Health a Vital National Interest: Health Information a Strategic Asset

by

Colonel Gary A. Wheeler
United States Army

United States Army War College
Class of 2014

REPORT DOCUMENTATION PAGE

Form Approved--OMB No. 0704-0188

The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE *(DD-MM-YYYY)* 15-04-2014	2. REPORT TYPE STRATEGY RESEARCH PROJECT	3. DATES COVERED *(From - To)*
4. TITLE AND SUBTITLE Health a Vital National Interest: Health Information a Strategic Asset		5a. CONTRACT NUMBER
		5b. GRANT NUMBER
		5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Colonel Gary A. Wheeler United States Army		5d. PROJECT NUMBER
		5e. TASK NUMBER
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Dr. Thomas J. Williams Strategic Leadership Development and Resiliency Program		8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army War College, 122 Forbes Avenue, Carlisle, PA 17013		10. SPONSOR/MONITOR'S ACRONYM(S)
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A: Approved for Public Release. Distribution is Unlimited.		
13. SUPPLEMENTARY NOTES Word Count: 6,054		

14. ABSTRACT

The health of Americans is a vital national interest. Despite the considerable resources devoted to healthcare, the US falls short of achieving optimal health. A strategic assessment shows this gap is due to disproportionate resource allocation to healthcare delivery. Historic strategic attempts to improve health through preventive strategies suffer from similar misalignment of ends, ways, and means. Future health strategies must more fully address governance, health resourcing, and health information. Health information is a strategic asset and a key enabler for effective health management. Although healthcare information is a subset of overall health information, current sources of health information are predominately sourced from healthcare delivery organizations. Development of information sources that reflect the broader determinates of health are needed. The challenges to achieving comprehensive health management include the current focus on healthcare delivery and the resultant limited patient treatment information collected. Improvement of health governance and establishing a broad-based health information architecture are the first steps toward achieving optimized health.

15. SUBJECT TERMS

Clinical Informatics, Military Health Threats, Health Enterprise Architecture

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 39	19a. NAME OF RESPONSIBLE PERSON
a. REPORT UU	b. ABSTRACT UU	c. THIS PAGE UU	UU		19b. TELEPHONE NUMBER *(w/ area code)*

Standard Form 298 (Rev. 8/98), Prescribed by ANSI Std. Z39.18

USAWC STRATEGY RESEARCH PROJECT

Health a Vital National Interest: Health Information a Strategic Asset

by

Colonel Gary A. Wheeler
United States Army

Dr. Thomas J. Williams
Strategic Leadership Development and Resiliency Program
Project Adviser

U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

Abstract

Title: Health a Vital National Interest: Health Information a Strategic
                  Asset

Report Date: 15 April 2014

Page Count: 39

Word Count: 6,054

Key Terms: Clinical Informatics, Military Health Threats, Health Enterprise
                  Architecture

Classification: Unclassified

The health of Americans is a vital national interest. Despite the considerable resources

devoted to healthcare, the US falls short of achieving optimal health. A strategic

assessment shows this gap is due to disproportionate resource allocation to healthcare

delivery. Historic strategic attempts to improve health through preventive strategies

suffer from similar misalignment of ends, ways, and means. Future health strategies

must more fully address governance, health resourcing, and health information. Health

information is a strategic asset and a key enabler for effective health management.

Although healthcare information is a subset of overall health information, current

sources of health information are predominately sourced from healthcare delivery

organizations. Development of information sources that reflect the broader determinates

of health are needed. The challenges to achieving comprehensive health management

include the current focus on healthcare delivery and the resultant limited patient

treatment information collected. Improvement of health governance and establishing a

broad-based health information architecture are the first steps toward achieving

optimized health.

Health a Vital National Interest: Health Information a Strategic Asset

There are no higher priorities than the health, well-being, and security of the American people.

—President Barack Obama[1]

The health of Americans is a vital national interest. Implicit in the founding

fathers' vision of a country that upholds the right to life, liberty, and the pursuit of

happiness is the expectation that lives should be healthy. The constitution of the World

Health Organization states, "The enjoyment of the highest attainable standard of health

is one of the fundamental rights of every human being."[2] While the recent passage of

the Patient Safety and Affordable Care Act generated vigorous debate around universal

access to health care as an individual right, few would argue that attaining optimal

standards of health is undesirable. Yet too little public debate addresses the larger

sphere of how to optimize health, the determinants of good health, and how the current

US healthcare delivery systems advance those determinates. Furthermore, future

debate must expand the accountability for health beyond healthcare organizations to

include accountability of individuals, and identify the roles of families, communities and

the workplace in promoting health.

The National Security Strategy identifies threats to health as a national interest,

specifically citing the need to avert global health threats posed by pandemics.[3] The

National Strategy for Biosurveillance further identifies the need for health information to

track, "WMD threats and a broader range of human, animal, and plant health

challenges, including emerging infectious diseases, pandemics, agricultural threats, and

food-borne illnesses."[4] The clear intent of the strategy is to conduct syndromic

surveillance of emerging Chemical, Biological, Radiological, Nuclear, and Explosives

(CBRNE) health threats, whether deliberately delivered or as a consequence of natural events, such as Severe Acute Respiratory Syndrome and avian flu.[5] Many stakeholders conduct biosurveillance including the Centers for Disease Control and Prevention (CDC), the Department of Agriculture, as well as state and local agencies. The CDC identifies governance and information exchange as significant challenges to effective biosurveillance.[6] The National Biosurveillance Strategy acknowledges the need for governance and information exchange, but posits that information sharing will occur if stakeholders actually benefit from its use. This premise is aspirational at best and dangerous at worst. Sharing of healthcare information in the US through Healthcare Information Exchanges at the state and national level remains problematic due, in large part, to a lack of sufficient incentives to prompt healthcare organizations to invest in infrastructure to facilitate information exchange.

This paper reviews the medical threat environment from a broader perspective than traditional CBRNE and pandemic threats and then proposes an improved health strategy to address the broader health threat environment. The broader threat includes diseases historically classified as pedestrian healthcare conditions, as well as those emerging in social and community domains. The broader medical threats mandate changes to the national health strategies if the Nation is to effectively address these threats. Not only have the strategies not addressed the threats, but the Nation lacks a disciplined strategy formulation process that recognizes and responds to this broader context. Addressing these broad medical threats requires the engagement of a wide range of stakeholders that includes the American public, healthcare organizations, healthcare payers, federal agencies, as well as legislators and other leaders. This

2

review and reformulation makes evident that an overarching health information architecture is required to address both the governance and information sharing challenges in biosurveillance and the strategic gaps in the broader national health strategy.

US Health Strategy

The health of Americans is a legitimate and vital national interest. Therefore strategists must engage in the same formulation process to mitigate health threats and optimize health that national security strategists use to achieve enduring US national interests. These interests are externally focused and provide a framework for international relations using political, military, and economic power. Currently, US domestic interests articulated through the national strategy formulation process are limited to the Department of Homeland Security Strategic plan. An effective strategy should consider national goals, underlying interests, and the allocation of resources in time, space, and purpose, all within a national social and political context.

The passage of the Patient Safety and Affordable Care Act (ACA) in 2010 prompted some movement towards a comprehensive national health strategy. In association with the ACA, the president created the National Prevention, Health Promotion, and Public Health Council (NPC), comprised of seventeen cabinet-level and other federal departments and agencies to plan and coordinate prevention efforts.[7] The council is chaired by the US Surgeon General. As directed by the ACA, the NPC produced the National Prevention and Health Promotion Strategy (National Prevention Strategy) in 2011, and the NPC Action Plan in 2012.

Historic US health promotion strategies generally failed to achieve desired objectives, largely due to incomplete strategic alignment of ends, ways, and means. In

2000 the CDC published *Healthy People 2010*, an initiative to improve the health of

Americans through a broad range of health goals, each associated with specific

measures and targets. The health goals broadly targeted increases in the quality and

years of healthy life and the elimination of health disparities. By the year 2011, the

health of Americans failed to meet established targets in nearly all measures, including

health insurance coverage, immunization rates, safe sex practices, motor vehicle

deaths, homicide and suicide rates, adolescent tobacco use, and obesity rates.[8]

The National Prevention Strategy (NPS) represents a more comprehensive

health strategy. The NPS endorses four strategic directions and seven priorities. The

directions are: "healthy and safe community environments," "clinical and community

preventive services," "empowered people," and "elimination of health disparities."[9] The

seven priorities are: "tobacco free living," "preventing drug abuse and excessive alcohol

use," "healthy eating," "active living," "injury and violence free living," "reproductive and

sexual health," and "mental and emotional well-being."[10] The NPC Action Plan directs

numerous federal measures to promote improvements in the NPS strategic direction.

Department of Defense is featured with several initiatives addressing nutrition, tobacco

use, mental health and reproductive health.[11] While the NPS is a good start towards a

comprehensive health strategy, it is at risk of failure from the same factors that caused

the failure of *Healthy People 2010.* Importantly, the NPC action plan does not

adequately provide all necessary stakeholders and processes with appropriate

resources to achieve the desired objectives.

Current Health - US and Department of Defense (DoD)

US Health Status

Given the significant US investment in healthcare, Americans should have the opportunity to achieve optimized health (i.e., the highest level of health that is both attainable and affordable). Unfortunately, optimal health remains aspirational. While advancing healthcare is increasing life expectancy, rising from 75.2 years in 1990 to 78.2 years in 2010, the US significantly lags behind other developed countries in the improvement of life expectancy. Comparatively, the US also performs poorly in most other significant measures of health including: dietary risks, tobacco smoking, high body mass index, high blood pressure, high fasting plasma glucose, physical inactivity, and alcohol use.[12]

In 2013, the National Institutes of Health directed a study comparing health in the US with 16 economic peer nations. This study found that the US ranked last in life expectancy for males, and second to last for females.[13] Further, the US had the highest prevalence of adult obesity and diabetes,[14] death by injuries,[15] the highest rate of death associated with pregnancy and childbirth,[16] and death of children before age five.[17] Morbidity and chronic disability account for nearly half of the US health burden, and the United States has not kept pace with advances in health achieved in other wealthy nations.[18]

Cost of Healthcare

As the remaining global super power and leading economy, the US can likely afford the best available healthcare. Until recently healthcare expenditures in the US saw years of unfettered growth, leveling in 2009-2011 to 17.6% of the Gross domestic product (GDP). A comparison to other Organisation [*sic*] for Economic Cooperation and

Development (OECD) countries is illustrative, where health expenditure averages 9.5% of GDP. Per capita, the US spent $8,508 in 2011, 250% of the $3,309 OECD average.[19]

Within DoD, healthcare expenditures also rose dramatically, growing annually by 6.3 % for the past decade and rising to $52.2 billion in FY12 (Figure 1).[20]
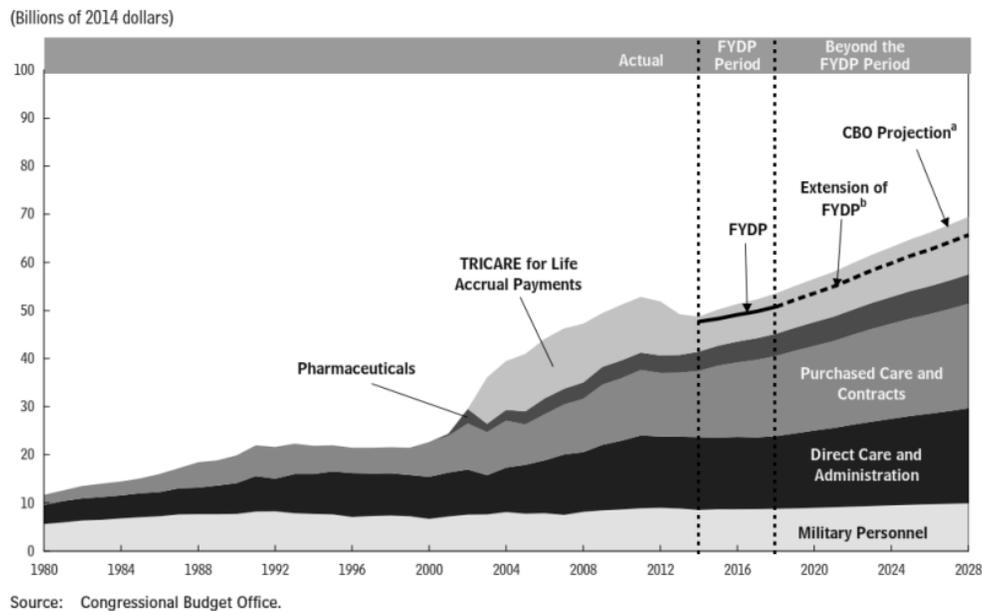

Figure 1. Actual and Projected Costs for Military Health Care as a Share of DoD's Base Budget 1980 – 2028[21]

Health care spending now accounts for about half military spending on personnel costs, and 9.5 % of the defense budget.[22] The Congressional Budget Office identified three main causes for rising healthcare costs: new and expanded TRICARE (the DoD health plan) benefits, increased utilization fostered by financial incentives to use TRICARE, and the medical costs of recent wars. Of the three causes, expanded benefits and increased utilization are the main drivers of increased cost.[23] Recent data of civilian healthcare utilization show that most of the rise in healthcare costs is due to the increased prevalence of chronic diseases, particularly those attributable to obesity, tobacco, and excessive alcohol use.[24] Within the DoD, healthcare costs treating these

conditions costs an estimated $2.1 billion per year: $564 million for diseases due to

tobacco use, $1.1 billion for treatment of excess weight and obesity, and $425 million

for high alcohol consumption. In addition, DoD incurs nonmedical costs related to

tobacco use, excess weight and obesity, and high alcohol consumption in excess of

$965 million per year.[25]

<div align="center">Threats to Health</div>

<u>External Health Threats</u>

The decline in the overall US health status represents a compelling domestic

health threat. Many factors mask the urgency of domestic threat: complacency, social

barriers, and long timelines. By contrast, the external US health threat environment is

varied, enduring, and often dramatic. To identify and combat external health threats,

typically by CBRNE agents, the CDC conducts syndromic surveillance, which is the

tracking of information sources to identify or anticipate outbreaks of disease. The

objective of syndromic surveillance is to identify illness clusters early, before diagnoses

are confirmed and reported to public health agencies, in order to mobilize a rapid

response to reduce morbidity and mortality (Figure 2).
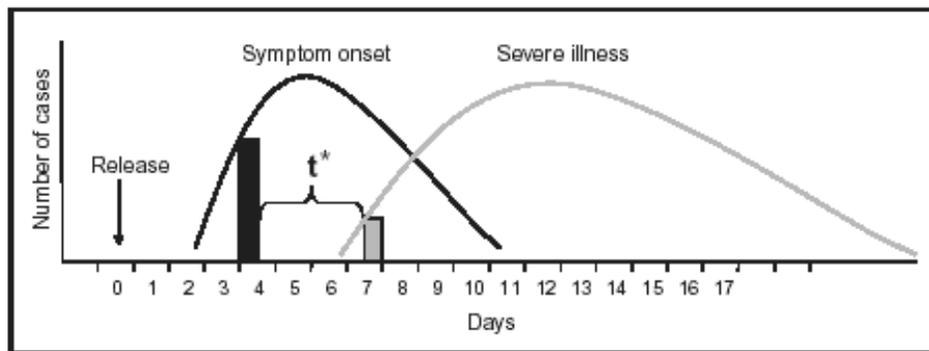
*t = time between detection by syndromic (prediagnostic) surveillance and detection by traditional (diagnosis-based) surveillance.

Figure 2. Syndromic Surveillance - Rationale for Pre-disease Symptom Surveillance[26]

Numerous natural and man-made CBRNE agents have already hit the US homeland in the 21st century. Pandemic influenza is a recurring threat; the H1N1 influenza outbreak in the 2009-2010 season claimed approximately 284,000 lives world-wide including an estimated 12,470 in the US.[27] The anthrax letter attacks in 2001 infected 30 people, killing 5, and cost over $27 million in cleanup.[28] The Severe acute respiratory syndrome outbreak of 2003 infected 8,098 people worldwide (eight in the US) with 774 deaths.[29]

The decline in domestic US health status and the CBRNE threat highlight the need for biosurveillance capability that collects, analyzes, and reports real-time health information from a variety of information sources. These sources must include pertinent healthcare reports collected from emergency rooms and ambulatory clinics, workplace and school absenteeism, coroners, social networking websites, and social messaging traffic.

Military Health Threats

In addition to the domestic chronic disease and CBRNE threats outlined above, military service members experience unique health challenges. The DoD imposes stringent health requirements on its military personnel, applying rigorous physical and mental standards for both induction to and retention in the military services. Not surprisingly, the mission required of the active duty service member places a high priority on health and fitness. Moreover military service poses unique occupational and environmental medical threats to service members and their families. Combat operations and worldwide deployment impose greater medical risks, and therefore the need to track and mitigate those risks with robust health information capabilities.

The decline of health in the US civilian sector has significantly affected recruitment. An organization the size and breadth of the DoD requires approximately 150,000 accessions year,[30] which in turn requires a sizable eligible applicant pool. Recent congressional testimony cited the "crisis in this country" of the "obesity problem amongst our youth" as a reason for lower numbers of eligible recruits.[31] With concomitant decreases in physical fitness and education status, "Only 25 % of our young people today, age 17 to 24, are qualified for military service--not a good situation."[32]

The nature of combat-related health threats to the US military evolved in the last century as the character of warfare changed. In contrast to World War II, with over 400,000 US service members killed,[33] the progressively asymmetric warfare in the 21st century produced far fewer US deaths. US military deaths related to combat number 2,298 in Operation Enduring Freedom in Afghanistan and 4,470 in Operation Iraqi Freedom and Operation New Dawn in Iraq.[34]

While recent wars generated fewer combat deaths, they produced challenging, prolonged, and often perplexing health syndromes. The protracted time period of conflict, the character of warfare, and the chronic recurrent exposure of troops to combat brought new and unique challenges in diagnosis, treatment, and tracking of illness. Traditional Disease and Non-battle Injuries tracking systems originated in conflicts of the distant past where predominate non-kinetic health threats included accidents as well as indigenous and sanitation related infectious diseases. Health threats from recent wars were far more complex. From health effects associated with Agent Orange exposure in Vietnam, to Gulf War Syndrome in Operation Desert Storm,

to the Traumatic Brain Injury (TBI) and suicide health threats associated with the recent wars Iraq and Afghanistan, it is clear that some wounds of war are not immediately apparent and represent challenges in identification and management.[35]

The signature weapon in the asymmetric warfare waged by coalition adversaries is the Improvised Explosive Device (IED). The advent of the IED brought new requirements in force protection and a marked shift in injury patterns. IEDs, roadside bombs, and suicide car bombs were responsible for most of the deaths in Iraq and many of the more than 240 combat deaths in Afghanistan.[36] In addition to causing combat deaths, IED casualties suffered a dramatic rise in traumatic amputations and TBI. Unique to the Iraq and Afghan theaters of operation, TBI emerged with a frequency never before encountered in combat. While IED use emerged in 2001, countermeasures and the medical recognition of emerging injury patterns took several years to develop. For example, the Defense and Veteran Brain Injury Center (DVBIC) released the Military Acute Concussion Evaluation to assess concussive injuries in 2006; five years after IED use began. A year later, the DoD expanded the DVBIC mission to include TBI surveillance.[37]

The cessation of combat operations in Iraq and the decreasing intensity of combat in Afghanistan produced fewer deaths and injuries in the 2012 to 2014 time period. Even as combat deaths fell, non-combat deaths by suicide rose, actually exceeding annual combat deaths in 2012. As suicides increased to worrisome rates in 2005, the Army and Marine Corps instituted resiliency programs to improve soldier mental health. These and other programs were designed to identify at-risk service members, intervene in effective ways, and decrease the stigma for service members to

seek help for suicidal thoughts. While the suicide rate for Army personnel historically

has been lower than that for the civilian population; since 2002 the suicide rate among

soldiers steadily rose and reached record levels in 2007.[38] Army suicides peaked at 325

in 2012 before falling for the first time in a decade to 301 in 2013.[39] The Army Study to

Assess Risk and Resilience in Servicemembers [*sic]* (Army STARRS) launched in July

2009 is a highly complex study. Army STARRS will examine 1.6 million Soldiers

retrospectively and over 110,000 prospectively to identify, "factors that help protect a

Soldier's mental health and factors that put a Soldier's mental health at risk."[40]

These disparate health threats have many characteristics in common:

1) the need for population-level information to identify trends;

2) risks, contributors, and disease manifestations that occur in the combat, garrison, and home environment;

3) symptom latency measurable in months to years; and

4) clinical presentations that are not quickly identified by the traditional, episodic healthcare delivery model.

As a result, the broad scope of these health threats has challenged the traditional

healthcare system in collecting related health information and in health management. In

response, the DoD developed ad hoc solutions for data collection, research, and policy

development. Often leaders add new organizations and bureaucracies (e.g., Centers of

Excellence) to respond to emerging management requirements that divert existing

resources to meet short term operational needs. A liability of this approach is the

erosion of effort and reduced resources dedicated to existing healthcare missions. DoD

urgently needs a robust health information system capable of conducting syndromic

surveillance on an enterprise scale to identify emerging trends in the health status of its personnel and mitigate or avert these identified health threats.

In many ways, the DoD struggle with emerging combat-related health threats parallels the broader US struggle with health. The previously reviewed problems of rising obesity, tobacco and alcohol abuse, and decreasing fitness occur at the population level, have latencies between risk factors and disease manifestation measurable in years, and require awareness, tracking and intervention. Future solutions must align ends, ways, and means to deliver solution sets that support health objectives. Therefore a strategic approach to health is needed.

Developing a Strategic Approach to Health

Elucidation of potentially unifying explanations for the gap between US and DoD health status and desired health outcomes begins with examination of the national health strategic environment (Figure 3).
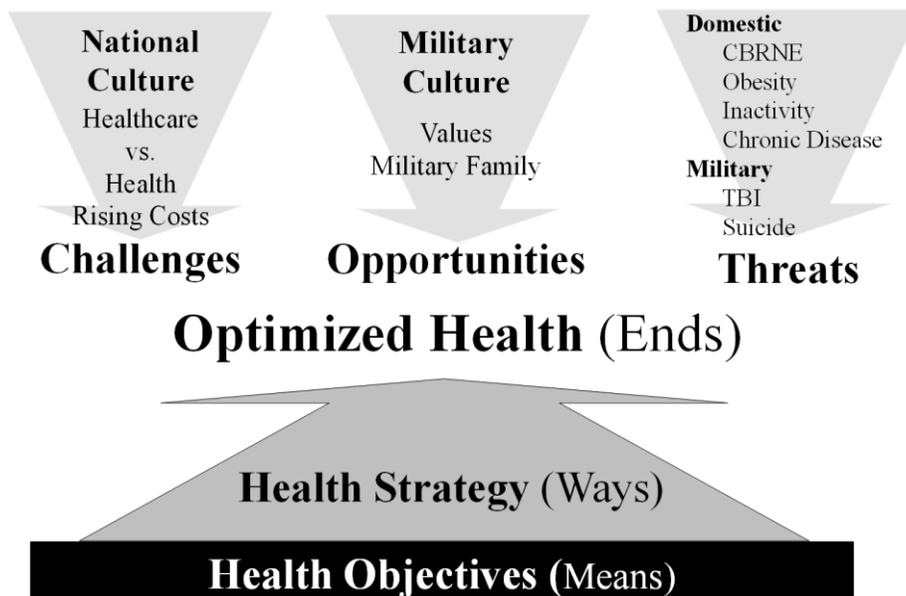

Figure 3. The Strategic Health Environment

12

One tenet in the execution of the National Military Strategy is consideration of all domains of warfare: land, air, maritime, space, and cyberspace. Full consideration of the warfare domains generates strategic objectives within each of the domains. Military Services, Service component commands, or Service functional commands then exercise domain strategies in support of the National Military Strategy. In an analogous process, the execution of a national health strategy should consider all domains of health (Figure 4).
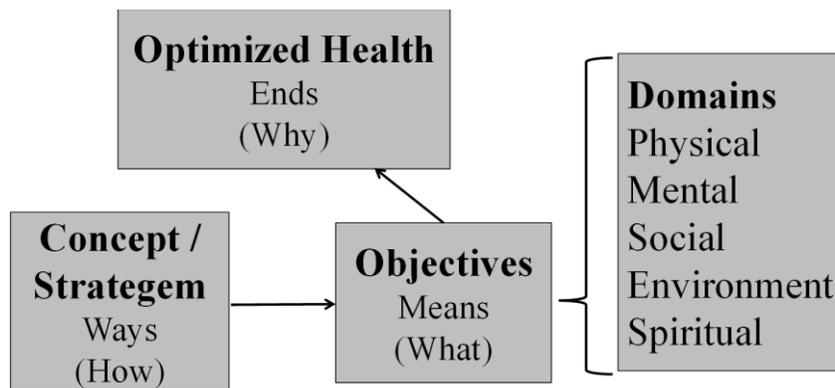
Figure 4. Health Strategy

The World Health Organization (WHO) defines health as, "A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."[41] The WHO further defines several domains of health: physical, psychological, level of independence, social relationships, environment, and spiritual.[42] If these domains are relevant in fully characterizing health, strategic success depends upon directing organizations to apply resources in time, space, and purpose to achieve objectives that collectively lead to overall "ends" of optimized health.

13

Historically, healthcare in the US predominately considered the physical and

mental domains of health. However, the focus on just these domains led to misaligned

application of ends, ways and means that produced the current healthcare system.

Society at large and the medical community in particular heavily emphasized a

healthcare model based upon identification and treatment of disease. Healthcare

organizations are heavily incentivized to deliver services in the form of testing, medical

treatment, procedures, and technical interventions; although ACA legislation made

some inroads with remuneration for specified preventive health services. To achieve

true health strategy alignment, the social, environmental, and spiritual contributions to

optimized health must be more fully characterized, incentivized, and integrated into

national health objectives as part of a broad health strategy.

Having identified the strategic objectives represented by health domains, an

examination of the "ways" in support of a strategic health leads to an examination of

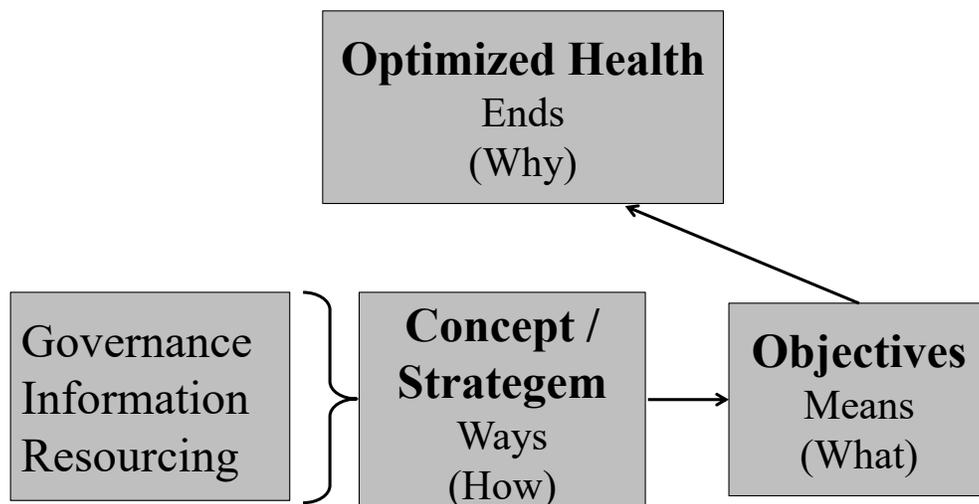health concepts and stratagems (Figure 5).

Figure 5. Health Strategy – Ways

At the national level, the National Prevention Strategy, the National Quality Strategy, and *Healthy People 2010* all represent national health strategies. Of these, the National Prevention Strategy is the most comprehensive; however it falls far short of aligning strategic "ways" of governance, information, and resourcing with the "means" of strategic health objectives necessary to successfully achieve optimized health. The NPS seeks to improve US health in the previously articulated high priority areas of substance abuse, nutrition, exercise, injuries and homicide, reproductive and sexual health, and mental and emotional well-being. To implement the strategy, the National Prevention Council represents a whole-of-government approach, mandated legislatively through the ACA, and implemented through the executive branch via multiple agencies. While a whole-of-government approach is a good start, optimized health requires a whole-of-nation approach.

Strategic Risk Analysis

The National Prevention Strategy includes worthwhile objectives that address many of the health gaps created by the current healthcare delivery systems. However, the strategy is at risk of not achieving its stated goal of implementing the "most effective and achievable means for improving health and well-being" in the US.[43]

From a strategic suitability perspective, the strategy falls short of a comprehensive approach to national health and healthcare due to inadequate governance, insufficient health information capabilities, and poor alignment of resourcing to desired objectives. An emphasis on prevention is laudable and necessary, but in and of itself is unlikely to produce optimized health. Given the vast resources currently invested in healthcare delivery, the strategy and associated action plan must do more to align resources, especially healthcare reimbursement, with health objectives

in all identified domains. Early efforts in aligning resources should focus on excess attributable risk. For example, what preventive health services are needed to reduce risk in areas of poor nutrition, inadequate exercise, and high risk behaviors? Such an examination and realignment of means can then drive policies that reprioritize resourcing according to the level of attributable risk. In contrast to traditional healthcare delivery, which is limited to patient-level interventions, such realignment can place appropriate interventions at the family, workplace and community levels.

Ultimately the national health strategy requires significant changes in policy to pursue measures that attain desired objectives. Fortunately, the National Prevention Council members can drive the critical policy reforms needed, such as those in healthcare reimbursement (Centers for Medicare and Medicaid Services within the Department of Health and Human Services(DHHS)), nutrition (Department of Agriculture and DHHS), and health information services (Office of the National Coordinator for Health Information Technology). A whole-of-nation stakeholder community will need to join the federal stakeholders to achieve optimized health. While the ACA emphasizes the role of healthcare organizations, the discussion within the healthcare and payer communities should expand beyond cost containment, quality, and accountability for delivered healthcare. Accountability for health rests first and foremost within citizenry of the US. Ultimately, optimized health requires health promotion and accountability at the individual, community, and society level. Optimized health requires a change in culture: moving the perception that good health depends predominately on delivery of high quality health care to knowledge that health

predominately comes from healthy choices rooted in the social domains of home, work, and community.

A recent initiative within the Army offers a glimpse of how such a cultural change is possible. In response to the numerous health challenges facing Soldiers and Families, the Army launched the Ready and Resilient Campaign (R2C) Plan in March 2013.[44] Applying definitive governance, the R2C is led by a guiding coalition of senior leadership covering domains of work (Army Deputy Chief of Staff for Personnel), home and community (Army Installation Management Commander), and healthcare (The Army Surgeon General). Specific health challenges addressed by R2C include substance abuse, domestic violence, suicide, and sexual harassment.[45] The campaign targets Soldiers, Civilians, Families, Units, and Communities in order to optimize health and resilience.

From a governance perspective, R2C leverages several positive aspects of organizational change including establishing a sense of urgency from the Secretary of the Army and the Army Chief of Staff, formation of a guiding coalition, and the establishment of "quick wins" to help build momentum.[46] The R2C promises to achieve the Army Medicine Vision: Strengthening the health of our Nation by improving the health of our Army. Army Medicine is driving significant internal organizational change that transitions from a healthcare system to a *system for health*; and partners with service members, families, leaders, and other stakeholders to encourage health promoting behaviors.

Appropriately aligned resourcing is critical to achieving strategic objectives. The Military Health System remains largely resourced based upon national healthcare

reimbursement models. As the Nation increases its understanding of true health promotion, resourcing models need to change from the current healthcare delivery emphasis towards achievement of improved health outcomes. As mentioned, the Health Prevention Strategy focuses heavily upon health preventative measures vice healthcare delivery. Increased investment in prevention will likely reduce current expenditures in healthcare delivery. At the federal level, the Centers for Medicare and Medicaid Services (CMS) sets policy and reimbursement levels for beneficiaries covered by Medicare and Medicaid; however, CMS is only part of a much larger payer community that includes private, state, and federal entities. Significant work lies ahead in realigning resourcing and reimbursement to better promote overall health outcomes.

<div align="center">Health Information – A Strategic Asset</div>

Electronic Health Records – Necessary but not Sufficient for Health Information

The examination of the national health strategy identified governance and resourcing as necessary "ways" to optimize health. Another critical capability is required: multi-domain health information. An examination of the current healthcare information resources in light of identified health challenges offers insight into important strategic information gaps. One such gap is the inability at the enterprise level to collect and convey healthcare information on the overall health of the populace. Broadening the implementation of electronic health records (EHRs) is one necessary element to close that gap. The American Recovery and Reinvestment Act of 2009 included $19.2 billion to increase the use of EHRs by physicians and hospitals. This portion of the bill was called the Health Information Technology for Economic and Clinical Health Act, or the HITECH Act. Administered by the Office of the National Coordinator for Health IT (ONC) at the Department of Health and Human Services, these financial incentives

have significantly increased EHR use. EHR products have matured rapidly under intense competition among vendors and HITECH-stipulated requirements. HITECH requires EHRs to be certified as meeting "meaningful use" criteria. HITECH meaningful use measures improve health management: electronic pharmaceutical prescribing, reporting quality measures to CMS, providing patient care summaries and medication lists, and exchanging information among providers of care. Ultimately, the widespread adoption and improved documentation of care in the EHR will facilitate prevention and improve healthcare outcomes.

Information in EHRs suffers from many of the same challenges as the healthcare delivery model. Being Healthcare Organization (HCO) centric, information within commercial EHR products focus on recording and managing pertinent data around healthcare delivery. Accordingly, available information includes encounters (outpatient and inpatient), often with associated cost information to allow for productivity and efficiency measures. In an effort to promote patient engagement, inform patients of important healthcare information, and to facilitate patient to provider communication, many leading EHR vendors now offer Personal Health Records (PHR). These PHRs are typically "tethered" to the EHRs from which they are based, and are essentially patient EHR portals that provide relevant information from HCO-based records. Tethered PHRs are useful health information sources but, being HCO-based, are usually limited to HCO-focused healthcare delivery information.

Fundamental challenges arise from an HCO-centered health information architecture. First, the information arises from healthcare encounters. As with the broader strategic health discussion, many determinates of optimal (or poor) health occur

in human domains outside of those covered in the few healthcare encounters experienced by most Americans each year. True person-centered health records therefore should leverage all appropriate sources to promote health. Figure 6 depicts Health information models, in order of increasing maturity.

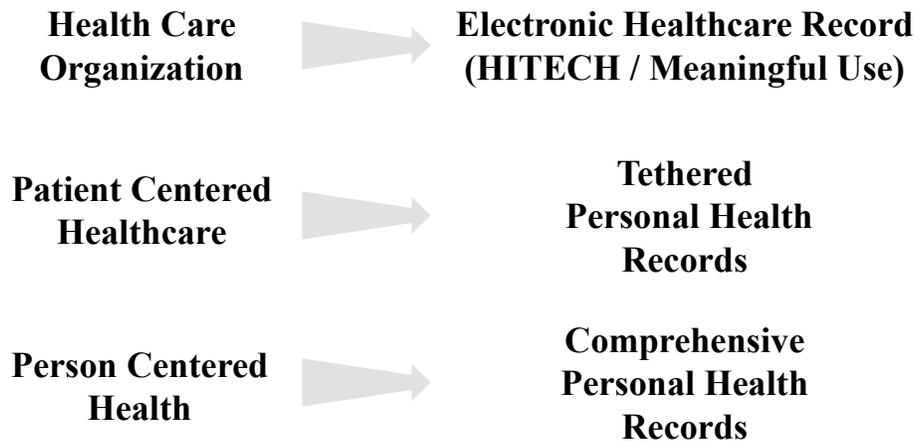|		
Health Care Organization	→	**Electronic Healthcare Record (HITECH / Meaningful Use)**
Patient Centered Healthcare	→	**Tethered Personal Health Records**
Person Centered Health	→	**Comprehensive Personal Health Records**

Figure 6. Health Information Models

Information sources should include the physical, emotional, social, environmental, and spiritual domains. Second, information sharing of even healthcare information is problematic. The relative immaturity and lack of standardization across the industry impedes electronic record sharing between providers or HCOs. Data interoperability and health information exchanges attempt to close this gap; however, current healthcare incentives may actually impede information exchange between competing organizations. At best, incentives currently do not sufficiently promote interoperability and information sharing. What is needed is an appropriately incentivized information architecture that is person-centered, rather than HCO-centered. Finally, HCO-centered data are secured by statute. Healthcare records are covered by the Health Insurance Portability and Accountability Act (HIPAA) privacy rule, which ensures that healthcare

information is properly protected while allowing the flow of information needed to provide and promote high quality healthcare.[47] Patient-provider confidentiality and therefore HIPPA privacy protections are appropriately inviolate. However, how these restrictions are enforced may unnecessarily limit the use of the information to optimize health management. Storing all domains of potential health information in HCO-based EHRs may introduce unacceptable risk to the National Health Strategy.

The DoD Healthcare Information Experience

Several historic DoD examples illustrate strategic gaps when information systems primarily support healthcare delivery and not the broader garrison and theater health information domains. These examples include battlefield medical care documentation, disability processing, and garrison healthcare.

The Integrated Disability Evaluation System (IDES) was developed to streamline medical and physical disability processing for service members. In response to the growing number of medically disabled service members, a pilot program of IDES was launched in 2007 at four Military Treatment Facilities.[48] By May 2012, there were about 27,000 Soldiers processing through the IDES system.[49] While the main impediments to meeting disability processing timelines were administrative, sharing of information between the DoD and Department of Veterans Affairs (VA) proved difficult and the subject of intense interest by leaders in both departments and congress. Disability processing and assessment is complex, with multiple information systems involved that manage medical documents, personnel documents, commander's line of duty evaluations, benefits determination, etc. A more person-centered information architecture would permit integration of the disparate medical, personnel, and benefits data.

Similarly, documentation of care from point of injury through the evacuation chain, to US-based healthcare was a significant challenge during the recent wars in Iraq and Afghanistan. As a result, the Army Surgeon General commissioned a formal examination of the documentation in the Combined Joint Operations Area - Afghanistan in 2011. Findings included numerous challenges with equipping and training EHR use in theater, programmatic capability gaps, lack of adherence to policy, and dispersed medical command and control.[50]

Garrison healthcare information is stored in a number of healthcare record systems. The primary program of record for outpatient Military Treatment Facility (MTF) care is the Armed Forces Health Longitudinal Technology Application (AHLTA). All MTF outpatient encounters are entered in AHLTA by the healthcare service provider. Information from these encounters is available for tracking of quality, prevention, and health measures. However, the database within AHLTA was not developed for data extraction and aggregation, making information retrieval cumbersome. Outpatient care purchased in the civilian sector is scanned into AHLTA in a readable format, but the scanning process does not result in data suitable for analysis. As medical providers deployed to the conflicts in Iraq and Afghanistan, a greater proportion of the health benefit was purchased in the civilian sector, rising to greater than 50% of the total.[51] Thus much of the outpatient care delivered cannot produce health information suitable for subsequent analysis at either the patient or the enterprise level.

Personal Health Information

The DoD experience with healthcare information provides compelling justification for a health information system that is person-centered and focuses on collecting a wider range of personal health information. Meeting the enterprise need for multi-

domain health information is critical to improved health management and promotion. Access to health information collected across all the WHO-defined health domains will result in a comprehensive health record (Figure 7). Given the chronic health challenges in the US, collecting and assessing information in the environmental and social domains represents the most pressing health management challenge.

Electronic Healthcare Record   **Personal Health Record**

          Outpatient   **Healthcare**
          Inpatient   **Environment**

                                   Communities
          History   **Social Networks**
          Physical   **Internet of Things**
          Lab/Rad/Rx   **Health Goals**
          Treatments   **Activity**
                                   Sleep
                                   Nutrition
                          Health Plan / Benefits

Figure 7. Electronic Health Record vs. Personal Health Record Information

The Internet of Things is estimated to grow to $1.9 billion sales globally by 2020.[52] In healthcare, internet enabled sensors are anticipated to enter widespread public use and enable the collection of a wide range of biometric data. The ONC recently published guidelines for collecting patient generated device information. These guidelines presume that these data will be stored in patients' EHR,[53] which is appropriate for data such as weight and blood pressure. However, data such as helmet g-force sensor data, area-based CBRNE, and pollution sensors are environmental and should be stored as such outside of the EHR healthcare data. Similarly, in the social domain, many fitness web sites allow members to store pedometer and other activity data, record calorie intake, dietary habits, and share weight loss and fitness goals with

others. Social domain health information may hold the keys to assessing elusive risk factors for suicide, violence, substance abuse and other behavioral health issues. In the future, health information must be more than healthcare information, warranting careful consideration of how to incorporate broader health information domains into comprehensive personal health records. Without a deliberate determination of the health management information collection and sharing requirements, the health community risks sequestering otherwise usable information in HIPAA-protected records and undermining effective health management.

Broader consideration of health information beyond healthcare delivery purposes holds tremendous potential to improve the health of individuals and the overall population. Bringing so-called big data analytics capability to health management will revolutionize health trend analysis and surveillance. In addition to tracking new CBRNE threats, biosurveillance through advanced analytic tools offers the potential of early detection of more subtle population level trends over months or years. Such analysis could identify the next emerging combat associated health syndrome, as well as enterprise population-level threats (Figure 8), potentially before the onset of spread of the disease or affliction. Significant characteristics of syndromic surveillance on this scale in contrast to typical CBRNE threat-based surveillance include longer time horizons (emerging health threats manifested in months to years vs. days to weeks), less discrete and less well-defined risk behaviors, much greater sample size (major portions of the population vs. just those seeking healthcare), and broader data domains.
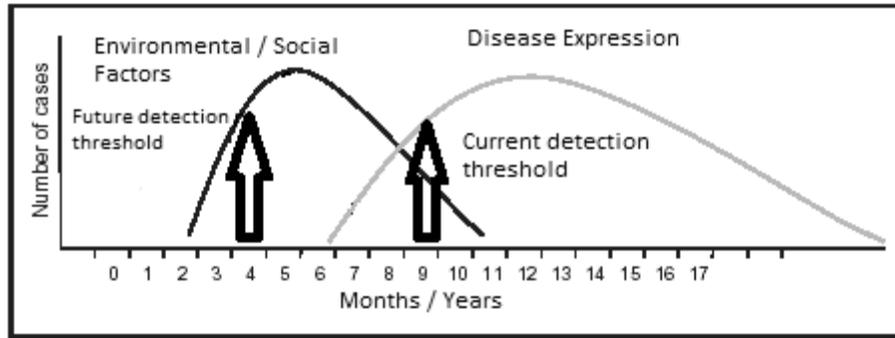
Figure 8. Syndromic Surveillance of Risk Factors before Disease Expression

The Way Forward: Conclusion and Recommendations

Health of Americans is a vital national interest that is derived from our fundamental human rights established in the founding of our nation. US health outcomes lag those of peer nations in nearly all measures. Despite outspending every other nation by a wide margin, we live shorter, less healthy lives. To achieve optimized health, the nation must turn from the assumption that investment of ever increasing resources in health care delivery will optimize health.

The US and DoD lack a comprehensive strategy for effectively managing a comprehensive health information architecture to inform and enable that strategy. A strategy formulation process examining "ends," "ways," and "means" reveals the current national strategies for prevention and quality are insufficient to improve health. What is needed is a process to develop a comprehensive whole-of-nation health strategy. Only a whole-of-nation approach brings sufficient stakeholder involvement to change culture, promote organizational reform, and provide needed governance. While the National Prevention Strategy can serve as a basis for the development of the health strategy, success demands tighter integration of public and private systems and resources.

Optimized health requires the "ways" of governance, resourcing, and a multi-domain information collection and analyses. We can no longer assume that EHRs, either in isolation or networked through interoperable health information exchanges provide the needed health information. Moreover, EHR-derived information is insufficient in and of itself to produce the multi-domain information required to support the proposed health architecture. The traditional "bottom up" approach, a result of health care organization centered business models, fails to address the identified strategic risks. Only a "top down" enterprise health architecture designed to yield optimized health provides the required health information (Figure 9).

Health Architecture
- Priorities
- Capabilities
- Business Systems
- Initiatives
- End-to-End Framework

Information Architecture
- Who exchanges what with whom?
- What manner (form, frequency, timelines)?
- What processes and activities are collected?

Optimized Health

Technical Architecture
- Connectivity Requirements
- Interfaces
- Performance Drivers
- System Configuration
- Network interfaces

Data Architecture
- Data Structures,
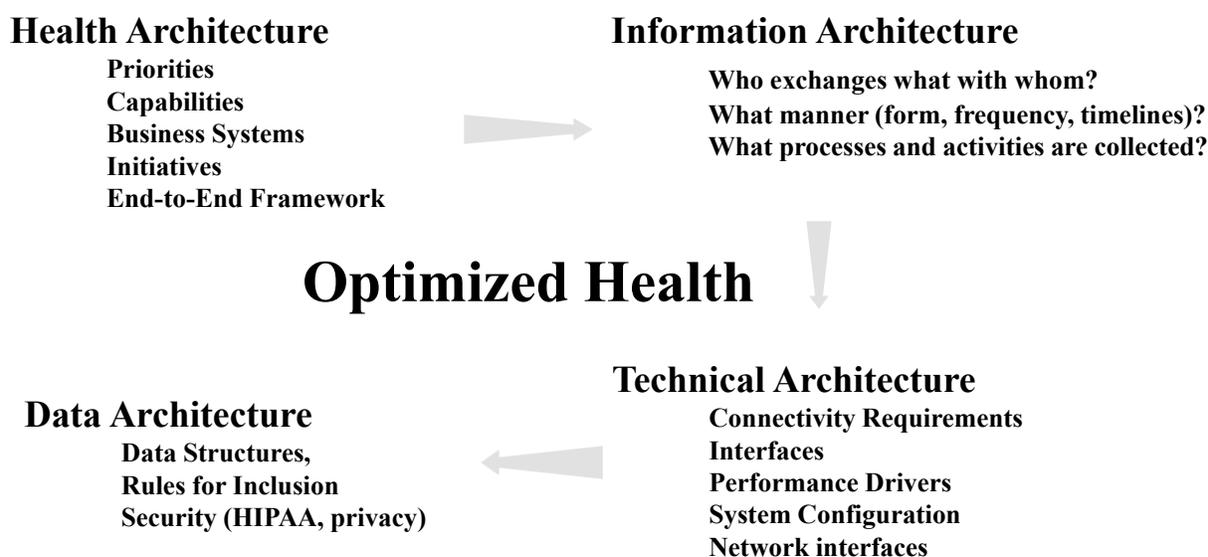- Rules for Inclusion
- Security (HIPAA, privacy)

Figure 9. Enterprise Health Architecture

In this model, comprehensive governance mechanisms define the desired strategic ends which then drive the health architecture. The health architecture in turn drives the information, technical, and data architectures in support of the overall enterprise outcomes. The resulting architecture, a true health information enterprise, is a strategic asset that will achieve the desired strategic outcomes.

Recommendations:

1. Develop an enterprise architecture for health. Leverage the R2C governance structure to develop the health architecture. Add the health architecture to the DoD Business Enterprise Architecture managed by the Deputy Chief Management Officer. Use the health architecture to develop the DoD enterprise health information architecture.

2. Develop health information enterprise as a capability. This capability should include at a minimum the data sources, data warehouses, data scientists, business and health analysts, and knowledge managers.

3. Ensure the health information enterprise is supported by the DoD and VA electronic healthcare records. The health information enterprise should drive the requirements for the data architecture of the next generation DoD electronic health record.

4. Leverage environmental scanning methods used for domestic security intelligence (big data, analysis of anomalies for trends, data governance) as a framework for development and implementation of the health information enterprise.

5. Broaden the scope of the National Prevention Strategy to develop a National Health Strategy. Expand the strategic stakeholder community, leveraging the whole-of-government representation of the National Prevention Council to form a whole-of-nation approach to health.

6. Perform a strategic risk assessment of the National Prevention Strategy. Assess the feasibility, acceptability, and suitability. Assess strategic objectives and increase integration with healthcare delivery mechanisms. Identify stakeholders not represented on the National Prevention Council and increase representation across all health management domains.

Endnotes

[1] Barack Obama, *National Strategy for Biosurveillance* (Washington, DC: The White House, July 2012), 1.

[2] World Health Organization Constitution, July 22, 1946.

[3] Barack Obama, *National Security Strategy* (Washington, DC: The White House, May 2010), 49.

[4] Obama, *National Strategy for Biosurveillance*, 2.

⁵ Syndromic surveillance is defined as," an investigational approach where health department staff, assisted by automated data acquisition and generation of statistical alerts, monitor disease indicators in real-time or near real-time to detect outbreaks of disease earlier than would otherwise be possible with traditional public health methods." For the purposes of discussion in this paper, the term "biosurveillance" as described in the National Strategy will be considered interchangeable. For more on the definition of syndromic surveillance, see Centers for Disease Control and Prevention, *Morbidity and Mortality Weekly Report* 53 (Suppl.), September 24, 2004, 5-11.

⁶ Jeffrey Engel and W. Ian Lipkin, *Improving the Nation's Ability to Detect and Respond to 21st Century Urgent Health Threats: Second Report of the National Biosurveillance Advisory Subcommittee*, Report to the Advisory Committee to the Director, CDC, April 2011, ii.

⁷ The 2010 National Prevention Council Members included: Surgeon General Regina M. Benjamin, Council Chair; Secretary Kathleen Sebelius, Department of Health and Human Services; Secretary Tom Vilsack, Department of Agriculture; • Secretary Arne Duncan, Department of Education; Chairman Jon Leibowitz, Federal Trade Commission; Secretary Ray LaHood, Department of Transportation; Secretary Hilda L. Solis, Department of Labor; Secretary Janet A. Napolitano, Department of Homeland Security; Administrator Lisa P. Jackson, Environmental Protection Agency; Director R. Gil Kerlikowske, Office of National Drug Control Policy; Director Melody Barnes, Domestic Policy Council; Assistant Secretary-Indian Affairs Larry Echo Hawk, Department of the Interior; Acting Chief Executive Officer Robert Velasco II, Corporation for National and Community Service; Secretary Robert M. Gates, Department of Defense; Secretary Shaun Donovan, Department of Housing and Urban Development; Attorney General Eric H. Holder, Jr., Department of Justice; Secretary Eric K. Shinseki, Department of Veterans Affairs; Director Jacob J. Lew, Office of Management and Budget.

⁸ *Healthy People 2010*, http://wonder.cdc.gov/data2010/focus.htm (accessed 5 March 2014).

⁹ National Prevention Council*, National Prevention Strategy* (Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General, 2011), 7.

¹⁰ Ibid., 11-12.

¹¹ National Prevention Council*, National Prevention Council Action Plan* (Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General, 2012), 9, 25, 36, 38.

¹² US Burden of Disease Collaborators, "The State of US Health, 1990-2010 Burden of Diseases, Injuries, and Risk Factors," 591.

¹³ Steven H. Woolf and Laudan Aron, Eds., Committee on Population, Division of Behavioral and Social Sciences and Education, and Board on Population Health and Public Health Practice, Institute of Medicine, *U.S. Health in International Perspective: Shorter Lives, Poorer Health*, National Research Council and Institute of Medicine. Washington, DC: The National Academies Press, 2013, 39*.*

¹⁴ Ibid., 36.

[15] Ibid., 29.

[16] Ibid., 30.

[17] Ibid., 2.

[18] US Burden of Disease Collaborators, "The State of US Health, 1990-2010 Burden of Diseases, Injuries, and Risk Factors," 597.

[19] Woolf, *U.S. Health in International Perspective: Shorter Lives, Poorer Health,* 39.

[20] Congressional Budget Office, Long-Term Implications of the Fiscal Year 2014 Future Years Defense Program (November 2013), http://www.cbo.gov/publication/44683, 25 (accessed March 5, 2014).

[21] Ibid.

[22] Ibid., 1.

[23] Ibid., 2.

[24] US Burden of Disease Collaborators, "The State of US Health, 1990-2010 Burden of Diseases, Injuries, and Risk Factors," *Journal of the American Medical Association* 319, no. 6, August 14, 2013: 591.

[25] Nonmedical costs included potential productivity losses due to higher rates of absenteeism, lower-than-normal work productivity, first-term attrition from military service, and alcohol-related arrests. For medical and non-medical costs, see TM Dall, Y Zhang, YJ Chen,RC Wagner, PF Hogan, NK Fagan, ST Olaiya, and DN Tornberg, "Cost Associated with being overweight and with obesity, high alcohol consumption, and tobacco use within the military health system's TRICARE prime-enrolled population,." *American Journal of Health Promotion* 22, no.2, 120-139, 2007.

[26] Centers for Disease Control and Prevention, *Morbidity and Mortality Weekly Report* 53 (Suppl.), September 24, 2004, 5-11.

[27] Centers for Disease Control and Prevention, http://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm (accessed February 13, 2014).

[28] U.S. Government Accountability Office, Capitol Hill Anthrax Incident, EPA's Cleanup was Successful; Opportunities Exist to Enhance Contract Oversight: Report to the Chairman, Committee on Finance, U.S. Senate (Washington, DC: U.S. Government Accountability Office, June 2003), 1.

[29] Centers for Disease Control and Prevention, http://www.cdc.gov/sars/about/faq.html, (accessed February 13, 2014).

[30] U.S. Congress, Senate, Committee on Armed Services, *Department of Defense Authorization for Appropriations for Fiscal Year 2014 and the Future Years Defense Program*,

113th Cong., 1st Sess., April 17 and 24, 2013, downloaded from http://www.gpo.gov/fdsys/pkg/ CHRG-113shrg85631/html/CHRG-113shrg85631.htm (accessed April 13, 2014).

[31] U.S. Congress, House, Committee on Armed Services, Subcommittee on Military Personnel, *Recruiting, Retention and End Strength*, 111th Cong., March 3, 2009.

[32] Ibid.

[33] *American Battle Monuments Commission Homepage*, http://www.abmc.gov/searc (accessed 4 March 2014).

[34] Honor the Fallen, http://projects.militarytimes.com/valor/ (accessed 13 February 2014).

[35] Gudrun Lange, Lisa McAndrew, PhD, "War Related Illness and Injury Study Center (WRIISC): A Multidisciplinary Translational Approach to the Care of Veterans with Chronic Multisymptom Illness," *Military Medicine*, no. 178, 7:705, 2013.

[36] Clay Wilson, *Improvised Explosive Devices (IEDs) in Iraq and Afghanistan: Effects and Countermeasures* (Washington, DC: U.S Library of Congress, Congressional Research Service, August 28, 2007), 1.

[37] *The Defense and Veteran Brain Injury Center History Page*, http://dvbic.dcoe.mil/history (accessed on March 3, 2014).

[38] Army Study to Assess Risk and Resilience in Servicemembers, "Evidence-Based Prevention is Goal of Largest Ever Study of Suicide in the Military." http://www.armystarrs.org/sites/default/files/2008-11-12_Evidence-Based-Prevention-is-Goal.pdf (accessed 3 March 2014).

[39] *The United States Army Home Page*, http://www.army.mil/article/119301/ Number_of_suicides_in_Army_drops_in_2013/ (accessed 13 February 2014).

[40] Army Study To Assess Risk and Resilience in Servicemembers, "By the Numbers," Quarter 4, 2013, http://www.armystarrs.org/home (accessed 3 March 2014).

[41] Frank Grad, *The Preamble of the Constitution of the World Health Organization*, Bulletin of the World Health Organization 2002, no. 80 (12), 981-984.

[42] For the purpose of this paper, domains will be limited to physical, mental, social, environment, and spiritual. For a full description of health domains, see World Health Organization Quality Of Life, *Measuring Quality of Life, Division of Mental Health and Prevention of Substance Abuse*, World Health Organization, 1997, http://www.who.int/mental_health /media/68.pdf (accessed March 6, 2014).

[43] National Prevention Council*, National Prevention Strategy,* 7.

[44] John McHugh, Secretary of the Army, "Ready and Resilient Campaign Plan"; http://usarmy.vo.llnwd.net/e2/c/downloads/281001.pdf (accessed 7 March 2014).

[45] "Ready and Resilient Campaign Plan, Key Messages," linked from *The US Army Homepage* at http://usarmy.vo.llnwd.net/e2/rv5_downloads/features/readyandresilient/readyandresilient5x8Card.pdf (accessed March 7, 2014).

[46] Ready and Resilient Campaign Quick Wins EXORD 037-13, at https://www.us.army.mil/suite/doc/38622595?s_cid=RREXORD (accessed 9 March 2014).

[47] US Department of Health and Human Services, "Summary of the HIPAA Privacy Rule," , May 2003, http://www.hhs.gov/ocr/privacy/ hipaa/understanding/summary/privacysummary.pdf (accessed March 9, 2014).

[48] Pilot sites included Ft Bliss, TX; Tinker AFB, OK; Robins AFB, GA; and Corpus Christi NHC, TX.

[49] U.S. Congress, Senate, Committee on Veterans' Affairs, *Seamless Transition: Review of the Integrated Disability Evaluation System,* 112th Cong., 2nd sess., May 23, 2012, downloaded from http://www.gpo.gov/fdsys/pkg/CHRG-112shrg74394/html/CHRG-112shrg74394.htm (accessed March 10, 2014).

[50] Office of the Surgeon General, U.S. Army, *US Health Service Support Assessment, Combined Joint Operations Area Afghanistan* (draft), October 2011, 34-37.

[51] Jonathan Woodson, Assistant Secretary of Defense (Health Affairs), *Evaluation of the TRICARE Program: Access, Cost and Quality, Fiscal Year 2013 Report to Congress*, TRICARE Management Agency, 2013, 24.

[52] Gartner Group press release, "Gartner Says the Internet of Things Installed Base Will Grow to 26 Billion Units By 2020," www.gartner.com/newsroom/id/2636073, December 12, 2013 (accessed March 10, 2014).

[53] Leslie Hall, Russ Leftwich, *Patient Generated Health Data Recommendations*, Consumer Technology Workgroup, Office of the National Coordinator, February 18, 2014, http://www.healthit.gov/FACAS/sites/faca/files/CT_PGHD_Recommendations_14_Feb_18.pdf (accessed 10 March 2014).