposure
22 Guidelines for Deployed Military Personnel,
23 United States Army Center for Health Pro-
24 motion and Preventive Medicine Technical
25 Guide 230 (or any successor technical guide

1 that establishes military exposure guidelines for
2 the assessment of the significance of field expo-
3 sures to occupational and environmental health
4 chemical hazards during deployments).

5 “(ii) Occupational and environmental
6 health chemical exposure standards promul-
7 gated by the Occupational Safety and Health
8 Administration.”.

9 (b) TECHNICAL AMENDMENT.—Section 1710(e)(4)
10 of such title is amended in the matter before subparagraph
11 (A) by striking “For purposes of this subsection—” and
12 inserting “In this subsection:”.

○

111TH CONGRESS
1ST SESSION

S. 1779

To amend title 38, United States Code, to provide health care to veterans exposed in the line of duty to occupational and environmental health chemical hazards, and for other purposes.

IN THE SENATE OF THE UNITED STATES

OCTOBER 14, 2009

Mr. BAYH (for himself, Mr. DORGAN, Mr. LUGAR, Mr. BYRD, Mr. SPECTER, Mr. ROCKEFELLER, Mr. MERKLEY, and Mr. WYDEN) introduced the following bill; which was read twice and referred to the Committee on Veterans' Affairs

A BILL

To amend title 38, United States Code, to provide health care to veterans exposed in the line of duty to occupational and environmental health chemical hazards, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the "Health Care for Vet-
5 erans Exposed to Chemical Hazards Act of 2009".

1 **SEC. 2. REVISION IN AUTHORITIES FOR PROVISION OF**
2 **HEALTH CARE FOR CERTAIN VETERANS EX-**
3 **POSED TO OCCUPATIONAL AND ENVIRON-**
4 **MENTAL HEALTH CHEMICAL HAZARDS.**

5 (a) **AUTHORIZED INPATIENT CARE.**—Section
6 1710(e) of title 38, United States Code, is amended—

7 (1) in paragraph (1), by adding at the end the
8 following:

9 “(F) A veteran who was exposed in the line of duty
10 to an occupational and environmental health chemical haz-
11 ard of particular concern is eligible (subject to paragraph
12 (2)) for hospital care, medical services, and nursing home
13 care under subsection (a)(2)(F) for any disability, not-
14 withstanding that there is insufficient medical evidence to
15 conclude that such disability may be associated with such
16 exposure.”;

17 (2) in paragraph (2), by adding at the end the
18 following:

19 “(C) In the case of a veteran described in paragraph
20 (1)(F), hospital care, medical services, and nursing home
21 care may not be provided under subsection (a)(2)(F) with
22 respect to—

23 “(i) a disability that is found, in accordance
24 with guidelines issued by the Under Secretary for
25 Health, to have resulted from a cause other than an
26 exposure described in paragraph (1)(F); or

•S 1779 IS

1 “(ii) a health effect for which the National
2 Academy of Sciences, in a report, has determined
3 that there is limited or suggestive evidence of the
4 lack of a positive association between occurrence of
5 the health consequences in humans and exposure to
6 an occupational and environmental health chemical
7 hazard of particular concern.”; and

8 (3) in paragraph (4), by adding at the end the
9 following:

10 “(C) The term ‘occupational and environmental
11 health chemical hazard of particular concern’ means
12 an occupational and environmental health chemical
13 hazard that the Secretary of Defense determines is
14 of particular concern after considering appropriate
15 guidelines and standards for exposure, including the
16 following:

17 “(i) The military exposure guidelines speci-
18 fied in the January 2002 Chemical Exposure
19 Guidelines for Deployed Military Personnel,
20 United States Army Center for Health Pro-
21 motion and Preventive Medicine Technical
22 Guide 230 (or any successor technical guide
23 that establishes military exposure guidelines for
24 the assessment of the significance of field expo-

1 sures to occupational and environmental health
2 chemical hazards during deployments).

3 “(ii) Occupational and environmental
4 health chemical exposure standards promul-
5 gated by the Occupational Safety and Health
6 Administration.”.

7 (b) TECHNICAL AMENDMENT.—Section 1710(e)(4)
8 of such title is amended in the matter before subparagraph
9 (A) by striking “For purposes of this subsection—” and
10 inserting “In this subsection:”.

○

Cheryl Gibson Sullivan

Education

Ph.D. O'Neill School of Public and Environmental Affairs, June 2020, Indiana University, Bloomington, Indiana.

Certificate. Program for Senior Executives in State and Local Government, summer, 1995. Harvard University, John F. Kennedy School of Government, Cambridge, Massachusetts.

M.S. Environmental Science, Environmental Health concentration, 1986. Indiana University, School of Public and Environmental Affairs, Bloomington, Indiana

B.S. Biological Sciences, 1974. University of Maryland, College Park, Maryland

Certification

Certified Association Executive (CAE) by the American Society of Association Executives (December 2017).

Professional and Academic Experience

American Academy of Nursing. Chief Executive Officer. (2010- 2018).

As the Chief Executive Officer for the American Academy of Nursing, was the chief spokesperson and policy liaison on behalf of the Academy with the executive and legislative branches of U.S. government, major policy organizations, the media, and foundations. Leads the Academy's role in examining and proposing public policies to enhance the quality of health, reduce health disparities and inequalities, shape healthy behaviors and environments, and strengthen the health delivery system.

Launched the Academy partnership with the National Association of State Departments of Veteran Affairs to improve the private sector's ability to assess military-related exposures to which veterans may have unknowingly been exposed; initiated the *Choosing Wisely* partnership with ABIM Foundation to reduce overused and costly treatments and procedures, launched the Institute for Nursing Leadership to place more highly qualified nurses on national and gubernatorial boards to drive positive change in health policy, and strengthened the *Raise the Voice* initiative on nurse-designed models of care to highlight the individual, family and community as the drivers of care. Works with twenty-four expert panels utilizing critical knowledge, analytical skills and policy networks to review the current research and issues and make recommendations on policy products or policy initiatives the Academy should undertake to transform healthcare policy and practice.

Crafted a development plan to increase unrestricted gifts, to designate restricted gifts, and to increase individual participation resulting in a 457% increase in gifts over seven years. Grants secured include from the Robert Wood Johnson Foundation with a subcontract to RAND, Bob

Woodruff Foundation, Military Order of the Purple Heart, Veterans Support Foundation, Pfizer, Eli Lilly, Hill-Rom, Independence Foundation, and the Jonas Center for Nursing and Veterans Healthcare.

Office of U.S. Senator Evan Bayh. Deputy Chief of Staff for Policy. (2005-2010).

As the primary advisor to the Senator on policy, was responsible for policy development for federal legislation and for policy documentation. Working with organizations, associations, and opinion leaders throughout the country, provided leadership in evaluating current federal policy and identifying, analyzing, and proposing new initiatives. Planned legislative strategy and prepare for Committee and floor debate. Legislation authored with the Senator includes the *All-Hazards Public Health Emergency and Bioterrorism Preparedness and Response Act*; the *Health Care for Members of the Armed Forces Exposed to Chemical Hazards Act*; *Management of Medication for Physically and Psychologically Wounded Military Personnel*; the *Nurses' Higher Education and Loan Repayment Act*; the *Responsible Fatherhood and Healthy Families Act*; the *Children's Health Care Quality Act*; and the *Breast Cancer Research and Screening Act*.

Indiana University-Purdue University Indianapolis. Vice Chancellor for External Affairs. (1997-2005).

Served as liaison between the IUPUI campus and its constituencies in federal, state and local government; business; and industry. A key advocate on funding a higher education policy worked closely with the Indiana Congressional delegation, the Indiana state legislature, and the central Indiana region to respond to legislation and new initiatives affecting Indiana University and the IUPUI campus. Responsible for overseeing the operations involved with government, community, and alumni relations; communications and marketing; and Division I intercollegiate athletics including fundraising. Appointed the chief strategist for external communications in 1997, was responsible for the development, implementation, and assessment of the comprehensive, integrated external relations plan to enhance IUPUI's visibility, reputation and stature while building community and public research university capacity.

As Vice Chancellor, worked with the Chancellor, Medical School Dean, and University President to garner statewide support for funding biomedical research resulting in a new \$50 million state appropriation; facilitated Congressional directed funding for education of minority students; advocated for \$3 million in federal funding for Area Health Education Centers; worked with the Chancellor to support the development of the Great Cities Universities core program; initiated the Chancellor's Report to the Community to provide accurate data to elected officials, community leaders, and donors; created marketing strategies which helped to set Spring 2003 record enrollment increase of 4.2%; and facilitated the design, development and market testing of the new Jaguars visual identity for the IUPUI campus.

State of Indiana. Family and Social Services Administration, Indianapolis, Indiana. Cabinet Secretary. (2003-2004)

In October 2003, was appointed by Governor Joe Kernan to be the Cabinet Secretary for the Indiana Family and Social Services Administration, a position held under the Governor Evan Bayh administration. During her leave of absence from IUPUI, was responsible for managing the agency's \$6.3 billion budget providing services for one in every six people in the state.

Facilitated the review of the Indiana child welfare system increasing accountability while adding 100 new caseworkers and strengthening training requirements; expanded community based services for people with disabilities; ensured foster children were enrolled in the 21st Century Scholars program; and increased by 20% the number of aging Hoosiers participating in the state's Medicaid prescription drug discount program.

Gore Lieberman 2000. (2000)

In June 2000, was appointed by Vice President Al Gore to be the Issues Director for the national presidential campaign in Nashville, Tennessee. During her leave of absence from IUPUI, served as the primary advisor to the Vice President on policy production and communications including policy content in papers, articles, questionnaires, and the web. As senior advisor to the Vice President, was the liaison for briefings and inquiries with members of Congress, Governors, and local elected officials.

State of Indiana, Family and Social Services Administration, Indianapolis, Indiana. Secretary. (1993-1997).

Served as principal advisor to Governor Evan Bayh on social service policy and Chief Executive of state government's largest agency. Directed administration of welfare, Medicaid, mental health, disability, aging, and other social service programs to strengthen families and communities. Managed an annual budget of more than \$4.1 billion and over 11, 000 staff, and oversaw 31 advisory boards and commissions. Developed (with staff, advocates, and members of the public) the agency's strategic action plan to address the needs of Indiana families by examining strengths, identifying challenges and disparities and setting clear goals.

As state government's leading spokesperson for family and social service issues, coordinated public relations activities with federal, state, and city officials; communicated regularly with state legislators, Members of Congress, non-profit organizations, and national and local media; and worked with national and state associations in the development of family and health care policy.

As Secretary, supervised (i) the development of the nation's most comprehensive welfare reform project which reduced the number of families on public assistance by 30%, saving taxpayers over \$143 million; (ii) the successful closure of a 400-bed state mental health hospital including the transition of persons with mental illness into the community; (iii) the restructuring of the state Medicaid program to reduce the rate of growth of Medicaid expenditures saving over \$520 million in two years while maintaining the availability of quality health care for Indiana's neediest citizens; (iv) the implementation of the acclaimed statewide Step Ahead process which links federal and state resources to local planning councils to improve children's services; and (v) the expansion of information technology systems to collect, compile and organize information to enforce child support orders, to protect children, to process Medicaid claims, and to coordinate services for the elderly and public assistance recipients.

Office of Governor Evan Bayh, Indianapolis, Indiana. Executive Assistant and Director of Policy for Health and Family Services (1992-1993).

Served as principal advisor to Governor Evan Bayh on health and social service policy and as a member of the Governor's policy staff served as liaison to the Indiana Department of Health, Family and Social Services Administration, the Governor's Planning Council for People with

Disabilities, and the Indiana Protection and Advocacy Commission. Led the Administration's efforts to enact legislation to reform Indiana's health insurance and health care industries, particularly with respect to chronic and catastrophic care.

State of Indiana, Department of Health, Indianapolis, Indiana. Bureau Chief, Family Health Services (1989-1993).

Directed the planning and implementation of statewide priorities for Maternal and Child Health, Children's Special Health Care Services, and Nutrition/WIC services. Developed well-coordinated, community-based preventive and primary health care services to low income and special needs families throughout Indiana. Restructured the Children with Special Health Care Needs program to decrease program costs through a community-based delivery system saving more than \$4 million.

Riley Child Development Center, James Whitcomb Riley Hospital for Children, Indianapolis, Indiana. Research Associate (1986-1989).

Coordinated research, data, and evaluation for the Center, one of a national network of University Affiliated Programs (UAP) providing model services, interdisciplinary training, and research for persons with developmental disabilities. Expanded the research and program evaluation activities for the Center through contracts and grants from federal and state agencies. Taught portion of the UAP core curriculum and administrative training to graduate students.

Institute for the Study of Developmental Disabilities, Indiana University, Bloomington, Indiana. Assistant Director for Administration (1979-1982).

Managed the daily administrative operations of the Institute, a component of the University Affiliated Program for persons with developmental disabilities. Responsible for the development, implementation, and oversight of \$1.3 million annual budget. Coordinated computer services to assist staff in the collection, analysis, interpretation, and dissemination of data statewide.

U.S. Congress, Office of Technology Assessment, Washington, D.C. Research Assistant; Administrative Assistant (1975-1978).

Participated in the design, research, and writing of *Cancer Testing Technology and Saccharin*, a major research study. Conducted literature reviews and compiled data for research studies on computerized axial tomography scanners, fetal monitoring, and medical technologies. Worked with Members of Congress, Congressional staff, contractors, and advisory panel members on a regular basis.

Lobund Laboratory, University of Notre Dame, Notre Dame, Indiana. Secretary and Lab Technician (1974-1975).

Determined the caloric intake and output of experimental animals through the use of an oxygen bomb calorimeter; compiled data from the results of the experiments. Typed and assembled manuscripts and grant proposals.

Professional Service

National

- Appointed to **The John Brademas Center on Congress at New York University** (2016 to present).

- Represented the American Academy of Nursing on the **Joint Commission, Nursing Advisory Council (2017 – 2018; 2011-2014)**.
- Represented the American Academy of Nursing on the **National Coalition on Health Care (2014 – 2018)**.
- Elected Secretary/Treasurer and Member of the Board of Directors, **Council of Governor's Policy Advisors**, (1996-1997).
- Appointed to the Executive Board of the **American Public Welfare Association**, (1995-1997).

State

- Appointed by the Dean of the School of Public and Environmental Affairs, Indiana University, to the **Distinguished Alumni Council**, (2011-2014).
- Appointed to the **Healthcare Business Women's Association—Indiana Steering Committee (2003-2004)**.
- Appointed by the Governor to Chair the **Juvenile Law Commission (2003)**
- Appointed by the Governor to the **Human Resource Investment Council (2001-2005)**.
- Appointed to the Board of the **Office of Women's Health (1999-2004)**.
- Appointed to the **Sentencing Policy Evaluation Committee (1995-1996)**.

Local

- Appointed by the Lawrence City Council to the **Lawrence Redevelopment Commission (2020 to present)**.
- Appointed by the Mayor of Indianapolis to the **Marion County Convention and Recreational Facilities Authority (2018 to present)**; elected President 2019.
- Appointed by the Mayor of Indianapolis to the **Greater Indianapolis Progress Committee (2000 -2007)**.
- Appointed by the Mayor of Lawrence to the **Ft. Harrison Reuse Authority (2004-2007)**.
- Appointed to the **Indianapolis Urban League (1999-2006)**.
- Elected to the Board of Trustees to the **Indianapolis Zoological Society (1998-2008)**.

Professional Recognitions

Inducted as an **Honorary Fellow of the American Academy of Nursing** for policy development to enhance the quality of health, reduce health disparities and inequalities, shape healthy behaviors and environments, and strengthen the health delivery system (2018).

Awarded the **Spirit of Philanthropy at IUPUI** for contributions to Intercollegiate Athletics through philanthropic gifts and voluntary services (2007).

Awarded the **Sagamore of the Wabash** by Governor Joe Kernan for distinguished service to the State of Indiana, 2004.

Recognized by the YWCA "**Salute to Women of Achievement**"; nominated for Outstanding Educator Award, 2001.

Honored by the Indianapolis Business Journal as one of the “**Women to Watch**” for vision, communication, and achievement, 2000.

Inducted as **Honorary Member of the Golden Key National Honor Society** to recognize and encourage scholastic achievement and excellence, 2000.

Awarded the **Sagamore of the Wabash** by Governor Evan Bayh for distinguished service to the State of Indiana, 1997.

Named **Woman of Distinction** by Soroptimist International of Indianapolis for contributions to human rights, 1996.

Recipient of the **Alumni Award** from the School of Public and Environmental Affairs, Indiana University in recognition of outstanding contributions to Indiana and the nation in the area of social services delivery, 1995.

Selected Presentations and Interviews

“21st Century Advanced Illness Care Team: How Team-Based Care is Moving Medicine beyond the Clinic into the Home and Community.” Petrie-Flom Center, Harvard Law School, June 21, 2016.

“Bright Spots in the Health Care Landscape that Imagine a Better System.” Lown Institute. Chicago, Illinois, April 16, 2016.

“National Perspectives on the Transformation of Leadership in Nursing.” Independence Blue Cross Foundation and National League for Nursing. Philadelphia, Pennsylvania, November 20, 2015.

“Nursing Leadership in Health Policy.” Transforming Health: Driving Policy Conference. Washington, D.C., October 16, 2015.

The White House. U.S. Department of Health and Human Services, Health Care Payment Learning and Action Network, Invited Participant, March 25, 2015.

“Moving Policy Forward: Coalition Building.” Transforming Health: Driving Policy Conference. Washington, D.C., October 16, 2015.

“Creating an Ethical Health Environment.” Gertrude E. Skelly Charitable Foundation Board of Directors. Princeton, New Jersey, October 3, 2014.

“*Have you ever served in the military?* Launch.” National Association of State Directors of Veterans Affairs, Nashville, Tennessee, September 2, 2013.

“Technology Drill Down.” TD2 Salon. Washington, D.C., September 15, 2010.

“Society’s Resilience in Withstanding Disaster.” Invited Participant. The Ditchley Foundations.

Ditchley Park, Oxfordshire, England. March 19-21, 2009.

"Indiana's Earned Income Tax Credit Campaign." National Governors Association for Best Practices. Santa Fe, New Mexico. June 11, 2004.

Indiana Lawmakers, WFYI. "Health and Medicaid." Interviewed by Jon Schwantes. February 27, 2004.

"The Future of Medicaid." The Legislative Conference. Indianapolis, Indiana. December 11, 2003.

"Indiana Commission on Juvenile Law." Juvenile Court Judicial Officers. Nashville, Indiana. June 19, 2003.

"The Role of Family in Public Policy." Working Group Chair. The Ditchley Foundations. Ditchley Park, Oxfordshire, England. March 19-21, 1999.

"Social Justice and the Relief of Poverty in the Global Economy." Section Rapporteur. Ditchley Park, Oxfordshire, England. May 23-25, 1997.

"Welfare in America: What is Being Reformed?" Symposium on the Welfare Revolution and Catholic Social Thought. Thomas J. White Center on Law and Government, University of Notre Dame, Notre Dame, Indiana. February 6, 1997.

NBC Nightly News. Interviewed by Andrea Mitchell. August 27, 1996.

"Medicaid: That is Still Where the Money Is." Democratic Leadership Council, Chicago, Illinois. August 26, 1996.

"Welfare Reform." D.C. Journal. Chicago Tribune Broadcasting. June 15, 1996.

"The Politics of Welfare." Mike Pence Show, Indianapolis, Indiana. May 25, 1996.

"Redesigning Indiana's Family Services Delivery System." Harvard University, John F. Kennedy School of Government. Cambridge, Massachusetts. May 1, 1996.

"Partnerships for Stronger Families." Panel discussion with Vice President Al Gore, The White House, Washington, D.C. March 13, 1996.

Roundtable Participant. "Power Shift: States Prepare to Meet the Challenges Ahead." Governing Magazine, pgs A1-A12. Harvard University, John F. Kennedy School of Government. November 1995.

"Taking a Step Ahead: A Case Study on the Indiana Collaboration Project." Information Technology Association of America's Industry Leadership Conference, Nashville, Tennessee. October 10, 1995.

"The State as a Partner: Building Healthy Communities." Council of Governor's Policy Advisors'

Policy Forum. Alexandria, Virginia. October 1, 1995.

"Information Flows Across Organizational Boundaries: Step Ahead. Harvard University, John F. Kennedy School of Government, Cambridge, Massachusetts. June 10, 1995.

"Transforming Service Delivery Through Intergovernmental Partnerships. A New Era: Creating the Customer Driven Government. National Conference on Federal Quality, Washington, D. C. July 13, 1994.

Family Reunion III--The Role of Men in Children's Lives. Panel discussion with Vice President Al Gore and White House Assistant to the President for Domestic Policy Carol Rasco. Nashville, Tennessee. July 11, 1994.

"Structural Solutions: National and Regional Initiatives." National Academy of Public Administration, Chicago, Illinois. June 4, 1994.

"Step Ahead: Indiana Collaboration Project." The White House, Washington, D.C. November 1993.

Publications

Mason, D., Martsof, G., Sloan, J., and Villarruel, A., and Sullivan, C. *Making health a shared value: Lessons from nurse-designed models of care.* Nursing Outlook 67 (2019):213-222.

Cox, K., Sullivan, C., Olshansky, E., Czubaruk, K., Lacey, B., Scott, L. and Willems Van Dijk, J. *Critical conversation: Toxic stress in children living in poverty.* Nursing Outlook 66 (2018): 204-209.

Martsof, G., Mason, D., Sloan, J., Sullivan, C. and Villarruel, A. *Nurse-Designed Care Models and Culture of Health: Review of Three Case Studies.* The RAND Corporation, 2017.

Martsof, G., Gordon, T., Warren, L., Mason, D., Sullivan, C. and Villarruel, A. *Innovative nursing care models and culture of health: Early evidence.* Nursing Outlook 64 (2016): 367-376.

American Academy of Nursing on Policy. *Support for humanitarian aid to refugee children.* Nursing Outlook 64 (2016):94-97.

Mason, D., Jones, D., Roy, C., Sullivan, C. and Wood, L. *Commonalities of nurse-designed models of health care.* Nursing Outlook, 63 (2015):540-553.

American Academy of Nursing announced engagement in National Choosing Wisely Campaign. Nursing Outlook 63 (2015): 95-98.

Policy agenda for nurse-led care coordination. Nursing Outlook 63 (2015): 521-530.

Sullivan, C. *Congress partly to blame for VA trouble.* Indianapolis Star, June 2, 2014.

Sullivan, C. "Standing by Closure of Central State." Indianapolis Star, April 26, 2009.

Sullivan, C. "My View: Everyone's on Alert for Signs of Child Abuse." Indianapolis Star, April 25, 2004.

Sullivan, C. "A Million Reasons to Work Together to Help Vulnerable." Indianapolis Star, November 4, 2003.

Sullivan, C. Bringing Prosperity Home: Choices for America's Families. The Gore-Lieberman Plan. October 2000.

Sullivan, C. "Would Al Gore's Social Security Reform be good for Taxpayers?" The Washington Times: Insight on the News, August 28, 2000.

Sullivan, C. "Welfare in America: What is Being Reformed?" Journal of Law, Ethics, and Public Policy 11(2): 633-647, 1997. University of Notre Dame, Thomas J. White Center on Law and Government.

North Central Regional Educational Laboratory and Sullivan, C. "Improving Outcomes in the Midwest Region—Indiana." Policy Report No. 2, pages 16-18, 1996.

Sullivan, C. "Partnership for Personal Responsibility." Journal of the American Public Welfare Association 54(3):26-34, summer 1996.

Godwin, B., Lovan, B., Sherman, G. and Sullivan, C. "Transforming Service Delivery Through Intergovernmental Partnerships." Creating a Customer-Driven Government--National Conference on Federal Quality, Washington, D.C. July 13, 1994. Proceedings pages 395- 406.

Sullivan, C. "Every Family Counts in Indiana." The Family-Economy Interface: Challenges for Policy, Research and Families. A Report on the Hoosier Family Policy Summit II, Purdue University, April 26, 1994.

Federal Government Grant Reviewer

Panel Chairperson. Health Care Innovation Challenge Grant Review. U.S. Department of Health and Human Services. Centers for Medicare and Medicaid Services. Center for Medicare and Medicaid Innovation. February/March 2012.

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