

Energy to Heal: Health Care, Climate Change, and Community Resilience

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Today, the health care sector has a critical role to play in both reducing climate change effects and improving the resilience of the communities it serves. In the United States and beyond, the health care industry is increasingly among the major energy consumers in any given region, and the industry is among the largest local employers in many areas of the country. Collectively, hospitals have begun to commingle their identities as consumers, industries, and citizens. They are exerting both upstream leverage on their supply chains and downstream influence on their employees and patients. Leading health care organizations are navigating shifting economics, patient expectations, and regulatory challenges to transform their practices to become leaders on a low-carbon development path and anchors for climate resilience.

Three important ideas are reshaping 21st-century health care in the service of health and planetary survival:

- carbon mitigation through energy-efficiency measures and transition to renewable energy sources;
- anchoring community resilience through local economic investments and securing infrastructure for extreme weather events;
- providing leadership and policy engagement in promoting population health, climate change advocacy, and environmental programs.

Can the health care industry become a model for the world by developing an ecological approach to emerging environmental and health challenges? Central to these approaches to medicine is the axiom, “First, do no harm.” This seminal principle forms the basis of a broad definition of health and recognizes prevention and restoration as preferable to treatment on a planet with a finite carrying capacity. How can health care positively contribute to the conditions that foster individual, community, and global health?

Background

The U.S. services sector—from real estate to retail and fast food to health care—accounts for more than 79 percent of the country’s economic activity.¹ As of 2010, health care alone accounted for a little more than 18 percent of total U.S. gross domestic product (GDP)—

¹ “U.S. Economic Profile,” Economy Watch (June 2013). Available at: http://www.economywatch.com/world_economy/usa/?page=2.

more than 20 percent of the services sector's economic activity.² The buildings that support the delivery of health care services encompass a broad range of building types—from small community outpatient clinics to large acute care hospitals—and an equally broad range of owners: philanthropic nonprofits to corporate entities.

The tremendous effect of health care on the environment can be divided into three basic categories: (1) upstream leverage, where health care influences its suppliers and others up the value chain; (2) downstream influence, where health care influences its customers (patients); and (3) environmentally responsible production, which requires the health care organization to consider how the “production” of services can be done more efficiently. There is general agreement that the health care sector has the capacity to define markets by what they build and purchase—and how they operate.

More recently, the complex set of factors that underlie increasing chronic disease burdens has begun to influence health care's interest at the intersection of community, environment, and buildings: The asthma epidemic, for example (annual self-reported asthma prevalence increased 73 percent between 1980 and 1996)³ may be attributable to increased exposure to indoor allergens and poor indoor air quality (the building environment), combined with more time spent indoors (90 percent on average), and decreased physical activity (behavior). Similarly, the obesity and diabetes crises are somewhat attributable to an industrial agriculture and food distribution system that subsidizes and promotes pesticide-intensive agriculture and the ubiquity of junk food. Hospitals are often distribution centers for the same poor quality foods that contribute to the ill health of the American people.

Recent US health care system reform, manifested in the 2010 Patient Protection and Affordable Care Act (ACA), has set in motion the transformation of health care with regard to community engagement, prevention, and population health. The ACA mandates that nonprofit hospitals become “accountable care organizations” and produce periodic Community Health Needs Assessments aimed at improving access to health care in lower-cost settings. Recent changes in the Internal Revenue Service definition of community benefit are increasing the ability for many health care organizations to invest in sustainable programs that benefit community health and healthy communities as part of maintaining their nonprofit status.

The sheer scale of health care, coupled with the emerging focus on chronic disease prevention and health promotion, are catapulting health care service delivery from self-contained, separated disease-care campuses to vital definers of urban fabric and place-making. Improving access to health care, an important factor in reducing system costs and improving public health, requires a new focus on locating health care facilities for convenient access that are

2 Natalie Jones, “Healthcare in America: Follow the Money.” (Washington, DC: NPR, March 19, 2012), available at <http://www.npr.org/blogs/health/2012/03/19/148932689/health-care-in-america-follow-the-money>.

3 D. M. Mannino et al., “Surveillance for Asthma—U.S. 1980–1999.” In: *Surveillance Summaries, Morbidity and Mortality Weekly Report*. (Atlanta: Centers for Disease Control and Prevention, 2002).

centered in communities. In addition, large numbers of staff, visitors, and patients aggregating on major health care campuses can, in and of themselves, generate necessary volumes for public transit investments. The varied health care workforce spans income and education levels, offering enormous local employment opportunities. As the purchasing agents for millions of health care consumers, health care organizations have tremendous leverage over their suppliers—and they can choose to invest in and support local economies. By virtue of the services it provides and the intrinsic public trust it holds, health care is held to higher moral and ethical standards than nearly any other business sector. Together, these factors support an expanded role for health care at the center of healthy communities.

Health Care and Climate Change

In 2009, the UK medical journal *The Lancet* proclaimed, “Climate change could be the biggest global health threat of the 21st century. Effects on health of climate change will be felt by most populations in the next decades and put the lives and wellbeing of billions of people at increased risk.” The article goes on to state, “the health sector can play a key role in helping societies adapt to the effects of climate change and the risk it poses to human health.”⁴

The building sector is by far the largest emitter of carbon, outpacing both transportation and industry. U.S. health care buildings are highly developed, and health care buildings constitute the second most energy-intensive U.S. building sector (consuming energy at an average of twice the intensity of commercial office buildings). Acute care hospitals drive this excessive consumption, although they represent only 25 percent of the total square footage of health care buildings. These buildings operate continuously, 365 days per year, with multiple back-up and redundant mechanical and electrical systems, and they only increase in energy intensity as medical diagnostic equipment with large heat loads continue to enter the marketplace. In 2013, the University of Washington’s Targeting 100! Study⁵ joined the U.S. Department of Energy in confirming that new U.S. hospital buildings could reduce their energy consumption by 50 to 70 percent and still maintain required air change rates and filtration by implementing mechanical system design approaches that are widely used in Europe. As existing hospitals implement aggressive energy efficiency programs, demand reductions of 25 to 30 percent are not uncommon.

Across the United States, states and municipalities are enacting legislation aimed at achieving rapid reduction of greenhouse gas (GHG) emissions through public transportation investments and green building programs. Because health care organizations are both large employers and massive consumers of energy, they are frequently prominent players in municipal GHG reduction efforts. At the same time, the health care industry increasingly

4 A. Costello et al., “Managing The Health Effects of Climate Change,” *The Lancet* 373 (9676) (2009): 1693-1733. <http://www.thelancet.com/climate-change>.

5 H. Burpee, and J. Loveland, “Targeting 100! Envisioning the High Performance Hospital: Implications for a New, Low Energy, High Performance Prototype.” University of Washington Integrated Design Lab (2012). Available at: http://www.betterbricks.com/graphics/assets/documents/Targeting100_ExecutiveSummary_063010.pdf.

views GHG reduction as a mission-related imperative, as the direct health effects of climate change—asthma, heat stress, spread of infectious diseases, water contamination, and environmental refugees—have been documented in public health literature.

On the other hand, the health care industry is only beginning to articulate the effects of climate change on the delivery of health care services. As average temperatures rise, heat island effects in dense urban areas will exacerbate chronic respiratory conditions in the elderly and children. More extreme weather events—hurricanes in eastern coastal areas, tornadoes and floods in the Midwest, or fires and drought on the West Coast—will require a more resilient emergency care infrastructure capable of delivering potable water and health care. Furthermore, grid reliability is likely to continue to be an issue in unstable energy markets.

Energy Strategies in Health Care

Health care organizations across the United States are implementing energy conservation strategies and shifting from fossil fuel to renewable energy sources. For most energy conservation strategies on hospital campuses, the business case is relatively straightforward: Utility savings can be redirected to fund investments in energy efficiency measures—paybacks range from relatively immediate to as long as 8 years. Health care organizations view the uncertainties associated with rising utility prices as a future “risk.” Therefore, investments in energy reduction are often viewed as part of a risk-avoidance strategy. The case studies in this section, gathered from health care organizations in diverse climates and regions, demonstrate both boldness and creativity.

In a groundbreaking study funded by the Commonwealth Fund,⁶ a package of energy reduction strategies that in aggregate reduced “average” hospital energy demand by 9.8 percent (27.2 kBtu/sf compared with an estimated average annual baseline of 276 kBtu/sf) yielded a combined net savings of \$980 million in 5 years, when extrapolated to the entire U.S. acute care hospital portfolio. Energy reduction strategies include lighting upgrades, variable-frequency drives, high-efficiency electric motors and motor upgrades, occupancy sensors for public areas, boiler and central plant chiller replacements, hydronic heating controls, and solar film on windows. In 10 years, aggregate energy savings were close to \$6 billion. These are persuasive numbers, and they lead hospitals to seek expanded and creative opportunities to partner in energy investments that reduce carbon, improve “energy-independence,” and save operating dollars.

Gundersen Health System, La Crosse, Wisconsin

Gundersen Health Systems, Inc., is an integrated health care network and is one of the nation’s largest multispecialty group medical practices, regional community clinics, hospitals, home care providers, behavioral health services, vision centers, pharmacies, and air

6 S. Kaplan et al. “Can Sustainable Hospitals Help Bend the Health Care Cost Curve?” Issue brief (New York City: The Commonwealth Fund, November 2012).

and ground ambulances. It operates in 19 counties in Wisconsin, southeastern Minnesota, and northeastern Iowa. In 2007, the health system's environmental stewardship program, Envision, was born. Gundersen has developed a multifaceted portfolio of innovative energy efficiency and renewable energy projects intended to lower costs, encourage community partnerships, and reduce the organization's environmental footprint. In a few short years, the health system has become a national model for other health care organizations looking to do the same.

Gundersen has an aggressive and challenging system-wide energy goal: to become 100 percent energy independent by 2014—a first for a U.S. health care system. Energy independent means the health system will produce as much renewable energy as it uses through a combination of energy conservation and grid-connected renewable energy projects. The first step toward energy independence began with conservation—by the end of 2010, Gundersen had reduced total energy consumption by 30 percent from a 2007 consumption baseline by using a wide-ranging set of energy efficiency measures.

Gundersen has developed their own renewable energy infrastructure rather than purchase renewable power at premium rates. Gundersen's creative renewable energy portfolio utilizes power generation opportunities available through partnerships with municipalities, utility companies, and private businesses.

Gundersen's gas-to-energy project with the La Crosse County landfill in Onalaska, Wisconsin, is a compelling example of what a public-private partnership can achieve. The health system is teamed with the La Crosse County Solid Waste Department to harvest biogas created from organic waste at the landfill, converting methane into electricity and heat—an excellent use of a previously unused energy resource. Two wind turbine projects, implemented in 2011–2012 in Lewiston, Minnesota, and Cashton, Wisconsin, have two commercial turbines at each site. The Cashton project, in partnership with Organic Valley—the nation's largest cooperative of organic farmers and a leading organic brand—reduces the amount of carbon dioxide in the atmosphere by 12 million pounds each year. Together, the combined wind projects are expected to offset an additional 13 percent of Gundersen's total energy use.

Dr. Jeff Thompson, CEO of Gundersen Health System, believes that “sustainable investments are one of only a few things health systems can do that improve health, save money, engage staff and inspire communities.”⁷ Gundersen's sustainability work is directly connected to its mission, core values, and commitment to the community. He says community excitement is something he's seen many times with Envision's sustainability projects. “The village of Cashton is very proud of its wind farm. It gives them green energy and distinguishes them from other rural communities.”⁸

7 R. Guenther and G. Vittori. *Sustainable Healthcare Architecture*. (Hoboken: Wiley, 2013); p. 227.

8 From Janet Brown, “Branding Sustainability in Healthcare,” *Healthcare Design Magazine*, Sept. 12, 2012. Available at: <http://www.healthcaredesignmagazine.com/article/branding-sustainability-healthcare>.

Partners HealthCare, Boston

Partners HealthCare, founded in 1994, is a nonprofit health care system that includes seven greater Boston area and three Cape Cod hospitals with their related ambulatory services; in aggregate, the system encompasses more than 17 million square feet of owned and leased space and employs 60,000 people. Partners HealthCare frames its sustainable initiatives around long-term cost control and risk mitigation, improved patient and employee health and safety, and improved public and environmental health. Energy efficiency provides the backbone of the business case; other sustainable features are incorporated based on the success of energy conservation.

John Messervy, vice president of real estate planning, notes, “Within our organization, up to the senior management level, there is a growing understanding of the relationship between fossil fuel combustion, health, and disease. We needed to address it through our energy choices.”⁹ In August 2008, Massachusetts passed the Global Warming Solutions Act, making it one of the first states in the nation to move forward with a comprehensive regulatory program to address climate change. It set aggressive GHG reduction targets as follows: (1) between 10 and 25 percent below 1990 GHG emission levels by 2020 and (2) 80 percent below statewide 1990 GHG emission levels by 2050.

At the same time, the rapid rise in the cost of energy in the energy-intensive health care sector demanded a strategic response to long-term energy management. The combination of escalating energy charges and increasing demand demonstrated that inactivity would result in an increase in system-wide energy costs from \$70 million per year in 2010 to \$140 million by 2022. A key question emerged: Could compliance with the Massachusetts legislation also provide a path to avoid the financial consequences of energy cost escalation?

This question led to the development of the 10-year Strategic Energy Master Plan (SEMP) that is guiding Partners HealthCare’s investments and is creating their short- and long-term compliance pathway. In summary, the SEMP demonstrated that achieving the statewide 2020 GHG reduction targets required extensive efficiency retrofit measures and integration of cogeneration (also known as combined heat and power, or CHP), although the 2050 goals demand a wholesale integration of renewable energy sources. Overall energy utility expenditure is expected to remain relatively constant; by 2022, system-wide energy costs may be as much as 44 percent less than if Partners HealthCare did nothing.

The SEMP concluded with the following action plan for the first two phases (2008 to 2022):

Invest in energy conservation measures (ECMs)

- \$61 million investment in 230 ECMs yields a 28 percent energy reduction;
- 3.7-year payback (27 percent annual return)

Implement cogeneration at major Boston hospital sites

- 33 megawatt total at four hospitals and one research lab;
- 7.8-year payback (13 percent annual return)

9 R. Guenther and G. Vittori. *Sustainable Healthcare Architecture*. (Hoboken: Wiley 2013); p. 204.

These measures were then phased in a 10-year period to achieve a relatively equal investment each year—approximately \$20 million to \$25 million per year. In the first two years of implementation, they have realized close to half of the 28 percent energy reduction goal related to implementing energy efficiency measures. They are installing 14 megawatts of CHP, with 48 megawatts of additional capacity in the planning stages. Collectively, by 2022 they will reduce carbon-based fuel use by 43 percent while increasing renewables from 32 percent to 37 percent; they will meet the most aggressive reduction target of the Massachusetts policy. They will also significantly reduce the financial risks associated with rising fossil fuel energy prices.

Implementing distributed cogeneration at the system hospital sites has presented opportunities for unique business partnerships and complex regulatory challenges. Working with Health Care Without Harm, Partners HealthCare has formed a network of Boston hospitals to accelerate energy successes and support local and state policy initiatives aimed at improving access to renewables and distributed generation.

At the same time, Partners HealthCare has continued to raise the bar for sustainable and resilient building practices across the system. Its recent major buildings (Massachusetts General Hospital's Lunder Building and Spaulding Rehabilitation Hospital) achieved the US Green Building Council's LEED Gold Certification, and Spaulding has demonstrated the system's proactive approach to climate change adaptation and resilience. Located on the Boston Harbor waterfront, the new facility is the first building in Boston to elevate its ground floor to account for rising sea level, place required electro-mechanical infrastructure (including its CHP plant) on the roof, and incorporate operable windows throughout. This building continues to influence policymakers along the East Coast, particularly post-Hurricane Sandy. In a poignant and prescient reminder of the importance of resilient health care infrastructure, its opening, approximately six months following Hurricane Sandy, coincided with the Boston Marathon bombings, and the victims of the disaster were among its first patients.

Kaiser Permanente, Oakland, California

Kaiser Permanente is one of the largest nonprofit health care plans in the United States with more than 9 million members, 37 hospitals, and 611 medical offices and other outpatient care facilities in California, nine other states, and the District of Columbia. Kaiser Permanente is uniquely positioned in the US health care marketplace as an integrated delivery model—a health plan, hospital system, and a medical group all working together to provide high-quality, coordinated, and affordable care to its members. It has a long-standing commitment to environmental stewardship and the relationship between the health of its members, communities, and the planet. Today, that commitment is reflected in the design, construction, and operation of greener hospitals and many specific goal-oriented health initiatives:

- Reduce carbon footprint: Reduce overall GHG emissions by 30 percent by 2020 compared with 2008 levels, including energy conservation and investments in clean and renewable energy sources and generating 13.5 percent of energy needs on-site with solar photovoltaic and fuel cells.

- LEED Gold Certification: For all new buildings and major retrofits.
- Support healthy food: More than 50 farmers' markets and farm stands are located at Kaiser Permanente hospitals and facilities to improve access to fresh, local, and organic foods for members and staff.
- Waste reduction: Reuse, recycle, or compost at least 40 percent of waste materials by the end of 2015.

Kaiser Permanente is considerably raising standards for aggressive energy use reduction targets. In 2011, Kaiser sponsored an international design competition, aimed at harvesting the best ideas for delivering a “net-zero” energy, resilient, and restorative hospital. The lessons learned are influencing their next generation of health care construction, including a net-zero medical office building at Kaiser Antelope Valley and a low-energy hospital at Kaiser San Diego Central Hospital.

Ascension Health

Ascension Health is improving energy efficiency in its hospitals and health care facilities as part of its Environmental Stewardship Program. Specifically, Ascension Health has set a goal to achieve a 20 percent reduction in energy usage from 2008 levels by 2020. With a portfolio of 71 acute care facilities and 35 million square feet across 23 states and the District of Columbia, Ascension Health developed individual energy reduction goals for each hospital and health ministry (regional health systems) in recognition of the varied existing conditions across its portfolio.

Because many of its facilities indicated a “first-cost hurdle” to capital investments in energy efficiency measures, Ascension created a facility investment pool of \$50 million to fund individual projects, with a focus on projects with payback of less than four years. Ascension Health has recognized its first goal of achieving a system-wide 7.1 percent energy use reduction (\$18.8 million in savings) from July 1, 2008 through June 30, 2012, owing in part to the ability to implement energy efficiency projects using dedicated capital funds.

Anchoring Community Resilience

As an important local employer and service provider, the health care industry is uniquely positioned to support the resurgence of support for local economies. Coined in 2002 by Harvard Business School professor Michael Porter, anchor institutions are defined as named industries anchored to a place—nonprofit centers for education or health, whose name and history tie them to a city. Increasingly, major U.S. cities and metro regions are focusing on tying development and economic revitalization efforts to anchor institutions—the “eds and meds.” Anchor institutions are pivotal to community resilience—or the capacity of communities to withstand and recover from economic, social, or environmental disruptions.

In U.S. health care, strategies focus on leveraging the economic power of health care organizations to produce targeted community benefits. Most hospitals are affiliated within large health systems that cover multiple states or metros; the Gundersen example discussed earlier demonstrates the power of a health care organization in leveraging local economic activity.

The Henry Ford Hospital in Detroit provides incentives to managers to hire locally and has set in place a policy to pay local vendors in advance to provide working capital. The hospital expanded this initiative in 2010 by partnering with two other local anchor institutions, Detroit Medical Center and Wayne State University, and has already seen \$400,000 in redirected annual purchasing to local businesses. The Cleveland Clinic has sponsored local urban farming businesses to supply year-round produce for its food service operations.¹⁰ University Hospitals targeted more than 90 percent of its \$1.2 billion campus renovation to supporting local businesses. These examples point to a future with creative partnerships between health care organizations and their communities for economic growth and investment.

At the same time, architect Thomas Fisher, in *Designing to Avoid Disaster*, notes that the acceleration of extreme weather events has challenged our current “fracture-critical” design reality, in which “centralized infrastructure, from power grids to hospitals, are larger, more complex, increasingly dependent upon massive amounts of increasing ongoing maintenance, and often vulnerable to failure of a single element.”¹¹ With each weather disaster, health care features prominently in headlines chronicling disruption and evacuation with, in some cases, significant loss of life. The health care sector should embrace “passive survivability” of health care infrastructure as critical—the concept, coined after Hurricane Katrina, that buildings be designed to survive loss of essential services, such as electricity, water, and sewer as a consequence of a natural disaster, utility outage, or terrorist attack.¹² On-site renewable energy, daylighting, and passive ventilation are examples of strategies that contribute to extending the critical services of a health care facility in the event of major ongoing utility disruptions. For mission-critical systems, it is imperative to provide multiple independent and redundant ways of supplying necessary services and locate those services out of harm’s way. Hospitals that incorporate renewable energy on-site, for example, have a second option when grid infrastructure is unavailable. Moreover, an active and resilient health care infrastructure can provide important community resilience in the wake of a devastating event, providing essential “safe haven” services.

The notion of resilience is beginning to transform the health care building environment. There are remarkable examples of social and climate-resilient health care buildings emerging in response to lessons learned from extreme weather events and natural disasters; these buildings are anchoring community health and restoration. Kiowa County Memorial Hospital, a critical-access hospital reconstructed after a devastating Category 5 tornado leveled Greensburg, Kansas, in 2008, is completely powered by on-site and off-site wind turbines with the goal of increased resilience. On the Boston waterfront, Spaulding Rehabilitation Hospital (profiled earlier) demonstrates a facility designed to withstand the effects of rising sea level.

10 <http://evergreencooperatives.com/business/green-city-growers/>.

11 T. Fisher, *Designing to Avoid Disaster: The Nature of Fracture-Critical Design*. (New York and London: Routledge, 2013).

12 A. Wilson. *Passive Survivability: A New Design Priority for the 21st Century*. GreenSource Opinion, June, 2006. Available at: <http://greensource.construction.com/people/0606mag-opinions.asp>.

Building Momentum through Leadership

The Healthier Hospitals Initiative¹³ (HHI) is a three-year campaign dedicated to transforming the US health care industry—more than 700 hospitals and 13 founding health care systems are shifting to a more sustainable business model and accepting the challenge to address the health and environmental effects of their industry. This platform provides a mechanism to integrate innovative energy strategies within the sector (through their Leaner Energy Challenge) and measure the collective improvements that are achieved by member hospitals and systems. HHI is partnering with Health Care Without Harm’s Global Green and Healthy Hospitals Network¹⁴ to extend learning and best practices globally. These leading organizations are working on issues ranging from energy to healthy food and waste reduction to environmentally preferable purchasing. Practice Greenhealth, a membership organization dedicated to improving the environmental performance of U.S. health care, recently launched the Greenhealth Energy Alliance, “a collaboration between industry leaders in clean energy and Practice Greenhealth members focusing on best practices for energy efficiency and clean energy implementation in the health care sector,” according to a statement on their website.¹⁵ Collectively, they are transforming the footprint of global health care.

As hospitals make the connection between their fossil fuel energy use and individual, community, and global health, the momentum to reduce energy effects and shift to renewable sources is building. The health care organizations profiled here, in concert with a growing number of others, are acting as if their energy decisions are an extension of their mission—they are using renewable energy to heal. Increasingly, the health care sector is participating in policy debates about issues that affect individual and community health. Finally, they are reaching beyond their four walls and outside their organizational boundaries to develop and test innovative community partnerships with utilities and with for-profit and nonprofit businesses.

The health care sector should not need to argue that delivering high-quality patient care requires a passport for waste and energy intensity—or that saving patient lives is somehow outside of broader population health and ecological concerns. The health care industry is in a pivotal position to lead the 21st-century reintegration of environment, health, and economic prosperity. Through their increasing focus on community benefit, green construction, and operations initiatives, leading health care organizations are demonstrating more than a broad commitment to high-quality patient care—they are committed to saving lives and improving health without undermining ecosystems or diminishing the world.

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13 See www.healthierhospitals.org.

14 See www.greenhospitals.net.

15 Available at: <https://practicegreenhealth.org/initiatives>.