neath

pathways in the global health economy 2026





INSTITUTE FOR THE FUTURE

The Institute for the Future is an independent, nonprofit strategic research group with almost 50 years of forecasting experience. The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research generates the foresight needed to create insights that lead to action. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity. The Institute for the Future is based in Palo Alto, California.

HEALTH FUTURE LAB

No single organization can solve the complex challenges facing the world today, particularly the fields of health and health care. At IFTF, we bring together a wide variety of stakeholders from health care to food and retail-to work toward more resilient responses for the complex challenges facing health, globally. For more than 30 years, IFTF's health research has brought futures thinking to the world of health and health care by looking for unexpected connections across this variety of stakeholders. Our research explores the social, scientific, economic, and technological forces affecting health, and grounds them with a deep understanding of the lives of individuals and families. By sensing connections between large-scale change and individual lives, we help organizations develop strategic insights and long-range initiatives to transcend boundaries and create sustainable approaches to supporting health and well being.

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Health is central to all human endeavors.
It is the essential ingredient in creating
the human capital that drives
social, economic, and scientific progress.

"There is a well-understood correlation that as the economy of a country improves, so the health of its citizens improves. What may be less obvious is that the opposite is also true." — Francis Collins, Director of the National Institutes of Health

The need for health is clear, the pathway to producing it is less so. Health emerges from intricate interactions among five key determinants: individual behavior, social factors, genetics and biology, environment, and medical care.

Over the past 20 years, we have made tremendous advances in health and health care through scientific discovery, technological innovation, and reorganization of health services. During this time, rising health consumerism has driven a focus on engaging consumers. Yet costs and chronic conditions continue to rise across all middle- to high-income countries, and disparities persist. Pressure for economically sustainable health and health care is increasing. Continuing down the same path, we can foresee a robust global health economy ten years from now with more offerings delivering health care, but not necessarily producing health.

What if we put producing health front and center instead? The aim would be a global health economy in 2026 in which we produce not just an expanding array of health goods and services for the few, but health itself for the many. In this economy, financial and social wealth would be built on the foundation of health. It would be understood that the cost of producing health for the many is not just an expenditure but also an investment.

With Centering Health: Pathways in the Global Health Economy 2026, the Health Futures Lab invites you to reimagine how to design viable pathways to health for the many. These pathways navigate the territories central to producing health-the determinants of healthwhile at the same time responding to and leveraging four larger social, economic, and technological forces that we have identified as most likely to impact health and health care over the next decade. These future forces are: divergent life expectations, expanding health authorities, embedded machine learning, and inclusive design.

Five big stories emerge as the four future forces driving change meet the familiar determinants of health: individual behavior, medical care, biology and genetics, the environment, and social factors. Each story is grounded with signals that offer present-day examples of projects, innovations, or practices that illuminate the future. Insight starters help you draw the implications of these stories of the future for your organization. Join us as we explore how to chart new pathways to health for the many through familiar territories. Our goal: to build viable pathways toward an equitable and sustainable global health economy over the next decade.

Future Forces

Four future forces can help us chart viable pathways to health through the familiar territories of individual behavior, social factors, genetics and biology, environment, and medical care, and at their intersections.

DIVERGING LIFE EXPECTATIONS

Historic shifts in the world's social structures, from aging to urbanization, are changing people's expectations of life. What people want from the global health economy, what they do to get it, and where they turn for health will increasingly diverge. The opportunity is to sense and to meet these divergent expectations.

EXPANDING HEALTH AUTHORITIES

From the medical sector to the information sector, from governments and companies to constantly morphing networks, authority in health is recalibrating and expanding. The opportunity is for incumbent authorities to adapt, to partner, and to innovate.

EMBEDDING MACHINE INTELLIGENCE

Information technologies have reached an inflection point where every human and machine task and any device we invent can be amplified by machine intelligence. As the velocity of change accelerates, our networked world will give researchers, inventors, and innovators the opportunity to harness the combinatorial possiblities of intelligence for health.

DESIGNING FOR INCLUSION

Health and wealth gaps between the haves and the have-nots the world over are growing, driving ill health and exacerbating the complexity and cost of producing health.

The opportunity is to design for inclusion of those with the fewest resources, which is revealing radical interventions—often cheaper—that produce health where we least expect it.

Determinants of Health

Centering Health: Pathways in the Global Health Economy 2026 offers foresight on how these future forces will interact with the well known determinants of health to carve new pathways for preventing and treating illness. Those determinants are familiar to you:

INDIVIDUAL BEHAVIOR

The myriad of actions we do or do not take every day, from eating and sleeping, to self care and exercise.

MEDICAL CARE

The goods and services that prevent and treat illness and support healthy lives.

GENETICS AND BIOLOGY

The interaction of our genes with food, disease processes, drugs, the environment, and the science that allows us to intervene.

ENVIRONMENT

The natural and built environments from which we derive shelter and sustenance.

SOCIAL FACTORS

The organization of our social systems and the resources we bring to support health.

With the following graphic we invite you to explore the emerging pathways to health then turn the page to read more about the big stories, forecasts, and the signals that are driving this future.

AND DEHAVIOR MEDICAL CARE DIVERGING LIFE EXPECTATIONS... **HOW TO USE** Modernizing Integrating **THIS FORECAST** the Care EMBEDDING MACHINE INTELLIGENCE **Every Day Standard Four Future Forces** amplify our ability to create new pathways Building **Enlisting** to health for the many survivorship virtual by acting on the familiar determinants of health. health models assistance **Five Big Stories** emerge as the four future forces meet the familiar determinants of health: Designing public health Engaging individual behavior, medical care, genetics and health-sustaining pharmacogenetic policies biology, the environment, support systems and social factors. Ten Pathways to Health offer forecasts of specific routes to health for the many at the intersections of the four future forces and the determinants CENTERING of health. health Renegotiating Maintaining the basic social proactive biohack contracts pathways in the global health economy 2026 **Developing** Accessing **Evidence Programmable** for Change Leveraging public Developing **Biology** safety for public health systemic interventions GENETICS & BIOLOG SOCIAL FACTORS Modeling regenerative Building 21st century environmental handprints resilient cities **Fostering** EXPANDING HEALTH AUTHORITIES **Planetary** Resilience ENVIRONMEN

INDIVIDUAL BEHAVIOR

Beyond Compliance: Integrating Health into Everyday Life

Enlisting virtual assistance

Because we're accustomed to interacting with computers through screens, we assume digital means screen based. But screen-based interactions with digital devices are being replaced by conversations with virtual assistants that aim to handle any spoken question or request as easily as a human being. As a pathway to health, virtual assistance has the potential to reduce the burden of self-care and coordinate caregiving for the growing number of people with multiple chronic conditions, while at the same time overcoming language and literacy barriers.

Voice-activated digital assistants that emerged outside of the health care system—made by companies like Google, Apple, and Amazon-are finding their way into it. Already, early reviews of Amazon's Echo assistant mention its value in aiding individuals with physical disabilities to manage home-health-related tasks. While current consumer technology is disconnected, the shift toward connected digital assistants with conversational interfaces will converge with longstanding efforts to integrate artificial intelligence into mental and emotional health care. As conversational interfaces proliferate, personalized, in-depth individual and family interactions will make it feel as though doctors, coaches, and other members of care teams are available anywhere.

signal



Help from virtual assistants

A study found voice assistants had unsympathetic responses to signs of suicide, depression, and heart attack, but they could improve.



androidcentral.com

On-demand pediatric advice

Boston Children's Hospital recently released a skill for Amazon Echo, KidsMD, that lets parents ask the device about pediatric symptoms.

Engaging health-sustaining support systems

Individuals and medical systems alike look for willpower to accomplish behavior change, but this is an unrealistic expectation. Behavior change is difficult to sustain unless it's built on what people already have—social connections, cultural grounding, or other sources of personal motivation and encouragement. As machine intelligence comes to saturate even low-resource environments, promising behavior change approaches are emerging that leverage mobile devices to take advantage of personal social capital and enhance connection, feedback, and support.

Over the next decade, with the rise of ambient machine intelligence—where sophisticated, cloud-based algorithms can be accessed from any device with a network connection—we'll see just-in-time meet-ups offering peer support, neighborhood mobilizations and cleanup efforts, and more effective care interactions. Consumer devices will automatically capture and curate health-defining moments, from daily food choices to nurturing conversations. People and their care teams will be able to surface patterns of behavior and social connection and use them to remove barriers to health.

Health is contagious, so help us pass it on.

Social support for behavior change

Microclinic International engages social networks to support behavior change for people with serious chronic conditions like diabetes and HIV.



Health-defining moments on film

The Graava camera—which films everything and then edits out the boring parts—could be repurposed to capture health-defining moments.



MEDICAL CARE

Beyond Sick Care: Modernizing the Medical Standard of Care

A broad definition of well-being is replacing a strictly biomedical or physical understanding of health, prompting health care systems to expand their capacities beyond providing clinical care. Through partnerships, acquisitions, and new initiatives, traditional health care is extending beyond clinic walls to augment the biomedical model's contributions to good health outcomes. By 2026, look for a more globalized standard of providing and financing medical care based on this new understanding of health.

During the next decade, the greater number of people in need of routine care to manage age-related and chronic conditions will drive a shift toward risk-sharing contracts and outcome-based payment models to incentivize high-quality and cost-efficient care delivery. Systems that are largely centered around technologically advanced hospitals and highly-trained medical specialists will work to integrate social, economic, and psychological interventions. At the same time, investment in growth markets in both private and public health care delivery systems and insurance programs will increase access to a modern medical standard of care, most notably in India, Indonesia, and China.

Digital health tools and technologies will increasingly be integrated into care model design for rural health, self-management, remote monitoring, and medication adherence. With this integration, new stakeholders with expertise in using sensor technology, machine intelligence, and data analytics will establish themselves as central players in the global health economy. Finally, the accelerating growth of prescription drug usage in markets across the globe will drive new pricing policies including reference pricing and comparative effectiveness, as well as a rise in the share of generics and biosimilars.

Building survivorship health models

New discoveries and therapies are transforming the way cancer is treated, resulting in longer survival and better quality of life for millions affected by the disease today. An accelerated translation of clinical research into new cancer detection tools and therapies, along with public health interventions and effective prevention, will continue to improve the survival rates for the almost 22 million people who will be diagnosed with cancer in 2030.

Over the next decade, assuming that access to care is not an overwhelming barrier, a diagnosis of cancer will, for many, mean not a lethal but a chronic condition. This means that millions will be living with a history of cancer. Leaders in the global health economy will tackle the financial, social, emotional, and physical health effects of the disease and treatment to ensure that the survivors experience good health post-treatment.

signals



Survivor education about treatment effects

The myHeart, yourHands site educates childhood cancer survivors about long-term and late side effects from treatment.

carevive s

Nurse-led survivorship care

The Victorian Cancer Survivorship Program in Australia shifts care out of oncology departments and into community and primary care settings with nurse-led offerings. carevive.com

myheartyourhands.org

Designing public health pharmacogenetic policies

Around the world, people will collectively take 4.5 trillion doses of medication in 2020. Routine medical practice is to prescribe the same dosage of any specific drug for everyone. But the next decade will bring the routine implementation of pharmacogenomics, the study of how genes affect a person's response to drugs. Where cost, access, and knowledge are not barriers, pharmacogenetic tests will make it possible to determine appropriate medications based on genetic profiles. This will undoubtedly improve individual care, allowing physicians to better customize treatment plans and minimize side effects.

On the other hand, where patient genotyping is too expensive to integrate into routine practice, the current regime of one dose fits all will continue, creating new disparities and gaps in routine medical care. Furthermore, cost and drug availability may make it hard for most of the world's infected population to have access to promising new treatments for widespread ailments. Leaders in the global health economy will need to use persuasive advocacy and innovative strategies that integrate pharmacogenomics technologies into public health infrastructure to ensure equitable health outcomes for all, regardless of where they live and what their socioeconomic status is.

signals PGENI

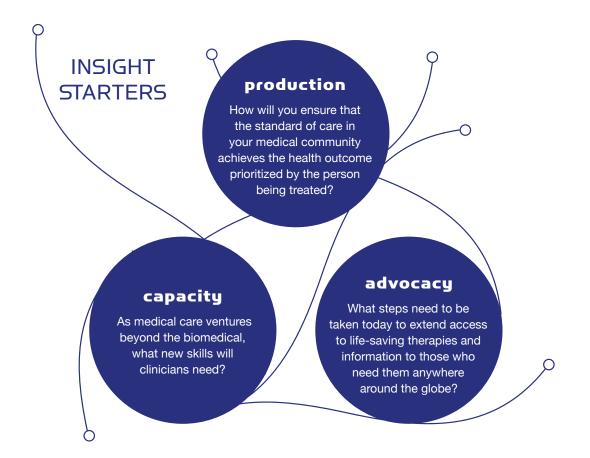
Genetic information to guide drug selection

The Pharmacogenetics for Every Nation Initiative (PGENI) collects, analyzes, and disseminates genetic information to guide drug selection for formularies in developing nations.



Genetic variation mapping to help target distribution

PGENI maps genetic variation to help target distribution of hepatitis C medicine by showing where treatment failure is likely.



GENETICS AND BIOLOGY

Beyond Self-knowledge: Accessing Open, Programmable Biology

Completion of the Human Genome Project in 2003 created excitement around the possibilities for precise care based on deciphering the health impact of the three billion base pairs in our genomes. Rapidly falling costs and the democratization of genetic sequencing and analysis platforms have put biological information directly into people's hands. The coming decade will provide more tools for those who want to be proactive in pursuing health and also more tailored care for all.

The convergence of biological and information sciences is shifting scientific authority and ushering in a new era for genetics and biology. With the massive collection and analysis of biological data that's going on, researchers are uncovering clues about the biological and genetic determinants of human health and identifying new pathways to well being. Investigations of epigenetics and the microbiome are depicting human biology as more interconnected with the broader world than we previously knew.

New information from this research, such as the connection between gut bacteria and health conditions, will empower people to be more proactive about their health if they choose. At the same time, wearables and other biological trackers, along with direct-to-consumer genetic and microbiome testing services, will increasingly connect people with insights into their biology and behavior that they can base daily decisions on. Treatment options will also expand. In the next ten years, we will see biotechnologies such as gene editing, stem cell therapies, and synthetic biology produce alternative treatments for cancer and diabetes.

Mainstreaming the proactive biohack

We will see the growth of biohacking in the next decade as people take their biology into their own hands. Experimenting on the cheap in small labs or at home, those who are fascinated by the biology of their own bodies will discover ways to improve their health, ability, and well being. Even as patent and regulatory disputes rage on in academic and institutional settings, individual workarounds such as DIY CRISPR kits for gene editing and genomic wiki websites will abound. Divergent data will be integrated into increasingly accessible, open systems, aiding this democratization of science.

People who want to proactively manage their health will find many tools at their disposal: not only supplements and wearable monitoring devices, but also exoskeletons, gene therapies, and implantable chips or devices that provide real-time internal health monitoring. As more people see their biology as not only knowable, but also alterable, they will mix and match emerging biotechnologies to create personal pathways to health. Conflicting systems will vie for prominence in this space, but the creation of more open systems capable of robust permission models and ongoing agency will keep health front and center.

signals

Version: 0.1.160
Generated: 2013-12-14 04:43
Infile: Roberta Estes's genome
Reference Population CEU
20080 genotypes annotated

Good news

Raw data into actionable information

Promethease bridges raw genomic data with the wiki site SNPedia to build a personal DNA report.

DIY gene editing

The crowdfunded DIY CRISPR Kit lets anyone make precision genome edits in bacteria at home.

indiegogo.com

promethease.com

Developing systemic interventions based on massive biological data

In the next decade, as biological data proliferates and flows through increasingly automated and embedded systems, we will gain a more complex and layered understanding of the myriad influences that contribute to health and disease. Anyone with a smartphone will be able to contribute biological data to increasingly diverse research projects, which will analyze not only individual, but also systemic patterns. Just as our view of the etiology of cancer has changed, a more nuanced understanding of physical and mental illnesses from zoonotic diseases to autoimmune disorders will emerge. Well-known culprits like sugar, plastic, and lead will be joined by a host of other identified influences, from microbes to environmental stressors that change gene expression.

With better knowledge of the multiple causes of many diseases, we will be able to intervene upstream in precise ways that increase health equity. Cutting-edge explorations of the microbiomes of buildings, cities, and bodies will be a fertile learning ground for the new translational science of ecosystem interventions. And the reconvergence of disciplines that drifted apart over the last century—public health, medicine, urban planning, land use management, and architecture—will enable us to develop multifaceted, holistic interventions.

signals



Street tree benefits

Mapping of urban trees is showing the dollar value of benefits to human bodies—like reduced asthma—and to the environment.



Microbes in hospitals

Hospital microbiomes will provide a microcosm to pilot modeling complex human-environment interactions and forging ecosystem interventions.

INSIGHT STARTERS

production

How can your organization ensure trust and responsibility in R&D as increasingly experimental biotechnologies proliferate in newly dispersed ways?

capacity

How can pharmaceutical, insurance, and other medical institutions make use of new data sources to cultivate interdisciplinary learning and action?

advocacy

How might you help ethical, social, and political needs gain traction within increasingly personalized and democratized health systems? hospitalmicrobiome.com

ENVIRONMENT

Beyond Risk Maps: Fostering Planetary Resilience and Regeneration

Never before have we had a clearer and more comprehensive understanding of the negative health impacts of poor environmental conditions. The pressures of climate change and powerful calls for planetary health as a precondition for human health will bring the importance of our environments into sharper focus over the next decade. In the face of global environmental challenges, resilience and regeneration will emerge as key processes to foster in individuals, communities, and cities worldwide.

Climate change is now seen as a public health issue, and environmental pollution and degradation are understood as environmental justice issues for those who disproportionately suffer health effects and lack the resources to adapt. The environmental challenges of the coming decades will require massive shifts in our social and economic patterns. The Paris Agreement in December 2015 marked a turning point in the glacial progress of national and international accords on climate change mitigation and response, but in the meantime public health, philanthropic, and municipal actors have stepped up.

New initiatives such as the Rockefeller Foundation's Planetary Health framework are drawing attention to the reality that protecting the integrity of natural systems is essential for human health. Dozens of city-to-city networks have emerged to promote effective action. In 2016, the World Health Assembly forwarded climate health as the best prevention strategy for a host of ailments. Spurred by the deep disparities and disruptions of environmental health crises, we will aim for resilience and regeneration as key pathways to health for all.

Building 21st century resilient cities

Cities are stepping up as one of the most active levels of governance confronting climate issues. Artists, civic hackers, and others drawing on the maker city playbook will connect planetary forces and everyday actions—easing suffering and showing the way to adaptation. Cities will be the most vibrant and creative places for this work to happen. Everything from modernizing infrastructure to aiding refugees will prove to be challenges, but also opportunities to create resilience in the face of climate shocks.

As community institutions, health care providers can and sometimes do participate in these networks. However, the externalities of health care are also part of the problem. A recent analysis of climate impacts of the health care industry itself rated the harm of the industry's emissions and pollution on a par with preventable medical errors. In the coming decade, dense networks of resilient activists will hold all kinds of organizations accountable to increase their handprints, not just reduce their footprints.

signals



Environmentally responsible health care

Health Care Without Harm is supporting local hospitals and policy reform in some of the most climate-vulnerable regions.



publiclab.org

Citizen engagement in environmental health

Air Quality Egg is among dozens of community-led air quality sensing networks engaging citizens in local environmental health advocacy. airqualityegg.com

Modeling regenerative environmental handprints

Responsibility and regeneration are emerging as economic imperatives for organizations of all kinds. This is occurring as the inequities of planetary health move front and center and we acknowledge that threats in both the built and natural environment disproportionately affect low-income, minority communities. Learning from and protecting peoples whose health and livelihoods are at deep risk leads organizations beyond just planning for sustainability and points to the need to plan for social and environmental regeneration.

Researchers and NGOs have documented that giving people greater rights and stewardship responsibilities over the ecosystems in which they live is highly effective in combatting climate change, improving health, and increasing economic opportunity. Support for indigenous people's efforts to play this pivotal role will be crucial in the decade to come. But the lesson of increasing people's personal investment in their environment to achieve regenerative results is not being lost on entrepreneurs and incumbent businesses. These savvy players are building enterprises that don't just produce goods and services, but also strengthen living systems at the same time. These entrepreneurial ecosystems both mimic and support natural ones, resulting in multiple positive impacts on human and natural health and equity.

signals

We exist to restore our oceans, mitigate climate change and create jobs.

greenwave.org

Jobs and climate mitigation

GreenWave kelp farm aims to replicate its business model in a "blue-green" revolution for sustainable livelihoods and climate mitigation.



Community rights for healthier forests

A World Resources Institute study finds that efforts to protect indigenous land rights result in healthier forests.

INSIGHT STARTERS production advocacy capacity What partnerships will you realign resources to foster

SOCIAL FACTORS

Beyond Inequality: Developing an Evidence Base for Structural Change

In the complex mix of what creates health, social factors such as economic inequality and violence have been the hardest to measure, but new data will pinpoint how much they matter. With that evidence, we can seize the opportunity during this time of social, political, and economic upheaval to renegotiate basic social contracts and address the root causes of health disparities. Emerging technologies and shifting authorities will help us chart this new pathway to health for all.

When it comes to addressing the social factors that contribute to health, action has been hampered by a lack of clear evidence and understanding of the public health impact of realities like income inequality and structural violence. But as the insurance industry realigns its incentives to support more preventive measures, there will be a surge of new research to understand the etiology of health disparities. Artificial intelligence will accelerate this by combining disparate data sets to create an evidence base for social interventions. Epigenetics will continue to reveal how social or environmental triggers change gene expression and therefore health outcomes.

Combined, these advances will equip a wide range of activists, companies, and community leaders with the evidence to demand the structural and social changes needed to improve health outcomes. The shift away from single-employer careers to more flexible, on-demand work will spark debates worldwide about the need for portable benefits or even a universal basic income guarantee, pressing us to renegotiate some of our most basic social contracts and modernize safety nets. New players—from food companies to urban planners—will also be on the hook to take responsibility for the health impacts of their actions.

Renegotiating basic social contracts

Health, work, and economics have always been intimately linked. On the most basic level, work is often exchanged for money and money is exchanged for health care and medical services. But the tenets of this system are coming under new pressures. In the United States, new regulation is changing what insurance companies pay for so that payment is based on the outcome achieved, not the treatments undertaken. And countries where health insurance is largely provided by employers face new challenges as the work ecosystem shifts to accommodate burgeoning numbers of gig workers in the on-demand platform economy.

As our economic systems become increasingly volatile, we'll see a renegotiation of our most basic social contracts. Looking at universal basic income initiatives alone, we can see a variety of approaches around the globe. Some supplement health and other government services with financial aid aimed at alleviating poverty as a way of getting at the root causes of disparities in well-being. Others focus on simplifying government by providing cash in the place of services and turning citizens loose in the market.

Rortable Benefits

Policy for portable benefits

The Aspen Institute Future of Work Initiative offers a Portable Benefits Resource Guide to help policy makers create a social safety net for on-demand economy workers.



Universal basic income

The nonprofit GiveDirectly is launching an experiment to provide around 6,000 Kenyans with basic income for ten years. givedirectly.org

aspeninstitute.org

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Leveraging public safety for public health

A new understanding of the relationship between public safety and public health is beginning to occur that will create new pathways to community health. In the United States, the medical community is calling for gun violence to be treated as a public health issue. And worldwide, activists are fighting against structural violence-violence wherein social structures or institutions harm people by preventing them from meeting their basic needs. Over the next decade, groups will begin collecting evidence of all the forms of violence their communities experience—from lead exposure and water pollution to lack of access to fresh produce-and will make their health impact explicit.

Capturing and sharing data has already become a major strategy for public safety activists. The Black Lives Matter movement, for instance, has leveraged phone cameras to capture photos, audio, and video of police brutality, as evidence used to rally people to the cause. As government public safety initiatives put more cameras and sensors on city streets to catch criminals and use more powerful algorithms to predict crime, community activists will first make sure data collection is unbiased and will then use this sensing and sensemaking infrastructure to advance their fight for public health. The functions of government public safety and public health agencies will converge.

signals



Machine bias unmasked

ProPublica revealed bias against blacks in software used nationwide to assess the risk of future crimes and guide sentencing decisions.



Gun Violence A Public Health Crisis

As doctors decry gun violence as public health crisis, AMA lobbies to overturn ban on CDC-funded gun violence research.

ama-assn.org

INSIGHT production **STARTERS** How would your products or services change if you were always held accountable for their long-term health impact?

capacity

How can you prepare for a workforce comprised of flexible on-demand workers who need portable benefits?

advocacy

What data do you already have that could assist new groups in their advocacy around social factors in health creation?

The past 20 years of innovation, market expansion, and consumer engagement in health and health care equips us to move on to the next era of the global health economy: delivering health to the many at a sustainable cost. Human expectations, advances in biological and genetic science, burgeoning capacity of machine learning, and the ability to design inclusive interventions make this goal well within our reach. However, we will need to engage all of the determinants of health, deploy them in concert, and design holistic and lean interventions with the goal of reaching those with the least resources as well as those with the greatest. As the burden of rising chronic conditions among rich and poor nations and growing health care costs strain societies across the globe, health and health care stakeholders will experiment in constructing approaches to producing health that are equitable, cost-efficient, and sustainable: approaches that recognize health, itself, as the essential ingredient for social and economic developmentinterventions that

center health.





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