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ABSTRACT

This paper examines the health care sector's impact on national security through an analysis of the structure, challenges, and outlook of its components: patients, payers (Government/ private insurers), providers (clinicians and hospitals/physicians), and pharmaceuticals. Moving through a discussion of critical economic and national security failures that the United States may face if current approaches to the nation's health and health care system remain unaltered, the paper concludes with several policy recommendations. Significant change will be required to lower cost growth and avoid the fiscal cliff, address the "silver tsunami," sustain military readiness, and strengthen the sector (and the nation) for future generations.

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INTRODUCTION

The health care sector in the United States (U.S.) consumes approximately 17 percent of GDP, comprises 42 percent of mandatory Federal spending,[1] drives deficit spending, and touches every aspect of American life, including military readiness. The Department of Defense (DoD) Unified Medical Program (UMP) – the consolidated budget for the Military Health System (MHS) – consumes more than eight percent of total DoD outlays.[2] Absent significant change, increased DoD health spending will begin to crowd out readiness and modernization efforts. Similarly, U.S. mandatory spending, driven by the aging population and rising health care costs, will begin to crowd out discretionary spending by 2029.[3] Compounding this grim financial picture, American health care is the world's most expensive, but far from the world's best in terms of access to primary care, prevention, coordination of services, and core measures such as morbidity and mortality.[4]

> Overall health system performance in the United States does not compare well with that in other wealthy nations, particularly given high U.S. spending... The health care spending gap with other countries appears to be driven by the high prices the U.S. pays for health care services — particularly doctors, pharmaceuticals, and administration.[5]

This cost-based failure of the health care system is further exacerbated by, and in turn exacerbates, health care inequity and inequality in the U.S. Cost restricts access, ensuring that vulnerable populations not only fail to receive care when ill or injured, but also fail to obtain adequate preventive and primary care. Equally problematic is our nation's *reactionary* response to individual and global health crises – about 70 to 80 percent of health care spending is on preventable conditions – which is not leading to quality outcomes.[6] Current challenges in the health care sector are not new, and do not hinge solely on rising costs, quality, or the availability of care; rather they arise from the interconnectedness and misalignment of all three. As renowned Harvard Business School professors Robert Kaplan and Michael Porter state:

> Efforts to reform health care have been hobbled by lack of clarity about the goal, or even by the pursuit of the wrong goal. Narrow goals such as improving access to care, containing costs, and boosting profits have been a distraction. Access to poor care is not the objective, nor is reducing cost at the expense of quality… the overarching goal for providers, as well as for every other stakeholder, must be improving value for patients, where value is defined as the health outcomes achieved that matter to patients relative to the cost of achieving those outcomes.[7]

This observation is equally true for the collective as it is for the individual.

The future health of the nation, and by extension its economic and national security, depend on the realignment of access, quality, cost, and the realization that long-term military readiness is dependent on a healthy population. On the basis of this Industry Study's analysis, we provide a series of recommendations for both Government and private sector entities to transform U.S. health care, making it more sustainable overall, and more conducive to national security requirements.

HEALTH CARE DEFINED

Much like the human body itself, the health care sector is a complex organism comprised of independently functioning, but interrelated systems. When one component industry is weakened or failing, the entire system suffers. The key products furnished by the health care sector fall into the broad categories of pharmaceuticals and devices, while the key services fall into the broad categories of insurance coverage and direct care delivery by clinicians and hospitals. In U.S. policy discourse and economic analysis, the four "P"s of health care are often referred to as patients, payers, providers, and pharmaceuticals.

Apart from patients, each of these groups comprises its own separate industry with multiple sub-industries. Payers are either private insurance companies or governmental organizations that pay for medical care; from an industry perspective, they do not include self-paying patients. Providers include physicians and other medical professionals, hospitals, rehabilitation facilities, and ambulatory care or other out-patient facilities. The pharmaceuticals industry includes firms that manufacture synthetic chemical drugs, biologics, and vaccines.[8] As discussed in the next section, these groups defy traditional consumer/competitor definitions, playing different roles depending on the transaction. For example, when insured patients visit a primary care physician, they are simultaneously a consumer of services from *both* the physician and the payer; the payer is simultaneously a supplier of service to the patient *and* a consumer of services from the provider. This pattern of overlapping roles is repeated in virtually every transaction within the health sector.

The World Health Organization (WHO) describes a functioning health care system as one "built on having trained and motivated health workers, a well-maintained infrastructure, and a reliable supply of medicines and technologies, backed by adequate funding, strong health plans, and evidence-based policies."[9] In 2008, the nonprofit Institute for Healthcare Improvement (IHI) first conceptualized the health care triple aim as "an approach to optimizing health system performance. It is IHI's belief that new designs must be developed to simultaneously pursue three dimensions […] improving the patient experience of care (including quality and satisfaction); improving the health of populations; and reducing the per capita cost of health care."[10] More simply put, this health care "trinity," now widely accepted as the defining approach to health care sector reform, aims for better health, better care, and lower cost.[11]

From a national security view, military readiness forms a fourth essential consideration. Thus, in 2013, the MHS adopted a *quadruple* aim that mirrors the IHI definitions but includes a requirement for "ensuring that the total military force is medically ready to deploy and that the medical force is ready to deliver health care anytime, anywhere in support of the full range of military operations, including humanitarian missions."[12] It is this quadruple aim, and its interdependencies, that form the focus of this report. Much of the work to be done, and the policy recommendations made here, depend on efforts to reduce cost and reframe expectations. As an Eisenhower School guest speaker advised, "To tackle the spending issue… [we must] reform the delivery system. By paying for value over volume and eliminating wasteful spending, we can potentially drive down costs while maintaining or improving the quality of care."[13] Therefore, to examine the broad role of health care in national security, it is imperative to consider the components of the sector that are the targets of the quadruple aim.[14]

CURRENT CONDITION OF THE INDUSTRY

According to business information publisher Marketline, the $3.5 trillion dollar U.S. health care sector saw overall growth of 5.4 percent in 2017, and is expected to grow another 32.8 percent in the next decade.[15] This growth is attributed in large part to (1) the Patient Protection and Affordable Care Act (ACA), which increased the number of insured Americans accessing pharmaceuticals at defrayed cost,[16] and (2) improvements in the global macroeconomic outlook. The latter is underscored by the Organization for Economic Co-operation and Development's (OECD) report that health care spending per capita is on an upward trajectory for all developing/developed countries, with the U.S. leading the way at nearly $10,000 per citizen.[17] Political and economic drivers aside, "another force behind the growth of the sector is the inflationary trend of healthcare costs… Rising costs in medical staff and other input such as pharmaceuticals, as well as increasing administrative costs are to blame for this trend."[18] To better explore and understand the sector's structure, growth, strategies, and market factors, it is helpful to consider its components in two categories: products and services.

Products Industry Perspective

Pharmaceuticals, which encompass drugs (chemically manufactured ingredients), biologics (derived from natural sources), and vaccines, are the dominant product category in the U.S. health care sector and represent about 10 percent of total expenditures.[19] Global revenue for the industry exceeded $1.1 trillion in 2017, and is forecast to increase an average of more than 3.7 percent per year, reaching nearly $1.4 trillion by 2022.[20] Industry profits are estimated at 23 to 24 percent of revenue.[21] As the world population ages, and people live longer with multiple chronic illnesses, the demand for pharmaceuticals will remain strong. The burgeoning middle class in developing countries provides substantial opportunity for growth within the industry.

The pharmaceutical industry is extremely competitive among and between established global innovators such as Roche, AstraZeneca, and GlaxoSmithKline (GSK), and generics manufacturers like Mylan and Teva. While recent financial performance and projections indicate that the industry is healthy, feast or famine cycles are the norm: blockbuster drugs are introduced, but eventually, their patents expire. When the U.S. Food and Drug Administration (FDA) grants approval to a generic manufacturer, the brand name drug experiences a significant decline in revenues and profits. The so-called "patent cliff resulted in an estimated $250 billion drop in sales between 2012 and 2015, prompting many manufacturers to constrain their R&D expenditures after being exposed to strong competition from generic drug manufacturers."[22]

There are many barriers to entry, including the high cost of research and development, the need for infrastructure and equipment, and knowledge of the FDA application and clinical trial processes. Nevertheless, new market entrants, particularly biotech start-ups, are often welcomed by the established manufacturers, who may provide incubator space, equipment, and FDA process expertise in return for favorable consideration if the start-up succeeds and is willing to sell its intellectual property (IP).[23] Pharmaceutical industry suppliers have little bargaining power with manufacturers, as raw materials and equipment are abundant. The threat of substitutes, such as alternative medicine, diet-based treatment, or physical therapy rather than pain medicine, is present but unlikely to significantly impact the industry's bottom line in the foreseeable future for a few

reasons. Many medical conditions can only be treated with pharmaceuticals, while in other instances, Americans may prefer taking a pill to making long-term behavioral change. These factors contribute to pharmaceutical manufacturers' strong market position.

Buyer bargaining power in the pharmaceutical industry merits its own discussion. Individual consumers have very little bargaining ability, but hospital networks and private insurance companies with Pharmaceutical Benefits Managers leverage their purchasing volume to obtain discounts. While other governments and nationalized health care systems like the United Kingdom's (UK) National Health Service (NHS) use the same type of leverage to get discounted pharmaceutical prices, the U.S. Medicare and Medicaid systems do not negotiate drug prices. Many health care experts and politicians have called for U.S. Centers for Medicare and Medicaid Services (CMS) to negotiate or set caps for these prices, like the Department of Veterans Affairs (VA) does – a recommendation shared by the Industry Study participants. The pharmaceuticals industry resists negotiating prices with CMS, citing its high cost, high risk business model as justification. Manufacturers note that once generics reach the market, a pharmaceutical company's annual profits for a particular drug can drop from $100 million to $1 million virtually overnight.[24]

Some industry observers divide pharmaceutical manufacturers into two camps: those who primarily innovate and develop new drugs, and those who primarily seek to profit from current drugs (branded or generic); though many companies pursue both strategies.[25] Enormous sums of money are spent on research and development to develop the next billion-dollar selling drug. The Tufts Center for the Study of Drug Development found that on average, pharmaceutical companies spent $2.6 billion to bring a drug to market, taking into account costs associated with the 9 out of 10 drugs that never make it to market.[26] Pharmaceutical companies also spend millions of dollars marketing brand name drugs to doctors and directly to U.S. consumers, a strategy that recent lawsuits have blamed for the over-prescription and overuse of opioids.[27]

Pharmaceuticals often deviate from the traditional economic supply and demand curves. An increase in the supply of patented pharmaceuticals, which are protected from competition, places no downward pressure on the price. In the U.S., drug manufacturers charge what the market will bear, which is frequently negotiated by the payer (insurer), *not* the patient. Only when a drug patent expires and a generic becomes available will prices come down – generally, competitive prices emerge when multiple generic manufacturers enter the market. Further, the purchase of behind-the-counter drugs is not simply transactional; legally, these drugs cannot be dispensed without a doctor's prescription. In essence, physicians are gatekeepers, and may influence whether the patient requests a generic or a branded drug. However, patient demand is increasingly driven by pharmaceutical advertising, and is often entirely devoid of price information or consideration, particularly if a third party payer is covering the cost.

Services Industry Perspective

In the health care sector, services are supplied by payers (Government and private insurers) and providers (clinicians and acute care facilities such as hospitals). Payers are intermediaries in the health care delivery process, and fulfill a critical role in ensuring patients' access to primary and specialty care, and in preventing personal bankruptcy from catastrophic health costs. The Federal Government is the payer for nearly two-thirds of all U.S. health care expenditures through Medicare, Medicaid, the Department of Veterans Affairs (VA), TRICARE (the military's health insurance program), the Children's Health Insurance Program, and subsidies for individual insurance premiums under the ACA.[28] The Medicare and Medicaid programs' spending was equivalent to 5.7 percent of the U.S. GDP in 2017, and are expected to grow to 7.3 percent of GDP by 2028.[29] The private insurance market accounts for the remaining one-third of health care expenditures. In 2016, the five largest private insurance companies (UnitedHealth Group, Anthem, Aetna, Humana, and Cigna) reported combined revenue of $431 billion and nearly 10 percent three-year average growth.[30, 31] In general, "the industry's net income rose to $13.1 billion, up 46 percent from a year earlier… [and] much of the earnings boost came from higher profitability in their Medicare Advantage divisions and smaller losses in their Obamacare [ACA] exchange packages."[32]

Insurers wield significant power over their buyers (patients) and sellers (providers and pharmaceuticals), particularly in localities with only one dominant private insurer. Health insurance companies negotiate reimbursement rates with sellers such as physicians, hospitals, and drug manufacturers to secure advantageous prices. At the same time, the U.S. Government wields tremendous influence in the payer sector, through statutory and regulatory requirements for both private and Government-funded insurance, and by setting Medicare's reimbursement rates. The VA's formulary of approved pharmaceuticals similarly affects drug manufacturers' or wholesalers' volume, price, and revenues, by dictating discounts.[33] However, the consumer often has little to no awareness of what the health care provider bills for services, or what the government or private insurance company reimburses for the services. Historically, new entrants have had little impact, but the payer industry is facing new, disruptive market forces, discussed below, that present serious challenges to the payers' current business practices. For private insurers, there is also the threat of substitutes, such as the U.S. adopting a single payer model in which the Government provides all health insurance. The single payer concept is highly controversial, and in past public debates and elections, has proven susceptible to criticism that health care would be rationed under that model.

The CMS is testing innovative payment strategies such as reimbursing providers for bundled services, rather than the typical fee-for-service, which will alter providers' financial incentives and is expected to improve outcomes. Numerous industry mergers and consolidations are taking place to create both economies of scale and strategic advantage for the companies. For example, insurer Aetna and pharmacy giant CVS Health announced merger plans in December 2017, while insurer Humana and retail giant Walmart are working together to provide accessible primary care and affordable prescription drugs at a large network of retail stores. In January 2018, corporate leaders Amazon, Berkshire Hathaway, and JPMorgan Chase announced a joint venture to provide affordable health care to their employees – a collaboration likely to be a game changer for the health insurance market, given the companies' size, scope, and track record as disruptors. The Industry Study recommends that CMS and the Defense Health Agency (DHA) both pursue value-based

payment initiatives and monitor unfolding disruptions in the payer sector with an eye to adopting successful strategies to lower costs while delivering quality care.

The patient-payer relationship often suffers from the principal agent problem, in which the principal and his agent's interests are not aligned, and information is not fully shared, leading to poor outcomes.[34] For the standard supply and demand model to work, consumers need information, particularly around costs and alternatives. However, insurers often mask the true costs of health care with confusing benefit explanation statements in which the quoted price, the price negotiated by the insurer, and the patient co-payment are unpredictable and presented well after care delivery. As long as health care costs are opaque and heavily subsidized by payers, market forces will fail to lower prices. Likewise, when consumers perceive they have little or no choice in payers, due to a lack of options offered by their employer or a lack of adequate competition in their region, markets do not effectively self-regulate.

Finally, this Study examined service providers such as hospitals and physicians. The U.S. hospital industry includes facilities of all sizes and specialties, which are experiencing revenue growth at an annualized rate of 3.3 percent to $1.2 trillion in 2022.[35] Average industry profit is projected to remain steady at 8 percent from 2017 to 2022, due to increased purchase and labor costs.[36] Concentration is low in the hospital industry; no single provider has controlling market share, and the top four companies collectively hold less than 10 percent of total market share.[37] Buyers exercise power in terms of *demand* and *choice* of facility in markets where multiple exist, but exercise almost none in terms of *price*, in light of the payer-related discussion above. Vendors or sellers have little power over hospitals, but the physicians who work for the hospitals possess a significant degree of leverage, because they are critical employees and in relatively short supply.

In response to the growing focus on patient-centered care, hospitals are increasingly acquiring, building, or partnering with smaller outpatient facilities to serve patients in more economical, community-based settings. Rapid growth is taking place in the number of new health care facilities, such as physician-run outpatient surgery centers, specialty hospitals, and diagnostic centers.[38] Due to hospitals' specialization, diversification, and vertical integration, they will not be entirely replaced by these substitute or associated facilities, but are likely to develop into more of a hub and spoke model for services. With increasing numbers of facilities, competition is strong in many markets, so hospitals often promote their quality care and patient outcomes to drive demand. To be successful, hospitals must secure access to a highly skilled workforce of physicians, nurses, and administrative staff. Managing labor costs, navigating the complex regulatory environment, and optimizing capacity utilization are all drivers of hospital revenue and profits.

At the top of the clinician pecking order, physicians have average U.S. salaries of $216,000 for primary care providers and $316,000 for specialists, according to the 2017 Medscape Physician Compensation Report.[39] Noting a 43 percent increase in physician salaries from 2011 to 2017, the report states, "The major reason for the increase in salaries of recruited physicians is intense competition for doctors. There is competition between hospitals and health care systems, and also between urgent care centers, Federally qualified health centers, direct care, concierge care, and other delivery systems…"[40] The U.S. will experience a projected physician shortage of between 40,800 and 104,900 physicians by 2030, attributed to factors such as the aging and increasing population, longer life expectancy, more access to insurance, and technological advances.[41] Barriers to entry

into the physician profession include the high cost of tuition and substantial debt burden typically assumed by students, the lengthy time commitment, the heavy workload and strenuous hours, the excessive paperwork, and high malpractice insurance.[42]

One of the challenges exacerbating the physician shortage is the financial incentive to specialize. Throughout this paper, the importance of primary care is discussed, yet family medicine and pediatrics are at the low end of the physican pay scale. The three highest paying specialties in 2017 were orthopaedics, plastic surgery, and cardiology.[43] This Industry Study recommends providing more incentives for medical students to pursue and practice primary care, such as Government tuition reimbursement or student loan forgiveness. Further, as providers attempt to mitigate the shortage and stretch physicians' valuable time by increasing the number of other clinical care providers such as physicians' assistances, nurse practitioners, and other technicians, the overall supply of these trained professionals must grow, as well. "A health professional is difficult to substitute, in particular by using new technologies, which may actually also bring an increase in volume (e.g. faster diagnostic tests)…"[44] Even with increased supply, labor costs will likely rise, in light of the sustained demand and enhanced training requirements.

CHALLENGES

Economic

The rising cost of health care in the U.S. threatens economic prosperity and national security. Increases in Medicare/Medicaid participation, as well as the growing cost of care, place the nation on an unsustainable path in which mandatory spending and interest on the national debt will crowd out defense and other discretionary spending. Among developed countries, the U.S. spends the most on health care – about $10,000 per capita annually – yet its outcomes, measured by the OECD, are not commensurate.[45]

The U.S.'s higher spending and suboptimal outcomes are attributable to a flawed health care system in which (1) health inequity and inequality lead to delayed and often more costly care, along with diminished population health, (2) costs are opaque and often settled by third party payers, leading to perverse market incentives, and (3) Americans pay more for (some would say subsidize) pharmaceuticals compared to the rest of the world. The aging population, which consumes health resources at a significantly higher level in the last year of life, industry wages that are increasing faster than productivity, and the expansion of technology are also driving costs, [46] as discussed in the Current Conditions and Essay Sections of this paper.

Unlike most industries, market forces in the health care sector do not necessarily drive down costs or enhance customer value. The market fails to regulate itself when there is asymmetrical information, a lack of standardization, or inadequate competition. Even those who work within the industry admit that the market is not finding equilibrium. Physician and journalist Elisabeth Rosenthal notes that competition and consolidation in the health care sector can actually drive prices up, stating that, "Economies of scale don't translate to lower prices. With their market power, big providers can simply demand more."[47] One health care industry Chief Executive Officer observes that accountability must be shared across the sector, stating, "When everybody gets paid for service but no one is accountable for value, you get escalating costs."[48]

Public Health

The U.S. is facing several health-related headwinds, but perhaps most urgently, must deal with an aging population, rising obesity, opioid abuse, and inadequate mental health care. These demographic and behavioral headwinds should be addressed through multiple channels such as public policy, the faith community, families, employers, and schools, as well as the medical community. Further, the U.S. and the global community must build up the resiliency of their health systems, so they are flexible and adaptable enough to respond immediately and effectively to disasters – to scale as needed, sustain operations during emergencies, and ensure the continuity of regular services to their population.[49]

"According to the WHO, the number of people aged 65 or older is expected to reach 1.5 billion in 2050 — nearly triple the number in 2010."[50] Health care systems must prepare for this consequential demographic change. "As the population ages, health care systems must adapt. Otherwise, they will be overwhelmed by a "silver tsunami" of patients — and with facilities and services that are poorly matched to those patients' needs."[51]

The rise of obesity in the U.S. is a far-reaching societal issue. "More than one third of adults and 17 percent of youths in the United States were obese in 2011-2014."[52] The CDC warns, "Obesity can lead to numerous health conditions which include: hypertension, high triglycerides, type II diabetes, heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and some cancers."[53] With some 70 to 80 percent of health care spending attributable to preventable conditions,[54] tackling a driver like obesity can lead to significantly better public health and lower costs.

Substance abuse is another preventable health condition reaching crisis levels in the U.S. "Opioids kill more than 100 Americans daily or 40,000 per year; with over 10 million people reporting an opioid-use disorder in 2014 alone, it's hardly surprising that the death rate from prescription-opioid overdose has quadrupled in just over a decade."[55] The increased emphasis on treating pain in the 1990s, accompanied by the introduction and aggressive marketing of new, extended duration opioids, contributed to a dramatic increase in opioid use and abuse. There is no easy solution – this public health problem, like obesity, requires a comprehensive Government and private sector response. "Failure to properly identify and fund prevention, education, enforcement, and treatment as well as the need to research and fund [a] new pain management protocol will continue to cost the country billions of dollars in lost productivity and loss of life."[56]

Finally, the nation must remove the stigma of disclosing and treating mental or behavioral health issues, especially among military and veteran personnel. According to the National Alliance on Mental Illness, one in five Americans experiences mental illness during adulthood, with depression and anxiety being the most common; of concern, about 60 percent of those Americans do not receive mental health services or treatment at least once a year.[57] As one noted psychiatrist writes, "When mental health is ultimately recognized as essential to physical health, not an extraneous element of it, then we will have access to true, complete, modern medicine."[58]

Access Issues

The U.S. is the only high-income country ranked by the independent Commonwealth Fund that lacks universal access to health insurance.[59] While the Federal Government supplies health insurance to military, veterans, the elderly, people with disabilities, and low-income Americans, the foundation of the U.S. health care system is employer-based. This design is responsible for some of the inequity and lack of continuity in health care for Americans across several income strata. Some argue that health insurance should return to its roots and intended purpose – not an employment benefit, but a way to prevent catastrophic health events from bankrupting citizens.[60] However, the dual tax incentive – a tax break for employers who provide health insurance, and a tax exemption on the benefits for covered employees – make it a difficult paradigm to change.[61]

Americans who lack insurance or cannot afford co-payments often forego primary and preventive care such as annual physicals, routine dental care, or even necessary prescriptions.[62] However, these individuals may consequently require emergency health care, which comes at an even higher cost, often borne by others. This is one of the fundamental challenges the ACA sought to resolve by extending health care coverage. Going a step further, countries with single payer systems score much higher in metrics such as access to primary care. However, there is no panacea; experts observe that single-payer systems are also subject to inequity: "Every country that has single payer health system has a private payer safety valve."[63]

Global Health

While the National Security Strategy (NSS) addresses the threat of infectious disease outbreaks, further planning is recommended to address other exogenous threats which find their root in other countries' health security crises. Just as U.S. national security depends on the country's economic and physical health, so too does it depend on the nation's ability to respond to human-generated or naturally occurring extrinsic health threats. In 2009, the White House released the National Strategy for Countering Biological Threats to plan for domestic or international intentional misuse of pathogens by state or non-state actors and to use bilateral and multilateral agreements to respond quickly to an intentional release of a biological agent.[64] Biological agents are attractive weapons of terror as they can easily be concealed, may be modified to increase pathogenicity, and may be economical and sometimes easy to acquire. Animal pathogens that have been modified historically for bioweapon use include anthrax, tularemia, brucellosis and more.[65]

Beyond the risk of malign actors, the U.S. is not guaranteed immunity from health crises such as Ebola, SARS, and pandemic influenza; these concerns can have global security and economic consequences. Humans, insects, animals, and foodstuff can travel rapidly across the globe, and a country free of a disease can have an outbreak via an accidental or intentional import with devastating consequences for livestock production, the economy, and even human life.[66] It is both easier and preferable to avoid a domestic outbreak in the U.S. through prevention, detection, and response of disease in the country of origin.

From the geo-strategic perspective, local health crises can also lead to regional destabilization requiring a U.S. response. The Health Security Crisis Cycle articulates the risk inherent in failing states, and the possibility of spiraling instability generated by governmental and infrastructure collapse. Health sector failure can drive regional conflict, refugee flows, transnational crime/terrorism, or cross-border infectious diseases.[67] The Global Health Security Agenda (GHSA) uses host government and donor partners to prevent, detect, and respond to outbreak of disease. Targeted health security capabilities include: "reliable, sensitive real-time disease surveillance systems; safe, secure, and strong laboratories; a well-trained workforce; capable information systems; a command structure to coordinate an effective and focused response; and multi-sectoral collaboration."[68] These global health security risks will require the U.S. to take an expanded view of how regional health crises affect U.S. national security.

OUTLOOK

Social and Political Determinants

Numerous social determinants and political factors impact the health care sector, and will continue to do so in the foreseeable future. "Lack of food security, safe neighborhoods, education, steady employment, [and] secure housing" are characteristics that drive health care inequity and inequality.[69] The presence of these factors has both intrinsic and tangible costs for the country in terms of lower population health, a higher cost of care delivery, and a reduced pool of healthy candidates for military recruiting.[70] Access to insurance and the health care system is an important start, but the knowledge and means necessary to lead a healthy lifestyle remain elusive for some lower income communities in the U.S.

Health care is also a highly politicized issue in the U.S., though the electorate is not necessarily well informed on the substance. One political observer noted that in U.S. elections, people turn out to vote about *access* to health care, but not on health policy; elderly voters reliably turn out to support candidates who pledge to maintain Social Security and Medicare.[71] At the same time, the health care sector is big business, and consistently ranks among the top three sectors for lobbying expenditures.[72] These factors make politicians wary of applying direct controls on health spending, or indirect controls, such as addressing the cost of pharmaceuticals. Now that health care coverage has been extended to millions of Americans by the ACA, it will be politically difficult to take such coverage or related subsidies away. At least 70 bills to repeal the ACA have come to the floor of the U.S. House of Representatives but were not enacted. Policy makers will have to explore restructuring the requirements or allowing more state variation to foster changes.[73]

Sector Projections

Susan DeVore, President and CEO of health care alliance Premier, Inc., identified several near-term trends for health care in early 2018. Among them are comprehensive patient engagement, "acceleration of the value-based payment movement… increased legislative and regulatory policymaking to foster increased drug market competition… [and] emerging and converging digital health."[74] Leveraging technology, in particular, is one of the most compelling near-term trends in health care. "Telehealth… holds the promise to significantly impact some of the most challenging problems of our current health care system: access to care, cost-effective delivery, and distribution of limited providers."[75] The industry's short-term outlook is also marked by several announced and potential mergers among payers, providers, and pharmaceutical companies, which would create economies of scale, vertical integration, and more competitive positioning in the market. Corporate giants Amazon, Berkshire Hathaway, and JPMorgan Chase disrupted the industry when they announced a joint nonprofit venture to establish sustainable health care for their employees. While details have not yet been released, the size and scope of this venture will impact the entire sector.

The long-term outlook for U.S. health care depends largely on the Government's ability to manage the cost of its major health programs as the aging population places the system under strain. As one guest speaker put it, "There's a tsunami coming – $3 trillion on health care per year is a drag on the economy and can't be sustained." The sector manufacturers and service providers must work with patients, employers, and the Government to curtail cost growth. Congress has begun to explore

new business models for Medicare, such as the "premium support" concept. "Under such a system, beneficiaries would choose health insurance from a list of competing plans, and the Federal Government would share the cost of their premiums," essentially subsidizing more expensive plans.[76] During the semester, the Industry Study heard more than once that bipartisan Congressional support exists for narrow health-related issues like biomedical research and value-based payments, but broader structural changes remain politically thorny.

Nevertheless, many policy experts were optimistic that the U.S. health care system will evolve and become more sustainable. They predict a shift to patient-centered care, supported by strong primary care and preventive care, and that resources will be marshalled more effectively through innovation and technology.[77] Experts also observe that "systems are much more efficient when people are closer to the cost."[78] As the American public becomes better educated through price transparency, and as both patients and providers become more accountable for achieving population health and better outcomes, cost-effective decision-making should follow.

In terms of global positioning, the U.S. health care sector is likely to maintain its global leadership in technology and innovation, in large part because of the profitable U.S. market and strong IP protections. Even if the U.S. level of health care spending slows, the baseline exceeds its closest peer by more than 50 percent, indicating there will be ample money for new drugs, biologics, medical devices, and health information technology. The Department of Commerce International Trade Administration (ITA) acknowledges that the U.S. market is largest and most lucrative for pharmaceuticals, adding, "prices are comparatively high to make up for lower profits in other countries and to cover R&D costs."[79] At the same time, medical tourism is a growing global industry, and the U.S. is both a consumer and a growing recipient of this trend. The ITA reports that, "exports (i.e., travelers coming to the U.S.) have doubled, and imports (U.S. travelers going abroad) have increased almost nine-fold from a low base in the early 2000s. Despite rising costs, the U.S. health system continues to attract foreigners because of its high-quality services and its closeness to large patient markets."[80]

National Security Implications

The broader national security implications driven by Government spending on health care and the effect of health care on military readiness are discussed elsewhere in this paper. This section highlights the direct connection between the health care sector and national security through engagement in global health crises and initiatives. "Since the early 2000s, successive U.S. presidents have declared various pandemic diseases as risks of varying levels to U.S. national security… while public health practitioners are focused on global health matters *vis-à-vis* local populations, national security practitioners have always assessed public health, domestically and internationally, from a strategic security perspective."[81] While some question whether a military or humanitarian response to health crises overseas is the most appropriate use of U.S. funds, such engagement directly supports national security. "Global health engagement abroad can deny a base to those who would like to see countries stay unstable; they will help develop close relationships—both military and civilian—between countries and the United States; and they will create friends out of what could potentially have become enemies."[82]

President Donald J. Trump's National Security Strategy (NSS), issued in December 2017, discusses these threats explicitly in Pillar I, in the context of securing U.S. borders and territory by combatting biothreats and pandemics. Likewise, the National Defense Strategy (NDS), issued in January 2018, notes, "Recent advances in bioengineering raise another concern, increasing the potential, variety, and ease of access to biological weapons."[83] Even a contained biological attack would have severe national security consequences, causing casualties, triggering economic loss, resulting in a loss of confidence in the Federal Government. To address these concerns, the U.S. is directed to prevent the spread of global disease by working with allies proactively and preemptively to detect and mitigate outbreaks.[84] As discussed in the Recommendations section, improving domestic emergency response will increase the nation's ability to rapidly detect, diagnose, and contain outbreaks, as well as to provide surge medical care.

GOVERNMENT ROLE AND GOALS

The U.S. Government plays several roles in the health care sector. Its largest role is as the insurer or payer for health care for the military, veterans, the elderly, people with disabilities, and low-income Americans who qualify for the Federal Medicare or Medicaid programs. This facet of the Government's role is increasing alongside the expansion of Medicare/Medicaid eligibility under the ACA. In 2016, approximately 35 percent of Americans received Government-funded care.[85] Given the size and scope of these Government payer programs, the Federal Government effectively establishes prices for procedures and other reimbursable health care interactions. Through CMS, the Government seeks to be a leader of health care innovation and reform for the U.S. health care system. Under the ACA, CMS is driving higher quality and accountability by measuring hospital readmission rates and reducing payments to providers that fall below the standards.

The Government has many other roles in health care, as well. It is the provider of health care services at military treatment facilities under the DHA and veterans' medical centers under VA. At the same time, the Government regulates pharmaceuticals and medical devices through the FDA. Additionally, the Government funds research through grants administered by the National Institutes of Health and the VA. Finally, the U.S. Government addresses public health emergencies and crises, whether domestic (such as the current obesity and opioid epidemics) or global (such as the response to pandemic diseases such as Ebola and HIV/AIDS.)

According to the 2018 State of the Union Address, the Government's goals for health care include speeding the FDA's approval process for breakthrough cures, reducing the cost of prescription drugs, and providing terminally ill patients access to experimental treatments.[86] Beyond the State of the Union Address, the Trump Administration has placed significant emphasis on addressing the opioid crisis in America. In October 2017, President Trump declared the opioid crisis a Nationwide Public Health Emergency, and his President's Commission on Combating Drug Addiction and the Opioid Crisis issued a final report on November 1, 2017. As a result, the Administration is pursuing a multifaceted strategy of education and prevention, funding for treatment and recovery, and increased emphasis on law enforcement and interdiction.[87]

The CMS has several ongoing initiatives to innovate around and reduce the cost of Medicare and Medicaid. These include Accountable Care Organizations (ACO) and Value-Based Insurance Design (VBID), which are testing fixed-price payments for treatment of certain chronic conditions, like diabetes or congestive heart failure.[88] The CMS is also engaged in addressing obesity among recipients of Medicare/Medicaid such as paying for obesity screening, counseling, intensive behavioral therapy and even bariatric surgery to lower future Medicare costs and lengthen the program's solvency.[89] The country's path forward regarding improved access to health insurance and lowering the cost of care remain a significant debate in the U.S. Congress. Many health care industry leaders predict increased legislative and regulatory intervention in the near-term.

Surge and Mobilization (Personnel, Infrastructure, and Technology)

At the outset, the resources needed to support surge and mobilization will be severely constrained, or perhaps unavailable, if the U.S. fails to adjust its course with respect to cost growth in government health care programs, and consequently, growth in mandatory spending. As such,

the nation's economic health – specifically, avoidance of the fiscal cliff – has a significant impact on surge and mobilization. More directly, the health care sector's ability to surge and mobilize in support of national security is essential to the military's capacity to handle trauma patients, outbreaks of infectious disease, or exposure to biological or chemical agents.

During Operation Iraqi Freedom/Operation Enduring Freedom, air supremacy and the established air bridge allowed the U.S. to transport trauma patients to military hospitals on installations in Europe. These favorable conditions are not guaranteed in future conflicts; thus the U.S. must be prepared to handle trauma patients in theater. Likewise, the potential for U.S. troops to contract an infectious disease or to be exposed to biological/chemical agents overseas requires a defense capability for emergency medical treatment on-site as well as evacuation. Beyond a small pool of reservists, the only way to "surge" military doctors or other clinical practitioners is through contractor support.

In October 2017, the DHA awarded a contract for physicians, nurses, dental and ancillary health care workers with a $7.5 billion ceiling "to supplement the medical staff at Department of Defense military treatment facilities with health care workers within the 50 United States, District of Columbia, Guam and Puerto Rico."[90] In a conflict scenario, contractor support may be used to free up additional uniformed health professionals to deploy. However, given the shortage of physicians and health care workers in pockets across the U.S., the increased use of contractors as health workers will deplete the pool of health care workers in the U.S. who are needed to provide the primary care and preventive services detailed in the Better Population Health and Military Readiness essays.

The National Health Security Strategy (NHSS), which is focused on health security and emergency response in the homeland, is issued by HHS. In it, the agency states, "Responses to adverse health incidents, such as the 2014 Ebola epidemic, demonstrate that much work remains to be done to ensure that public health, healthcare, and emergency services systems are able to work together day-to-day, mutually supporting one another so that they can seamlessly scale up to handle increased requirements or demands…"[91] Given the above-referenced need for trauma capability and infectious disease response in theater and/or rapid evacuation to the U.S., DOD and HHS should increase coordination and contingency planning, to specifically identify the personnel, the infrastructure (medical treatment facilities), and the transportation resources needed to surge and mobilize to handle a large scale military trauma event or infectious outbreak among U.S. troops, particularly overseas.

ESSAYS ON MAJOR ISSUES

Major issues in the health care sector are examined and discussed through the lens of the "*Quadruple Aim*": Better Population Health, Better Care, Lower Cost, and Military Readiness.

Better Population Health

"It is now widely accepted that nations with healthy populations are more likely to be productive, prosperous, and peaceful."[92] A primary purpose of the U.S. health care system is to improve the health of the entire population, which involves reducing health inequities, promoting primary care, and emphasizing prevention and healthy behavior. However, declining life expectancy and increasing morbidity reflect a population with serious health challenges, many attributable to preventable conditions or behavioral issues such as substance abuse and suicide.[93] The health of the U.S. population is suffering from rising obesity, opioid abuse, unresolved mental health issues, and chronic diseases. Further, the way health care is delivered in the U.S. is not supporting broad population health. "Today's individual health care processes are designed to respond to the acute needs of individual patients, rather than to anticipate and shape patterns of care for important subgroups," notes former CMS Administrator Donald Berwick.[94] The U.S. and the global community must place more emphasis on comprehensive health care – not just curative care, but preventive, promotive, and rehabilitative care.[95] In particular, "prevention can reduce the risk factors that lead to chronic diseases, slow their progression, improve overall health and reduce health care spending."[96]

The U.S. Government should follow its own, successful precedents for changing attitudes and behavior toward public health issues. Education and preventive medicine campaigns led by the Surgeon General have effectively reduced smoking and brought attention to high-risk activities associated with skin cancer.[97] Targeted public information campaigns must now address today's public health challenges. For example, "prevention and education policies targeted towards our nation's youth will help slow the growing obesity epidemic."[98] Funds should be allocated to promote better nutrition and more exercise for adults and children. Likewise, "the United States must develop a comprehensive strategy that includes prevention, education, enforcement, and treatment in order to slow the [opioid] epidemic and attempt to reverse its current trend."[99]

Population health is increasingly supported by the use of "big data" to monitor public health, build intelligence, identify trends, and initiate outreach. Public health informatics is the practice of "acquiring, storing, retrieving and using healthcare information to foster better collaboration among a patient's various healthcare providers…"[100] Geisinger Health System, a pioneer of population health programs, uses health informatics to mine and analyze data in order to improve the health of their patients and community. Geisinger then provides comprehensive, often "simple, low-cost behavioral interventions," with powerful return on investment, such as their Fresh Food "Farmacy" that provides diabetic adults with free, nutritious food, which is delivering positive clinical results. The broader U.S. health care system should adopt Geisinger's best practices with respect to the patient-centered, value-based care and the use of health informatics to improve population health.

Better Care

The U.S. health care system has been characterized as "sick care," due to its focus on treating illness rather than maintaining health. To achieve better health outcomes at a sustainable cost, the delivery of care must evolve and embrace innovation. U.S. health care delivery must become more integrated, team-based, value-based, and focused on prevention to create the superior population health expected of Americans' incomparably high level of health spending. As discussed below, technology plays a large part in driving this change.

Currently, patient care delivered by U.S. providers, generally physicians, through medical practices and hospitals, is fragmented, inefficient, and costly. "Health care providers today are typically organized around specialties and services, which complicates coordination, interrupts the seamless, integrated flow of patients from one process to the next, and leads to the duplication of many processes."[101] This fragmentation is both detrimental to the goal of patient-centered care and suboptimal in terms of scarce physician resources. Global business information company IHS Markit projects a shortfall of 40,800 to 104,900 doctors in the U.S. by 2030.[102] To address this deficit, U.S. medical schools have expanded their capacity, but Congress must increase the Federal cap on residency positions at teaching hospitals (and contribute to funding those positions) to increase the throughput.[103] Integration of patient care through a team-based provider approach, including physician's assistants, nurses, pharmacists, physical therapists, behavioral health providers, and non-clinical staff, will make more effective use of limited physician time, increase patient satisfaction, and lower the overall cost of care.[104] As the IHS Markit report projected shortages in the other clinical positions, as well, the U.S. should take steps to encourage more people to enter the health care field.[105]

Changing the fragmented, underperforming health care paradigm requires the U.S. to focus on strengthening primary care, which "provides entry into the system for all new needs and problems, provides person-focused (not disease-oriented) care over time, provides care for all but very uncommon or unusual conditions, and coordinates or integrates care, regardless of where the care is delivered and who provides it."[106] One innovative care approach, the medical home concept, "uses primary care to improve health in the targeted population by increasing access to care, reducing health care access disparities, and increasing integration of health care with public health care systems."[107] In 2017, the CMS launched a new advanced primary care model, called the Comprehensive Primary Care Plus (CPC+) program. The CPC+ program provides increased incentives for eligible physician practices and promotes value-based holistic population health management and coordinated care.[108]

Technology-enabled care (TEC) is driving the improved delivery of health care, and an area in which the DOD and VA are assuming a leadership role. The terms TEC, telehealth, and telemedicine, used interchangeably, mean "the use of telecommunication and information technologies to provide health assessments, treatments, consultations, and other services across distances."[109] TEC promises to

> Significantly impact some of the most challenging problems of our current healthcare system: access to care, cost-effective delivery, and distribution of limited providers… It will increase access to healthcare so that remote patients can more easily obtain

> clinical services, and remote hospitals can provide emergency and intensive care services.[110]

Through TEC, military personnel and veterans are receiving care without costly or disruptive travel, with shorter wait times, and with improved patient outcomes. At the same time, the deployment of Electronic Health Records (EHR) is enabling more integrated, team-based care, and along with wearable electronic devices, is advancing the use of data informatics to monitor conditions, predict risk, make diagnoses, and develop more precise treatment.[111]

Similarly, the MHS is implementing recent legislative reforms to identify efficiencies, reduce redundancies, and improve the quality of care to active duty, dependents, and retirees, all while lowering costs.[112] Like the U.S. health care system writ large, the MHS must evolve and deliver care differently in the future. Rather than being military treatment facility (MTF)-centric in its delivery model, the MHS of the future will provide more team-based care and in particular, will integrate with private sector providers to ensure timely access and quality care.[113] Intertwined with these objectives, consistent with the broader health care system, the MHS is seeking greater affordability, and thus sustainability.

Quality and patient safety are crucial elements in the provision of better care. The quality of the U.S. health care system ranks below 10 other high-income nations, despite the fact that the U.S. outspends the next highest country by 50 percent.[114] Further, a study conducted at the Johns Hopkins University School of Medicine in 2016 concluded that, "medical errors are the third leading cause of death in the U.S., after heart disease and cancer, causing at least 250,000 deaths every year..."[115] While medical errors may be caused by clinical provider fatigue, they are more often attributable to a lack of communication or coordinated care.[116] Sustainable improvements in health care outcomes and patient safety requires two key ingredients, according to the OECD: "The first is a quality culture among both clinicians and service managers, to encourage continuously better and safer care… The second ingredient is a clear accountability framework."[117] The medical home model and advanced use of health IT are both methods of increasing integration and coordination that should be viewed as part of the solution with respect to medical errors and quality outcomes.

Lower Cost

The U.S. must address the many flaws in its health care system, leverage technology and innovation, and promote prevention to bend the cost curve while generating better outcomes. The ACA enabled more than 17 million uninsured Americans to gain access to health insurance,[118] but did not address the cost, quality, or equity of health care. Lower quality and inequity are cost drivers in the long-term. "Inequities in healthcare… inevitably result in the increased demand and the use of costly services at later stages of illness [and] negative outcomes…"[119] Minimizing patients' reliance on emergency medical services and proactively managing the needs of health care "super users" have been shown to reduce expenditures. Specifically, the Geisinger Health System's population health practice demonstrates how the use of health information technology, early intervention, and quality primary care identifies opportunities for outreach, effectively reduces emergency department visits, stabilizes chronic health conditions, and lowers overall costs for patients who are high consumers of care.[120]

Pharmaceutical prices are a significant cost driver in the U.S. health care system. "Drug prices are higher in the U.S. than in the rest of the industrialized world because manufacturers set the prices. In many other countries, regulators negotiate prices or reject coverage of the medications when they consider the price too high..."[121] Market forces such as competition are not lowering the cost of pharmaceuticals in the U.S., even for older cancer drugs.[122] Many in government and public policy assert that lowering drug prices will require Federal intervention. Leveling the playing field with more consumer information or creating a value-based pricing system that weighs the costs of drugs against the benefits and alternatives are two possible approaches to lowering pharmaceutical costs.[123] A change in the law to prohibit pharmaceutical advertising may lower demand for brand name drugs and thus lower prices. "The only two countries in the world that allow prescription drug advertising on television are the United Stated and New Zealand. In 2016, drug companies spent $6.4 billion on advertising in the US."[124] Finally, the U.S. could accelerate the entry of generic drugs into the market, potentially by shortening pharmaceuticals' patent protection.

Lack of cost transparency puts U.S. consumers at a market disadvantage; they are often unaware of the actual cost of their care or the drugs they are prescribed, and intermediaries (insurance companies) negotiate the prices paid. HHS Secretary Alex Azar is leading the charge for providers and pharmaceutical companies to be more transparent, stating, "In both health care services and pharmaceuticals, the huge gaps between the list price and the actual price are notorious, …" adding that if the industry doesn't respond, "we have plenty of levers to pull that would help drive this change."[125] Consumers are also disadvantaged by the health care system's perverse incentives. Physician and health journalist Dr. Elisabeth Rosenthal reports that many providers adjust their billing codes and practices to maximize their Medicare or private insurance payments.[126]

Still, "the core problem of fee-for-service medicine is that you get what you pay for … volume ahead of value."[127] As experienced health policy experts Bill Frist and Alice Rivlin framed:

> Our current fee-for-service system does not offer specific compensation for health care providers helping patients to make changes to improve their health. It also has few structural or financial mechanisms to connect health care providers to their broader communities. This is unsustainable because diet, exercise, smoking, substance abuse, violence, and environmental conditions have a greater influence on health than treatments and pills.[128]

Accordingly, CMS has launched several efforts to innovate and lower costs, such as ACOs and value-based payments in lieu of the traditional fee-for-service model. "ACOs are groups of doctors, hospitals, and other health care providers, who come together voluntarily to give coordinated care to their Medicare patients… When an ACO succeeds both in delivering high-quality care and spending health care dollars more wisely, the ACO will share in the savings it achieves for the Medicare program."[129] The VBID model is being used by CMS to test fixed-price payment for treatment of certain chronic conditions, like diabetes or congestive heart failure.[130]

Studies by independent organizations such as the Kaiser Family Foundation show that a disproportionate share of Medicare spending takes place during a patient's last 12 months of life.[131] With a population bulge reaching the septuagenarian years, the U.S. must have a national conversation about end-of-life care as well as palliative care (not necessarily the same thing). When

physicians discuss end-of-life concerns proactively, many patients choose more comfort-focused care and receive care more aligned with their values and goals.[132]

Technology is both a source of transformative care delivery and potential savings, but requires more training and higher wages. "Healthcare organizations can immediately begin increasing capacity and lowering cost today by incorporating virtual services… It will not only provide a method to reach underserved groups but can change the very nature of the demand/capacity equation."[133] Technology such as Artificial Intelligence (AI) is helping innovators such as pharmaceutical companies more quickly identify promising molecules or biologics to further research. Notably, the more complex the technology, the more training and compensation required by the workforce; these short-run costs are expected to be outweighed by long-term benefits. System reform, advantageous use of technology, a new approach to end-of-life care, and increasing use of preventive medicine are promising approaches to making U.S. healthcare more affordable. The biggest challenge to pursuing these solutions is political fortitude.

Military Readiness

The health of the total force is part and parcel of military readiness. Absent both a strong current body and a strong recruitment pool, no amount of technological advancement or expenditure will facilitate overwhelming overmatch. In all services, the mission remains dependent on human capital. Understanding this, the MHS has adapted the health care triple aim to encompass DoD-specific goals and objectives for the provision of care, adding readiness as a fourth aim.[134] DoD's success in achieving these goals demands a clear-eyed understanding of how various aspects of both the military and general health care sectors affect DoD operations.

Many of the factors driving increasing civilian health care costs are also driving increases in military health care spending. "The Unified Medical Program (UMP) budget has grown to $52.55B in Fiscal Year (FY) 2017. This amounts to 8.4 percent of the total DoD outlays for FY2017. Continued cost growth in healthcare expenditures could crowd out readiness and modernization efforts in the DoD."[135] Much of the cost associated with these increases relate to the ongoing provision of care to retirees and dependents without individual contributions such as deductibles, co-pays, and premiums. This "free health care for life" model is expensive and will only get costlier. "DoD projections […] indicate that the size of the active duty and reserve populations will remain relatively stable through 2024 but the number of retirees and retire families is expected to increase by over 100,000 beneficiaries. This sizeable increase in an age group that tends to consume more health care services than the younger portions of the population will cause a noticeable increase in MHS expenditures."[136] In some ways, addressing this challenge may require an acknowledgement that health care access for dependents and retirees is in conflict with medical readiness.[137]

This readiness challenge relates not only to the expenditure of funds, but also the structure and staffing of the military medical system. Currently, DoD "recruit[s] specialties that are required for civilian dependent care, and it provides little value to treat combat related injuries downrange. The DoD must convert these positions to critical combat related doctors, nurses, and physicians assistants."[138] Moreover, the MHS falls short in providing the quality of care required to meet military family needs. "Readiness for combat operations requires a re-examination of peacetime

operations as well. If limitation of the "health care for life" model or divestiture of the dependent care programs are politically unpalatable, then DoD will continue to be confronted with the mounting challenges and costs of caring for an aging, increasingly unhealthy population that is already being felt across the health care sector in the civilian world.

Just as cost and access to care are topics of concern across both the military and civilian health sectors, the obesity and opioid epidemics also have significant implications for the DOD's ability to recruit and retain a world-class fighting force and are highly illustrative of the way in which broader trends in the U.S. health sector can directly (and adversely) affect military readiness. There are few universal truths in health care; one is that obesity is an underlying factor in the increasing costs, decreasing productivity, and the sinking health of the general population in the U.S. Obesity is a root cause of the top five chronic conditions among Medicare recipients. The strain it puts on the health system carries forward to the general fiscal health of the nation; "obesity is associated with over $150 billion in healthcare costs annually, half of which are from public funds."[139] In corollary, military health system expenditures on obesity-related illness are staggering. "In all, overweight and obese active-duty military personnel cost the taxpayer $105 million a year in lost productivity, and $1 billion annually in treatments for obesity-related illness — more than treatments for tobacco- and alcohol-related illness combined."[140]

The effects of obesity also spill over into military recruitment efforts. The South produces nearly half of all new recruits to the uniformed services.[141] The Southern states are also the most obese; with the exception of Florida and Virginia, these states have adult obesity rates in excess of 30 percent. Five southern states have obesity rates that exceed 35 percent.[142] "In order to sustain its ranks, the Department of Defense must recruit upwards of 190,000 new service members each year... Nearly 25 percent of all military applicants are disqualified due to being overweight or obese – obesity is the number one reason for disqualification."[143] The obesity crisis has, in fact, reached such levels that even marginal increases in the overall rate could have profoundly detrimental effects on the sustainability of the force.[144]

Much like the obesity epidemic, the opioid crisis is having an effect across all sectors of the economy. "The number of working-age men (24 to 54) in the labor force has decreased from nearly 100 percent in the mid-20th century to just over 88 percent in 2017. There are a number of factors that impact this, some of which […] are the impact of opioid addiction."[145] In addition to fully removing individuals from the work force, and therefore reducing the pool of applicants available for enlistment, the opioid crisis' toll is also being felt in terms of lost productivity, reduction in workplace safety, and increased costs in employer-provided medical insurance and care.[146] The uniformed services are not immune from these challenges, but here the military experience diverges from the civilian in terms of addressing the challenge. In fact, the MHS is ahead of the civilian health sector in terms of both driving down opioid use and addressing the systemic change required in pain management approaches amongst providers. According to a 2017 DOD report to Congress:

> Data suggest that DoD's extensive efforts in prevention, education, and treatment are countering opioid misuse in Service members. Although Service members are prescribed opioid medications at a higher rate than the general population, prescription drug misuse in the military is low and declining. The number of Service members diagnosed with opioid drug dependence or

opioid abuse decreased by 38 percent between 2012 and 2016."[147]

This improvement is in large part attributable to efforts being made across the MHS to reduce opioid use and over-prescription. While work remains to be done, the statistics are heartening. Just as military innovation has informed developments in civilian use of technology, so too is it possible that MHS initiatives in introducing cultural change and increasing efficiency of operations in the closed military health system could inform broader efforts to achieve the triple aim in the public and private sectors. If so, DoD stands to benefit, as this positive influence will facilitate improved population health, an expanded pool of recruits, increased economic productivity, and breathing room in terms of U.S. discretionary spending.

RECOMMENDATIONS

Addressing the significant fiscal and economic threat that health care costs pose to the nations' economic and national security will require broad, aggressive, systemic reform. Consistent with the quadruple aim, changes musts be made by and with health care industry members to promote better population health, better care delivery, lower cost, and military readiness. Among these objectives, slowing the growth in costs is essential to prevent health care from consuming an increasing share of the nation's GDP and the Federal budget. Above all else, the U.S. must shift from the transactional pricing of a fee-for-service model to value-based medicine. Additionally, legislation and regulation must promote increased cost transparency, enhancing the ability of informed consumers to make sound financial choices. In its role as a payer, the Government should lead and benefit from these reforms, as patients making more cost-informed choices are likely to reduce both insurance pay-outs and out-of-pocket costs.

To the extent it is politically feasible, the U.S. Government should negotiate drug prices for Medicare/Medicaid; this is a best practice demonstrated by many developed nations that achieve better health care outcomes than the U.S. at lower per capita costs. However, such negotiation must be accomplished in a way that mitigates adverse effects on the industry's pursuit of research and development, perhaps using grants or tax incentives. Pharmaceutical companies should be incentivized to shift their current business model, in which the U.S. market arguably subsidizes overseas sales, to one that shares the burden across all consumers. Providers must participate in bending the cost curve, as well. Hospitals should be held to new standards of cost accountability though a close examination and retooling of Internal Revenue Service (IRS) standards for nonprofits whose operations generate billions of dollars of revenue and high net proceeds. Finally, government policy must foster innovation and encourage disruptors to enter health care markets in meaningful ways, either through grants or incentives that serve to reduce the high barriers to entry in both the hospital and pharmaceutical sectors.

Regardless of systemic changes, the U.S. is unlikely to spend less on health care unless and until the general population becomes healthier and patients assume greater personal responsibility with the support of care models that emphasize primary care, prevention, and outcomes. Medicare can drive positive change throughout the industry; CMS should continue to innovate and implement new care and payment models, reducing the emphasis on fee-for-service and stressing value-based medicine. Managed care concepts should be more widely adopted across the sector to facilitate a better balance of cost, access, and quality.[148] More immediate policy as well as longer-term legislative changes should be crafted to cultivate a patient-centered model in which the primary care physician serves as a facilitator for better health and a gatekeeper for specialized services. Incentives such as Government tuition reimbursement or student loan forgiveness must be introduced to encourage medical students to become primary care physicians, rather than pursuing more lucrative specialties.

In order to implement new solutions that increase access, improve outcomes, and reduce costs across the health care sector, the U.S. must also sustain its position as a global leader in health care research, development, and technology. To this end, Federal research grants should be sustained or expanded, particularly in support of telemedicine, wearable technology, and other resources that will expand access to care without significantly increasing costs. The Federal

Government should work with industry to establish national standards for Electronic Health Records (EHR) to further facilitate the national shift towards patient-centered medicine, and to enhance data-sharing and provider coordination. These standards can then be rolled out sector wide. While adopting EHR systems will require significant initial expenditures for providers that are not already implementing this technology, the benefits in terms of improved communication, better coordination of care, and reduced medical errors will pay dividends in the long run.

Tackling the cost of health care also requires addressing the obesity epidemic, which exacerbates both the chronic and acute conditions driving both cost and demand in the U.S. today. Incentivizing greater patient responsibility and an increased focus on preventative medicine will facilitate a reduction in adulthood obesity, but this must be paired with aggressive Government policy focused on the next generation.[149] With the support of Federal agencies (such as the Department of Education and HHS), state and local governments should reintroduce physical education requirements in elementary through high school curricula. Nutrition lessons should be more widely incorporated in the classroom, and school lunch programs should be redesigned (and better funded) to place the focus on healthier, and more nutritious food options for the 30 million kids who eat school lunches annually, as of 2017.[150] Federal efforts to reduce smoking were widely successful in large part due to the regulation of advertising; restrictions should be placed on junk food and soda advertising targeted at children and sin taxes should be imposed to offset the cost of childhood obesity programs at the Federal, state, and local levels. The DoD can further facilitate nationwide efforts to tackle childhood obesity, and enhance overall recruitment efforts, through the expansion of Junior Reserve Officer Training Corps (JROTC) programs.

While the obesity crisis has arguably been longer in the making, the strain on the health care sector created by the opioid crisis is equally likely to have a devastating long term impact if not curtailed in the near term. The current Administration has announced its intention to address the opioid crisis, and recently held a summit to examine the issue. It is imperative that the Government now develop a comprehensive plan to support prevention, education, enforcement, and treatment. This will require partnership with governmental and private partners across the health care sector to ensure that prescription guidelines are redrafted, treatment and post-treatment plans are developed, and the manufacture and sale of opioids are sufficiently regulated and monitored to drive the nation towards a more responsible approach to effective pain management.

In order to ensure military readiness in the face of an increasingly constrained fiscal environment, DoD must continue to re-examine the scope and composition of the MHS. The same worrying trends observable in the civilian sector are influencing the future of military health care. Assuming no immediate change in payer models within the broader health care sector, DoD should move from provider to payer for all non-uniformed services by shifting dependent family members, retirees, and veterans to private health insurance, introducing both deductibles and co-payments, if politically feasible. This will address access and choice, as well as increasing patient responsibility for these populations without substantially increasing DoD cost.[151] With this reduced patient care requirement, MHS and the Veterans Health Administration (VHA) should merge, streamlining operations to focus on the skills necessary to maintain the health of the force, provide deployment services, and sustain lifetime care for service-related injuries. More radically, some have suggested eliminating the provision of health care for veterans for any medical need not precipitated by military service; this would not be politically feasible, nor does this study find it ethically palatable.

Means testing to qualify veterans to use VHA services may offer a slightly more feasible alternative.[152]

Finally, the U.S. cannot ignore global health security if it wishes to ensure regional stability and protect the homeland from the threat of bioterrorism, pandemic, or other human-generated or naturally occurring global health crises. Health sector failure can drive regional conflict, refugee flows, transnational crime/terrorism, or cross-border infectious diseases.[153] While the NSS addresses the threat of infectious disease outbreaks, further planning is recommended to address other exogenous threats which find their root in other countries' health security crises. The U.S. should sustain its support for the Global Health Security Agenda (GHSA), which uses host government and donor partners to prevent, detect, and respond to outbreaks of disease.[154] DoD should better align all military elements (services and Combatant Commands) to address pandemics and other health care crises, and strengthen its coordination with interagency partners.

CONCLUSION

"Because the strength of our nation is in its people, their good health is a proper national concern; healthy Americans live more rewarding, more productive and happier lives. Fortunately, the nation continues its advance in bettering the health of all its people."[155]

In 1955, Dwight D. Eisenhower recognized health care as a fundamental issue of national concern; while the scope and tenor of the issues have changed, the significance has not. The health care sector has a profound effect on the physical and economic well-being of the nation and impacts our national security across a broad range of issues. Today, the single greatest threat to U.S. national security comes not from an outside actor, but from the self-inflicted fiscal crisis that will strike in 2029, driven most significantly by the costs associated with caring for an aging, overweight population plagued by poor health. If the United States is to avoid the fiscal cliff, retain the ability to meet the needs of its citizens, and defend its interests abroad, health care sector costs, provider practices, and government policies must be brought into better alignment with the quadruple aim of improved population health, more effective delivery of quality care, greater affordability, and enhanced military readiness.

Improved population health can only be achieved through a paradigm shift away from high-cost reactive medicine and towards preventive medicine and primary care. Americans must be encouraged by their doctors and their political leaders to take responsibility for their own health with the support of facilitating public policy. The obesity and opioid crises must be curtailed. Scientific and technological innovations that improve outcomes and access while driving down costs must be aggressively pursued. Providers and payers must develop new models of compensation that move towards patient-centric, value-based medicine, rewarding the achievement of good health over the provision of services.

Better population health will generate improved recruitment capability for enhanced military readiness. Maintaining force fitness and providing critical mobilization resources also requires a continued reform trajectory within DHA and MHS. In addition to streamlining operations, DoD must take steps to address the currently unsustainable MHS clinician staffing model, which deprives the force of critical care capabilities needs to respond to both deployment and crisis scenarios. Finally, "health care for life" models should be adapted to incorporate elements of patient responsibility (including cost-sharing) that will sustain the budget and reduce the cost to DoD of providing care beyond the battlefield.

Cost remains the most critical area for policy intervention and practice reform. Whether single-payer programs, subsidized private markets, pharmaceutical price regulation, or other solutions are the right approach remains a matter of contentious political debate. It is beyond the scope of this study to decide, nevertheless, it is clear that Americans and their leadership must take steps to reverse the trend towards health care consuming all Federal revenue in the near future. The nation's physical, economic, and national security health depend on it.

APPENDIX A

INDUSTRY STUDIES ANALYTIC FRAMEWORK: CROSS-CUTTING QUESTIONS

The Eisenhower School has introduced a series of cross-cutting questions to be considered within each industry study to better address today's current resourcing requirements, mobilization challenges, and industrial base scope and limitation. While the health care sectors broad nature (and enormous component industries) constrains the depth to which such an analysis can be achieved over the period of one semester, this Appendix seeks to scratch the surface of these challenges as they relate to health care. While not comprehensive, in considering select aspects of the industry's composition, capabilities, and operational models, this review highlights the criticality of the health care sector to national security and to the Department of Defense's ability to prevail in future conflict.

EVALUATE NATIONAL SECURITY AND INDUSTRY

Industry Capabilities with Respect to National Security

The health care sector directly and indirectly impacts national security; critical capabilities the sector provides include assuring the health of the general population (economic strength/recruitment capability), the provision of peacetime health services (readiness), and deployment care (mobilization).

A healthy, able-bodied workforce contributes to economic productivity, drives GDP growth, and propels the nation forward. The U.S. population's bulging health care demand is driven by a population that is 66% overweight (66%; 38% a BMI of 30+), physically inactive (28%), smokers (23%), stressed (36%), and aging (22% over age 55).[156] The less productive the U.S. is, the lower the tax revenue; the sicker the U.S. is, the higher mandatory spending is. Lower tax revenue and higher mandatory spending mean less funding for Department of Defense operations and mobilization.

With the rise of revisionist powers, the U.S. ability to negotiate from a position of strength depends on the ability to staff the military. This is constrained by the general poor health of the population and exacerbated by the fact that the U.S. military historically recruits from eleven Southern states[157] that happen to be some of the unhealthiest in the country. Alabama, Arkansas, Louisiana, and Mississippi have obesity rates near 35% ranking them among the top 5 in the U.S.[158] Not only does this impact the pool of potential military applicants who are available/able to serve, but those who are often at an increased risk for injury.[159]

The education, training, and certification of health care providers and researchers also impact military readiness and the physical and economic health of the nation. The U.S. will experience a projected physician shortage of between 40,800 and 104,900 physicians by 2030.[160] This will adversely affect the Military Health Systems (MHS) ability to recruit and retain medical staff for peacetime operations. It will also severely hamper the ability to backfill during mobilization, which is additionally constrained by the MHS' current capability to provide the correct medical staff skillset for deployment operations.[161]

Externally, the inability for failing or failed states to provide even basic levels of health care for their populace can lead to health security crises cycles, which in turn threaten local and regional stability as these states turn belligerent to distract from domestic crises or create humanitarian crises which require regional and international – including U.S. diplomatic, economic, and/or military – responses.[162] This implicates U.S. strategy since it may find the strategic need to provide military medical or humanitarian assistance/disaster relief (HA/DR) forces to quell the health security crisis.[163] Many of these incidents will be not only interagency in nature, working with Federal agencies such as CDC and USAID, but will require close coordination with sectors of the health care industry that provides goods and services for pandemic and HA/DR operations. This includes for-profit pharmaceutical firms developing vaccines and treatments[164] and non-profit firms/non-governmental organizations providing medical personnel, logistics support, or distribution networks in-country (e.g., the Bill and Melinda Gates Foundation, Doctors Without Borders/Medicins sans Frontieres, or the International Committee of the Red Cross).[165]

Government and Industry Business Models with Respect to Procurement and Staffing

The health care sector (including, to some extent non-profit firms) is revenue driven. In contrast, the Federal Government, and DoD-specifically, is more focused the defense of the homeland and the protection of its personnel. With respect to the provision of patient-care services, the Military Health System is essentially a closed one. MHS contracts for the care that cannot be provided internally, with Tricare filling the same role as a civilian insurance provider. On the research and development side, however, strong cooperation exists between the military and civilian sectors.

U.S. Military medical research and development is a requirements-based model that is driven by service needs; here again the private sector is heavily profit driven. In order to address both sets of objectives in military-civilian collaborations, particularly in the vaccine/medicine value chain, the DoD is heavily involved in the discovery and research phases. Development, registration, and life cycle management are then generally conducted in partnership with or wholly by the pharmaceutical industry. This allows the DoD and the pharmaceutical industry to each leverage their areas of expertise and strengths. Where service needs offer finite opportunity for profit federal government financial support (through DoD, DARPA, BARDA, and other agencies) is imperative to support product development. Vaccines for diseases such as malaria, chikungunya, and Ebola, antibiotics and treatments for tuberculosis were all motivated by DoD necessity.

In case of need, the government also has the ability to facilitate the approvals process and allow earlier use of crucial products in the event of national security requirement. Given the necessary timelines involved in the development, research, and regulation of medical products and pharmaceuticals, however, the government cannot meaningfully order industry to produce a medical remedy or increase/decrease production of vaccines or medicines.

Success in the health care sector, both in the provision of services and the development of new products, requires significant and highly specialized human capital. The impending physician shortage discussed above constrains both the health care sector and the government ability to recruit and retain sufficient staffing. This does not, however, more broadly apply to the research and development capability of the United States which remains second to none. Practitioners in the health care sector, and particularly in the area of research and development, cite their strong interest

in supporting the free-flow of ideas and welcome foreigners in both academia and employment.[166] Many raise concerns about intellectual property protections and tend to use the U.S. patent process as a protection (or at least a means to seek legal recourse), but also take a fairly pragmatic view on the challenges of operating in a fully internationalized sector.[167]

MOBILIZATION/FORCE GENERATION

The United States supply chain will present significant challenges in the event of large-scale mobilization need. For example, production of IV fluids in the U.S. is limited to a handful of manufacturers, one of whom is Baxter International, whose plant in Puerto Rico was damaged and put offline by Hurricane Maria. With over 80% of all pharmaceuticals used by Americans produced overseas, the health care sector is reliant on sustained, uninterrupted international commerce to meet the peacetime need. The U.S. lacks sufficient redundancy in its medical supply chain to respond to a full military mobilization, a natural disaster or large-scale terrorist incident.[168]

The advent of highly personalized and profoundly expensive drug therapies will further strain the sector's capacity to meet need, particularly as payers, providers, and pharmaceutical firms struggle with the ethical and financial challenges of treatments that can cost in the hundreds of thousands of dollars per administration. A challenge with personalized care and patient specific treatments is that the drug supply may not always meet the needs of the providers. With limited drug manufacturers, whose business model is profit driven, even an institutional heavyweight like one leading cancer research institution this study visited, needs to rely on the personal involvement of its lead pharmacists to ensure the procurement of necessary drugs.[169]

This is not to say that the health care sector, particularly the producers, are incapable of rapid response. The first reported outbreak of Ebola occurred in 1976 in the Democratic Republic of the Congo. Prior to 2014 the largest outbreak of Ebola was in Uganda in 2000 and impacted 425 people. The 2014 Ebola Outbreak saw more cases and deaths than all others combined. The DoD mounted a massive response to the outbreak with ten treatment units and seven mobile labs that processed 4,709 samples. Multiple companies such as GSK, J&J/BN and New Link Genetics partnered with the National Institute of Allergy and Infectious Disease.[170] Responses to national and international crisis such as Ebola require collaboration between the USG and the pharmaceutical industry that must take commercial business models into account. Nevertheless, the USG cannot expect an industry to upend its business to respond to the latest crisis with no possibility of recouping its financial loses. Often by the time a remedy is developed and produced the crisis has passed and people have lost interest.

MANAGE / FORCE EMPLOYMENT

The Military Healthcare System (MHS) it is a closed system that does not currently rely on international security supply agreements that require offshore suppliers unless they are approved by the Food and Drug Administration (Vaccines, Generic Drugs). In the event of unmet need in an international Area of Operation, Acquisition and Cross-Servicing Agreements with allies or coalition partners are negotiated on a bilateral basis to allow U.S. forces to exchange most common types of support, including food, fuel, transportation, ammunition, and equipment.

Such logistics support "transfers" come into play primarily during wartime, combined exercises, training, deployments, contingency operations, humanitarian or foreign disaster relief operations, certain peace operations under the UN Charter, or for unforeseen or exigent circumstances. As a result, ACSA authority is almost always exercised by the Unified Combatant Commands. [171]

At the direction of the National Defense Authorization Act of 2017, The Defense Health Agency (DHA) will create a joint, integrated Combat Support Agency that enables the Army, Navy, and Air Force medical services to provide a medically ready force and ready medical force to support Combatant Commands in both peacetime and wartime by October 2018. [172] The DHA is designed to supports the delivery of integrated, affordable, and high-quality health services to Military Health System (MHS) beneficiaries and is responsible for driving greater integration of clinical and business processes across the MHS. [173] This organization will monitor the impact of domestic supply shortfalls in key healthcare domains (healthcare professional), training of healthcare professionals, supply chain and contingency plans must be reviewed to insure they also include the Homeland, Combatant Commanders and MHS. National Health Security Strategy focuses its efforts within the Department of Homeland Security. [174]

INNOVATION

Industry Capabilities with Respect to Innovation

This paper has widely addressed the rising cost of health care both nationally and within the DoD. It is almost universally accepted that technological innovations will aid in reducing healthcare cost. [175] Technological innovation can reduce, consolidate, and automate health care expenditure in the DoD. Trends to MHS and Veteran's Health Administration (VHA) Artificial Intelligence (AI) in 2018 can be aligned to Intelligent – AI Foundation (Intelligent Apps and Analytics), Digital – Digital Twins (Conversational Platforms) and Mesh - Blockchain (Event-Driven Model). This capability will also enhance patient care on the battlefield in real-time.

Mobile health (or mHealth) is another factor in any discussion of health sector innovation. The World Health Organization defines mHealth as, 'the provision of health services and information via mobile technologies such as mobile phones and Personal Digital Assistants (PDAs).[176] In 2017, mHealth revenue reached about $23 billion and is projected to hit $46 billion by 2020.[177] The market is driven primarily by the monitoring services and solutions that aid chronic disease management; mHealth includes cardiac monitoring, diabetes management devices, health and wellness and medical reference applications (focusing on exercise, weight loss, sleep, and meditation). The healthcare Internet of Things (IoT) encompasses health trackers, wearables, medical devices, implants, electronic medical records, and even ingestible video pills. Long-term data from these devices can be brought together to empower patients and provide a better picture of their treatment experience to medical teams.

Commercial-off-the-self technology and commercial market opportunities are helping the DHA (MHS) and the VHA become national leaders in telehealth services. [178] mHealth is enabling the role of the patient expert, and artificial intelligence is finding new and exciting applications in medicine. The health care IoT, however, faces challenges in integrating with complex, cost-sensitive, widely varying health systems globally because of the rapid acceleration of technology.

This acceleration will significantly affect the collection and collation of data; patient privacy considerations and usability issues are likely to arise unless international rules and processes are implemented to govern the use of the full spectrum of patient healthcare informatics.

The trends in AI, IoT and mHealth point towards improving the patient experience and reducing the burden of diagnosis and monitoring by using Personal Digital Assistants (PDAs). In the near future, service members and veterans will use wearables, mobile health apps, data analytics, and new medical devices. As telehealth becomes integral to health care MHS and VHA will work to use technology to enhance operations and become more patient-centric. Technology Enabled Care and Telemedicine innovations are allowing the DHA to remain the early adopter in healthcare on pace with the civilian space. To stay competitive, providers, insures, and manufactures of medical devices and technologies must work collaboratively to reduce cost and improve outcomes. Embracing innovations is critical to addressing the myriad of problems plaguing the health care system.

Healthcare organizations can immediately begin increasing capacity and lowering cost by incorporating virtual services. This change involves even greater improvements to technology, scheduling/appointment processes, policies, and culture. Immediate value can be achieved by targeting ambulatory care and expanding access to high-quality specialist providers. The government should position to investment in and take immediate advantage of expanding virtual care services. Faced with resource and physical facility limitations, and mounting pressure for greater use of commercial healthcare, the DoD especially should prioritize virtual care in a targeted manner. Virtual solutions provide not only a method to reach underserved groups but can change the very nature of the demand/capacity equation. Simply put, virtual health can enable more care services for DHA and veterans by means other than expanding the workforce.[179]

APPENDIX B

COMPARISON OF HEALTH CARE SYSTEMS IN INDIA, THE UNITED KINGDOM, AND THE UNITED STATES

Seminar 10 conducted a three-country comparison of disparate health care systems to identify targets for improvement at home: India, the United Kingdom (UK) and the United States (U.S.). In reviewing these three countries, substantial differences terms of access and payers, in particular. India has a struggling public health system with significant out-of-pocket costs and limited coverage with urban populations having considerably more access than rural areas. The UK has a single-payer National Health Service (NHS) providing coverage and access for its entire population, while the U.S. has mandated insurance coverage provided by employers, Medicare, or through state-run exchanges, but it also struggles with high costs.

In India, the individual states are responsible for providing health services to their residents with the Central Government setting national health policy. Under Prime Minister Modi, health has been made a fundamental right through the National Health Care Policy of 2017.[180] The population of India is 1.28 billion with 6.2 percent of the population age 65 and older, and an unimpressive 4.7 percent of GDP spent on healthcare.[181] Household out-of-pocket health spending was 69.1 percent of total health expenditures.[182] Public health insurance is available, but coverage is limited, and most people resort to expensive, private care, resulting in middle class citizens falling into medical poverty. "In principle, government health services are available to all citizens under the tax-financed public system. In practice, backlogs in accessing such services compel households to seek private care, resulting in high out-of-pocket payments."[183] There are several types of national health care in India. The Rashtriya Swasthya Bima Yojana (RSBY) provides health insurance coverage to families living on incomes below the poverty line, with just over 50 percent of targeted population enrolled.[184] There are insurance plans for factory workers, civil servants, railway, defense employees and some states provide insurance for employees; less than 20 percent of the population has any form of health coverage. All services at government facilities are free, but there are severe shortages of staff and supplies. [185]

In the United Kingdom (UK), health care responsibility belongs to the Secretary of State for Health, who has a legal duty to promote a free, comprehensive health service. The UK population of 65.6 million consists of 18 percent citizens 65 or older, with nearly 10 percent of the GDP spent on health care.[186] In England, this care is administered by NHS England through local Clinical Commissioning Groups with public health services separate and budgeted at the local level. "In 2015, an estimated 10.5 percent of the U.K. population had private voluntary health insurance for more rapid access to care for elective procedures."[187] The NHS provides a wide variety of medical, dental, rehabilitative services with scope of services decided at the local level incorporating the National Institute of Health and Clinical Excellence (NICE) recommended pharmaceuticals and treatment protocols. In the UK, "the general practitioners (GPs) act as gatekeepers for secondary care," and the average out of pocket expense per capita is $586.[188] NHS standards are set forth by the National Institute for Health and Care Excellence (NICE). NICE has worked out guidelines and standards for a variety of ailments and has targeted wait times for appointments. Unfortunately, the

UK has a shortage of GPs which is increasing wait times for appointments and non-emergency visits to specialists with average waits of two weeks for routine diagnostic tests such as MRIs or CT scans.[189]

In the U.S., the 2010 Patient Protection and Affordable Care Act (ACA) created a system of shared responsibility for the government, employers, and individuals to provide all Americans access to affordable, quality health insurance.[190] The population of the U.S. is 327 million, with 15.3 percent aged 65 and older, and just over 17 of the GDP spent on health.[191] Medicare is a Federal program for adults 65 and older and some people with disabilities. Low income populations are covered by a Federal-state partnership of Medicaid and other programs. Roughly 37.1 percent of U.S. residents are covered by public health program, and despite passage of the ACA, 8.6 percent of the population remains uninsured.[192] Medicare is financed through a combination of payroll taxes, premiums, and federal general revenues. Average out of pocket expenses for Medicare recipients is $1034 per capita.[193]

Criteria	India	UK	US
Total Population (millions)	1295.29	64.88	321.19
Percentage >65	5.50%	17.40%	14.50%
Birth Rate/1000	23.8	11.9	14
% GDP	4.70%	10.20%	17.20%
HC Spending per Capita	$215	$4,094	$9,364
# of Physicians/1000	0.07	2.8	2.6
Total Acute Care Beds/1000	0.09	2.3	2.5
% Adults Daily Smokers	13%	19%	13%
Prevalence of Obesity	5%	26%	38%
Quality of HC System Index	64.36	72.61	69.03
Life Expectancy at Birth	66.80	80.05	78.37
Cancer Death Rate/100,000	100	147	133
Incident of Tuberculosis/100,000	176	15	3.6
HIV/AIDS/1000	2.02	1.38	3.91

Figure 1: Top 14 Comparative Health Care Metrics

APPENDIX C

LIST OF ACRONYMS

ACA	Patient Protection and Affordable Care Act
ACO	Accountable Care Organization
ACSA	Acquisition and Cross Servicing Agreement
AI	Artificial Intelligence
AOR	Area of Operation
BARDA	Biomedical Advanced Research and Development Authority
BMI	Body Mass Index
CBO	Congressional Budget Office
CDC	Centers for Disease Control and Prevention
CFIUS	Committee of Foreign Investments in the United States
CMS	Centers for Medicare and Medicaid Service
CPC+	Comprehensive Primary Care Plus
DARPA	Defense Advanced Research Projects Agency
DHA	Defense Health Agency
FDA	Food and Drug Administration
FY	Fiscal Year
GDP	Gross Domestic Product
GP	General Practitioner
GSK	GlaxoSmithKline
HHS	Department of Health and Human Services
IHI	Institute for Healthcare Improvement
IoT	Internet of Things
IV	Intravenous
MHS	Military Health Care System
MTF	Military Treatment Facility
NHS	National Health Service, an agency of the United Kingdom Government
NHSS	National Health Security Strategy
NICE	National Institute of Health and Clinical Excellence
OECD	Organization for Economic Cooperation and Development
PDA	Personal Digital Assistant
TEC	Technology Enabled Care
UK	United Kingdom
UMP	Unified Medical Program
VA	Department of Veterans Affairs
VBID	Value Based Insurance Design
VHA	Veterans Health Administration
WHO	World Health Organization

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