DESIGNING GLOBAL HEALTH SUPPLY CHAINS FOR THE FUTURE

WILLIAM DAVIDSON INSTITUTE
AT THE UNIVERSITY OF MICHIGAN

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A synopsis of trends shaping healthcare supply chains in the future and key considerations for donors, country governments, and the private sector

A study conducted for the William Davidson Institute at the University of Michigan with support from the Bill & Melinda Gates Foundation

FOREWORD

Supply chains are the backbone of a health system. Improving supply chains for health products is fundamental to the success of any health program.

Supply chain management for drugs, devices, diagnostics, and equipment has received increasing attention and significant investment in the last decade. However, this interest and investment cannot hide the shortcomings in the structures and systems that are used to run supply chains in many developing countries – structures which were often developed more than 50 years ago and haven't evolved much. Over the last 20 years, best practices in supply chain design have changed dramatically- from relying on centralized planning to a relentless focus on agility, responsiveness, and flexibility. Private sector supply chains have been quick to imbibe these changes, but public sector supply chains continue to operate with decades old design.

In the decades ahead, we can expect demographic changes, rapid urbanization, rise of non-communicable diseases, and growing threats of pandemics and antimicrobial resistance to put further pressure on public health supply chains.

Efficient and well-performing supply chains lead to improved health outcomes and make health systems more sustainable in the long term. The imperative to improve supply chains has been articulated in numerous reports. What is different in this report—and what makes it exciting—is the possibility of utilizing new developments in supply chain technology, business models, private sector best practices, and innovative financing, which create unprecedented opportunities for improving health supply chains in developing countries.

This report takes stock of trends impacting the field of supply chain management and global health, and then analyzes the trends that lie at the intersection of the two fields. It poses questions that governments, development partners, and private actors should be asking today which can enable them to make relevant and timely investments to build and strengthen supply chains of the future.

Four key lessons in this report are:

1. Public health supply chain organizational structures and operations in many developing countries are out of step with patient needs and with state-of-the-art supply chain design
2. "Future proofing" public health supply chains will require business model redesign and investment to create greater agility, responsiveness, and flexibility in supply chains
3. Market mechanisms, new technologies and new business models alone will not solve today's supply chain challenges and under-performance- we will need ongoing reform to improve government-run supply chains and support governments in becoming strategic purchasers and stewards of supply chain services
4. We need a stronger focus on capacity building for new era skills in data science, analytics, outsourcing/contracting, monitoring, and supply chain performance across the public and private sectors

FOREWORD (CONTINUED)

Pursuing the recommendations laid out in this report will not be easy. We need the political will for change, openness to creative thinking, insistence on performance and accountability, and a sense of urgency across different agencies. As the report points out, progress will depend on attitude changes and reskilling/retooling strategies among different actors in the supply chain.

I would like to extend my personal thanks to many partners and stakeholders who have provided vital inputs to this report and especially to Maeve Magner and Prashant Yadav for putting together this report. I hope the report stimulates new thinking and constructive debate about what can we do to dramatically improve public health supply chains.

Dana Hovig
Director of Integrated Delivery
Bill & Melinda Gates Foundation

PREFACE

This is not an attempt to forecast the future. We aim to challenge and broaden your assumptions about what comes next and how you can participate in the coming changes.

We hope to stimulate thinking about global health supply chain design so that governments, global agencies, and private actors support relevant and timely investments. We can all help ensure that patients around the world achieve dramatically improved access to affordable healthcare – when, where, and how they want it.

We encourage you, as a global supply chain stakeholder, to reflect on how the trends highlighted in this report will impact your organization and to consider the actions you can take to address them. While some aspects of this report may appear Panglossian to some readers, economic forces and the spread of technology are coming together in a way that this is indeed a time for being optimistic about healthcare supply chains in developing countries.

Sincerely,

Dr. Prashant Yadav and Maeve Magner

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EXECUTIVE SUMMARY

We travel to 2030 and envision how global healthcare will operate. Using a collaborative research process, we identified six forces as having the greatest likelihood of impacting global health supply chains in 2030 and beyond:

1. Economic Growth: Rising income levels redefine healthcare financing
2. Shifting Disease Burden: New demands pressure healthcare delivery
3. Urbanization: Urban growth transforms healthcare markets
4. Patient-Centric Care: Supply chains organize around patient data
5. Generation Data: Competition thrives with data abundance
6. Innovation's Tempo: New business models rise from new networks

These futures are not prescriptive but simply illustrate the change achieved by governments, global agencies, and private actors. The change ahead for each category of supply chain actor is summarized by the following themes:

- Governments: Becoming the main funders for health
- Global Health Agencies: Traditional influence levers fade
- Private Actors: Investing in a deeper supply chain presence in growing markets
- Patients: Capitalizing on the revolution in personal health information

Given those likely developments, we have asked the natural question: What should we start working on today?

We propose a series of initiatives governments, global agencies, and private actors should undertake to build capacity for 2030. Those initiatives are in four focal areas:

- Patient-Centric Supply Chain Design: Explore supply chain models able to thrive in more urbanized, omni-channel new world healthcare markets
- Cross-Sector Data Partnerships: Build ties among public and private supply chain organizations investing in advanced analytics and Information & Communication Technology (ICT) capacity
- Capacity Building for New Era Skills: Invest in workforce training, entrepreneurial innovation, and markets
- Public-Private Market Crossover: Explore and develop models for effective public-private supply chain collaboration

The dilemma of uncertain growth underscores the need to invest in more agile and flexible supply chains. Innovation will only create opportunities for fast and flexible decision-making. Organizations need to reorganize to act upon those opportunities.

In some cases, this will come at an additional cost. Donors, country governments, and private companies will need to pay these upfront costs to enable greater savings. That is the only way to ensure increased, equitable access to high-quality health products in the future.

We do know for certain that the future will not be evenly distributed. This makes it imperative that supply chain actors transform ahead of 2030.

OUR APPROACH

We assembled the resulting strategic perspective by performing the following steps

DESKTOP RESEARCH:

Review of macro trend reports from various institutions, think tanks, and logistics companies

EXPERT CONVERSATIONS:

First round interviews with experts from a variety of industries, including pharmaceuticals, consumer packaged goods, high-tech electronics, and logistics companies, among others

MACRO-MICRO ANALYSIS:

Reflection on how macro-micro trends will interact to ascertain the potential impact on global health supply chains

FOLLOW-UP WITH EXPERTS:

Second round interviews to further consolidate and explore causal chains.

PRELIMINARY FINDINGS:

Feedback from a select group of public health and humanitarian sector logisticians.

IMPACT ANALYSIS:

Analyzed the implications of these trends for supply chain actors (governments, agencies, and private actors).

THE VIEW FROM 2030

We are now in the year 2030, where all new world countries (formerly developing countries) have evolved, some more than others.

Global markets have expanded. Cutting-edge technologies have become mainstream. The Internet of Things (IoT) means the world is more connected than ever. Healthcare across new world countries has adapted to these changes. Governments, international agencies, and private actors have reorganized care around the signals and data emanating from patient populations.

KOFI

Waiting for the bus in Jamestown outside Accra, Kofi takes in the daily news. The day's events stream to Kofi on advertising-supported video signage. Engrossed, he fails to notice how tired and thirsty he has become. A vibration on his wrist from his wearable glucometer alerts him that his blood sugar is higher than normal.

When he arrives home, Kofi retrieves an at-home diagnostic test. Within minutes, the test confirms a high blood-glucose level and issues a recommendation to seek further consultation with one of three local doctors who are currently available online. Kofi selects a doctor and calls for a video consultation. Via the cloud, the doctor accesses Kofi's electronic medical record, which includes his health vitals from his wearable device along with his genetic and microbiome data, and confirms his allergies and the type of medication needed.

The doctor then transmits a prescription to a local pharmacist. Kofi's prescription is one of many streams of data shared securely and privately upstream with the pharmacy's distribution and ultimately contract manufacturing partners.

Twenty minutes later, Kofi receives a notification that his treatment was 3-D "printed" by the pharmacist and is being transported via drone to his home. When the treatment arrives, Kofi hears his phone sound an alert and watches from his window as the drone lands on the rooftop of his small house in a densely populated and overcrowded part of Ga Mashie. Before opening the package, Kofi scans it to verify receipt and authenticity. Kofi's entire patient journey is captured electronically and, after ensuring anonymity, sent to a central system that informs future healthcare planning.

A few days later, Kofi is back to his healthy self. As he returns to his daily routine, he pauses to consider the changes he has seen in the healthcare system over the past 20 years. He no longer waits in long lines at the public health facility, worries about whether they have the right diagnostics or medicines available, or considers whether the health products he needs are of good quality. He is more confident in the quality of his healthcare services now than ever before.

TANIA

Tania and her children arrived in their new country nine months ago. Massive storm flooding displaced her and thousands of others from her home island in Polynesia. While the authorities blamed climate change, they were unprepared for the scale of displacement created by the disaster. Tania and her children were fortunate to find a place in a refugee settlement established by the United Nations (UN) in Papua New Guinea.

Tania is waiting in line with other refugee families at the on-site medical clinic. Tania's youngest child Manu accompanies her. She first noticed his fever and rashes yesterday morning. While displaced, Tania and others in the settlement remain in touch with each other and the world via social media. On social media, she learned that other children in the camp were experiencing similar symptoms. Tania sent the clinic's diagnostic app pictures of Manu's arms, legs, and torso. The international care team used deep learning models to triage patient symptoms with image recognition and to define the treatment protocol. By early evening the clinic contacted Tania to confirm a preliminary diagnosis and tell her they scheduled Manu to receive care at 10 a.m. the next morning. The clinic's appointment scheduling algorithm also reminds the care team to preorder Manu's medicines from the distribution center in the closest large city. It arrives promptly on time just before Manu's visit the next morning, eliminating the need for the space-constrained clinic to hold any stock.

After Manu receives the treatment, Tania interacts with the clinic via smartphone to confirm Manu is on the mend. The response at the settlement was a success. Public-private coordination contained a potential pandemic of a new emergent infection.

Tania and her family participate in the country's settlement camp's healthcare scheme through subsidies from global health agencies.

Tania is grateful for the speed at which Manu and other children have been treated. The panic passes in a few days and Tania can refocus on finding a new permanent home for her family.

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

We identified six trends that will define the global health supply chain ecosystem in 2030:

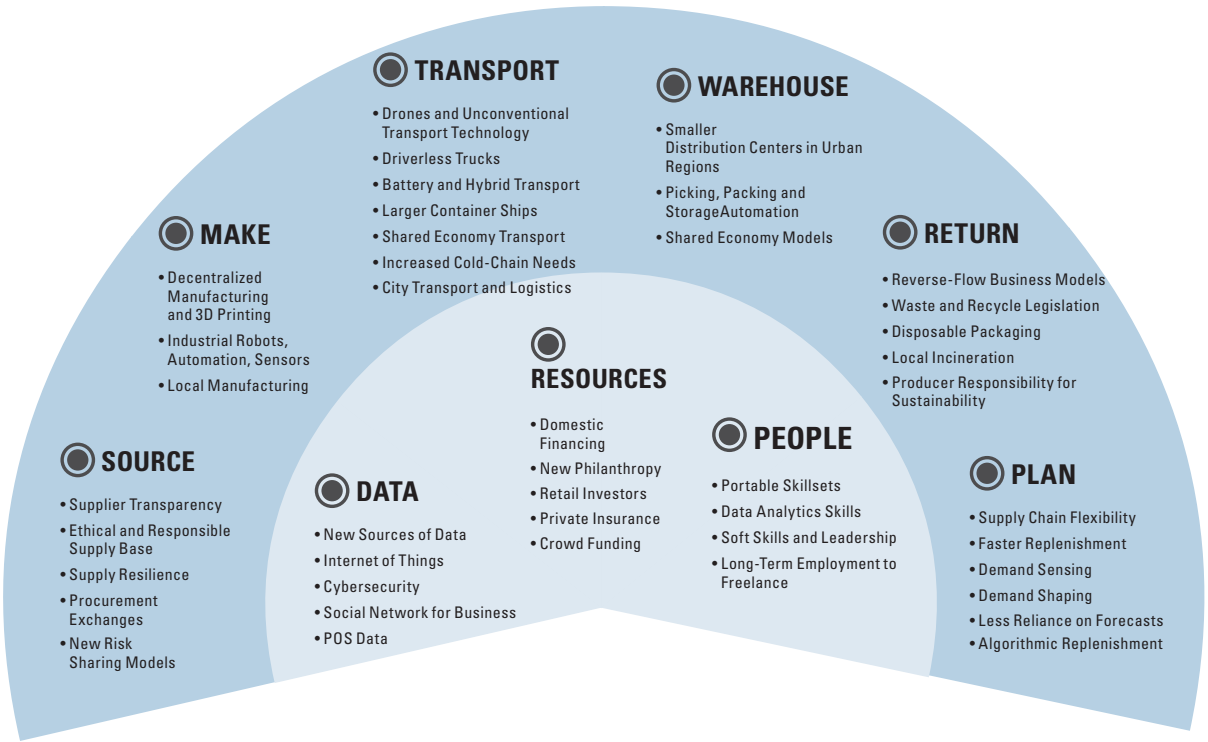
1. Economic Growth
2. Shifting Disease Burden
3. Urbanization
4. Patient-Centric Care
5. Generation Data
6. Innovation's Tempo

The change ahead for each category of supply chain actor is summarized by the following themes:

- Governments: Becoming the main funders for health
- Global Health Agencies: Traditional influence levers fade
- Private Actors: Investing in a deeper supply chain presence in growing markets
- Patients: Capitalizing on the revolution in personal health information

In the following sections, we discuss the shift each trend will create and envision the resulting scenario for supply chain actors, and then lay out questions supply chain actors should use as a compass today. We also discuss trends in commercial supply chains and how they will impact the future global health supply chain eco-system. The following graphic summarizes trends in key supply chain functional areas:

Key trends shaping the future of commercial supply chains



Ongoing trends and innovations in key supply chain functional areas will transform the set of tools available to supply chain actors to address broader economic, demographic and technological forces

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

1. Economic Growth

Rising Income Levels Redefine Healthcare Financing

By 2030, global economic growth results in many low- and middle-income countries assuming middle- or high-income status.

Governments in many new world countries are less dependent on international aid due to global economic growth. Governments invest more domestic resources in the health of their populations and embrace new technologies. Governments establish core competencies around health service provision and health financing. National health insurance pays for medicines through public and/or private channels. Donors' aid policies have become more volatile with shifts in nationalist sentiment.

Admittedly, political instability, short cycles of economic bust and boom fueled by commodity prices, and famines have not entirely vanished. Some countries continue to be buffeted by macro events and have not sustained healthy growth.

Governments take ownership of their country's health services.

Governments are now more accountable for their country's health services and expenditures. Governments fund their own health budgets through traditional means such as taxation coupled with innovative financing partnerships with local private philanthropies.

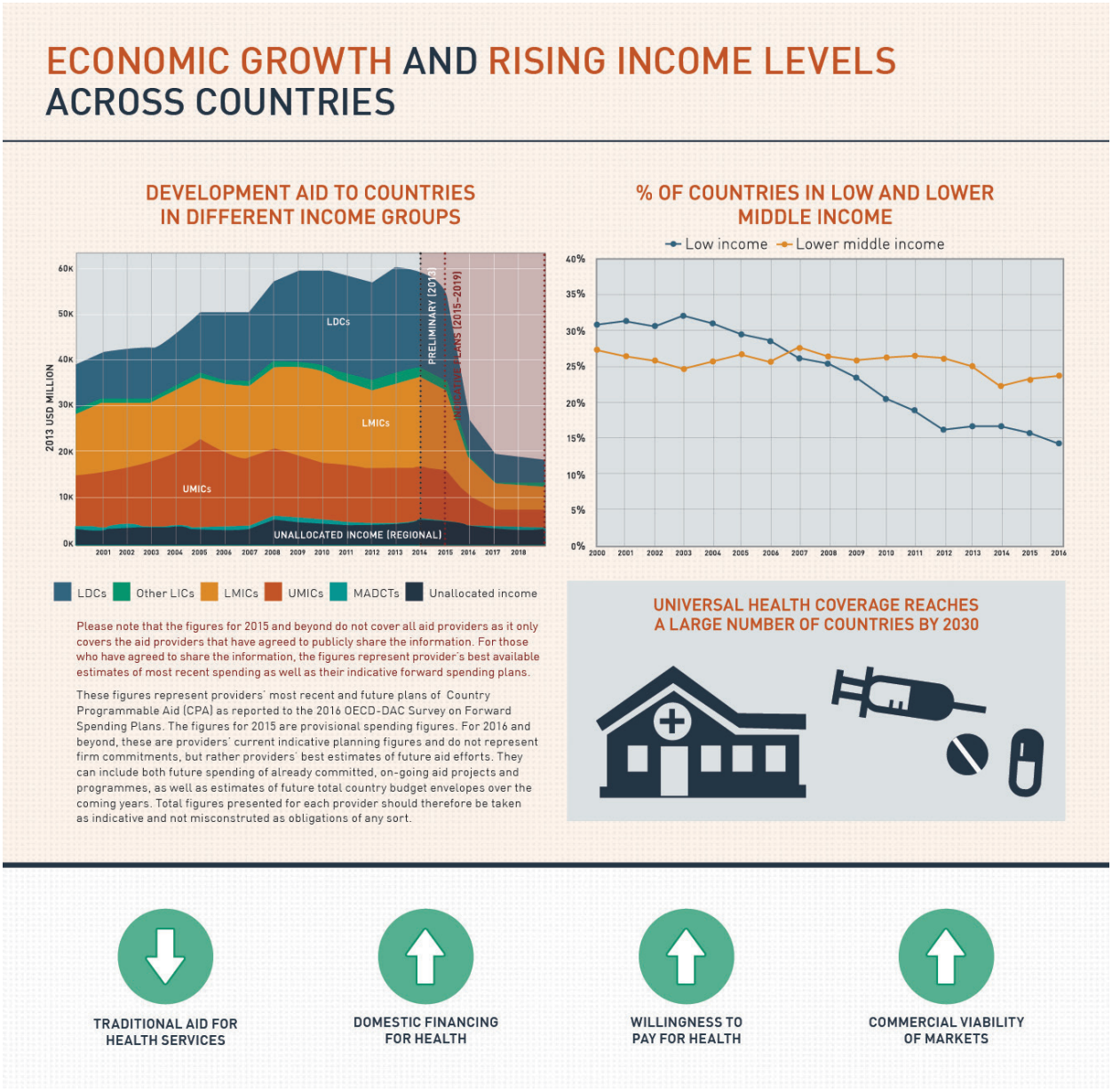
As countries "graduate" from donor funding, government spending, health insurance schemes, and private spending become the primary sources of financing for healthcare. Medicines are purchased by patients through some form of insurance, pre-payment or health savings accounts, not out-of-pocket cash payments.

Governments focus on core wellness and decentralize financing.

Governments focus on access and preventive care as they develop more extensive healthcare services. Many country governments decentralize health financing to lower tiers of government (a trend already evident today in countries such as Kenya, Nigeria, and India). Decentralization is allowing the health system to better cater to local preferences and stronger involvement of local communities and patient groups. It is also enabling greater inter-sectoral coordination, particularly in activities related to prevention and wellness.

Traditional levers of influence of global health agencies fade.

By 2030, international agencies have moved away from traditional procurement and taken on new roles in the ecosystem. Different actors domestically are starting to procure health products through a combination of local, regional, and global suppliers. As markets mature, supply chains rely on more market behaviors and actors (e.g. pharmacies buying from distributors who source from manufacturers).



Projected economic growth will increase governments' and individuals' ability to pay for health services, reshaping the role of traditional aid-driven financing mechanisms.

Organizations like the Global Fund, GAVI, and the Global Financing Facility (GFF) still finance mainstream population health programs through the government, although in fewer countries and for a broader range of diseases. Having transitioned out of public health commodity procurement on behalf of multiple countries, these agencies continue to play a more limited role facilitating price negotiations for individual countries. There remains a need for oversight into aggregate global demand and availability as well as a third-party negotiation of market pricing.

Global health agencies focus on healthy markets.

Global agencies facilitate healthier markets for new health products, technologies, and logistics services. Products which have thin/unviable markets (e.g. pediatric tuberculosis (TB) medicines and specialized diagnostics for malaria) still are procured using centralized agencies.

Support and facilitation programs, along the lines of the World Health Organization (WHO)-prequalification program for medicines, have evolved into a global network of country regulatory authorities that have become stringent and pool their resources to ensure the high quality of medicines.

Partnerships build capacity for the supply chain workforce.

International agencies have taken the lead in promoting best practices among leaders at the national, sub-national, and regional levels. This has grown out of the public-private partnerships developed through initiatives such as People that Deliver (PtD), the African Resource Center (ARC), and Project Last Mile (PLM). Partnerships with the private sector have also emerged through incubation programs and Entrepreneur in Residence (EIR) programs, whereby entrepreneurs are seconded to the government for periods of six months to a year. Supply chain education providers and knowledge centers have expanded globally. For example, the SCALE network of the MIT Center for Transportation & Logistics is now in four continents and by 2030 would have a node in Africa as well. These efforts have supported the growth in demand for a qualified supply chain workforce.

Private capital invests in almost all countries.

The sources of financing for developing country health programs are even more varied due to the emergence of commercially viable markets. In most countries, domestic investments in health increase. Private capital steps up and makes direct investments in hospitals and health supply chain infrastructure. Firms that develop private healthcare channels are merging as they drive infrastructure investments. The role of Development Assistance for Health (DAH) has decreased significantly and has become limited to areas such as global health security, surveillance, and catering to highly marginalized population groups.

Greater government and private spending on health has increased the attractiveness of developing country markets for global life sciences companies who have established local subsidiaries and stronger distribution footprints in these countries.

Patients embrace choice as options proliferate.

With the rise of more viable markets and subsidized options, patients participate more actively in healthcare, a trend that has been accelerated by technology. With feedback and diagnostics in hand, in the form of always-connected devices, patient choice defines the outcomes for both public and private healthcare schemes.

COMPASS QUESTIONS

Global Agencies: What can be done to put countries that are likely to be left behind in the growth agenda on a faster trajectory for supply chain improvement? How should "supply chain readiness" be factored into country graduation thresholds?

Governments: Are we building effective capacity of governments (national and sub-national level) to manage strategic purchasing and procurement using domestic resources or reimbursement for product purchasing under insurance? Do they understand the obstacles to building and retaining a skilled supply chain workforce in more competitive markets?

Private Actors: Are we sufficiently leveraging the stronger distribution footprint of global pharma/life science companies and the capital investments being made by international donors?

Patients: How will we prepare patients to participate in national healthcare schemes?

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

2. Shifting Disease Burden

New Demands Pressure Healthcare Delivery

By 2030, national health systems are frequently beyond capacity, stressed by persistent levels of infectious disease, an increase in non-communicable disease, and frequent pandemics. Humanitarian efforts further challenge the combined resources of supply chain actors. Conflicts and natural disasters are ongoing and mass migration continues. Refugee camps have become quasi-permanent but informal settlements. Anti-microbial resistance, which has driven the need for new antibiotics, burdens healthcare markets with higher costs and complexity.

Non-communicable diseases (NCDs) and Anti-microbial resistance (AMR) change health product mix.

With many targets of family planning and malaria met, the routine flow in most health supply chains is very different in 2030. Non-communicable disease treatments make up most of the volume. Anti-microbial resistance adds a further wrinkle to supply chain design. As antibiotics become ineffective, markets source new variants produced in high-income countries, creating long supply chains. NCDs, greater volume, and new product mix drive high operating costs, forcing organizations to seek new forms of efficiencies.

Patient awareness changes focus and form.

The rise of non-communicable diseases and pandemics requires different forms of patient vigilance. Both depend on habits and changing behavior. Governments and private actors take the lead in promoting wellness on the one hand and rapid response on the other. Casual communication such as social media has proven invaluable in the early detection and containment of emergent infectious diseases. Analysts combine social media data with global repositories of surveillance and epidemiological data to build big spatial data models and predict new emerging infections with some advance notice.

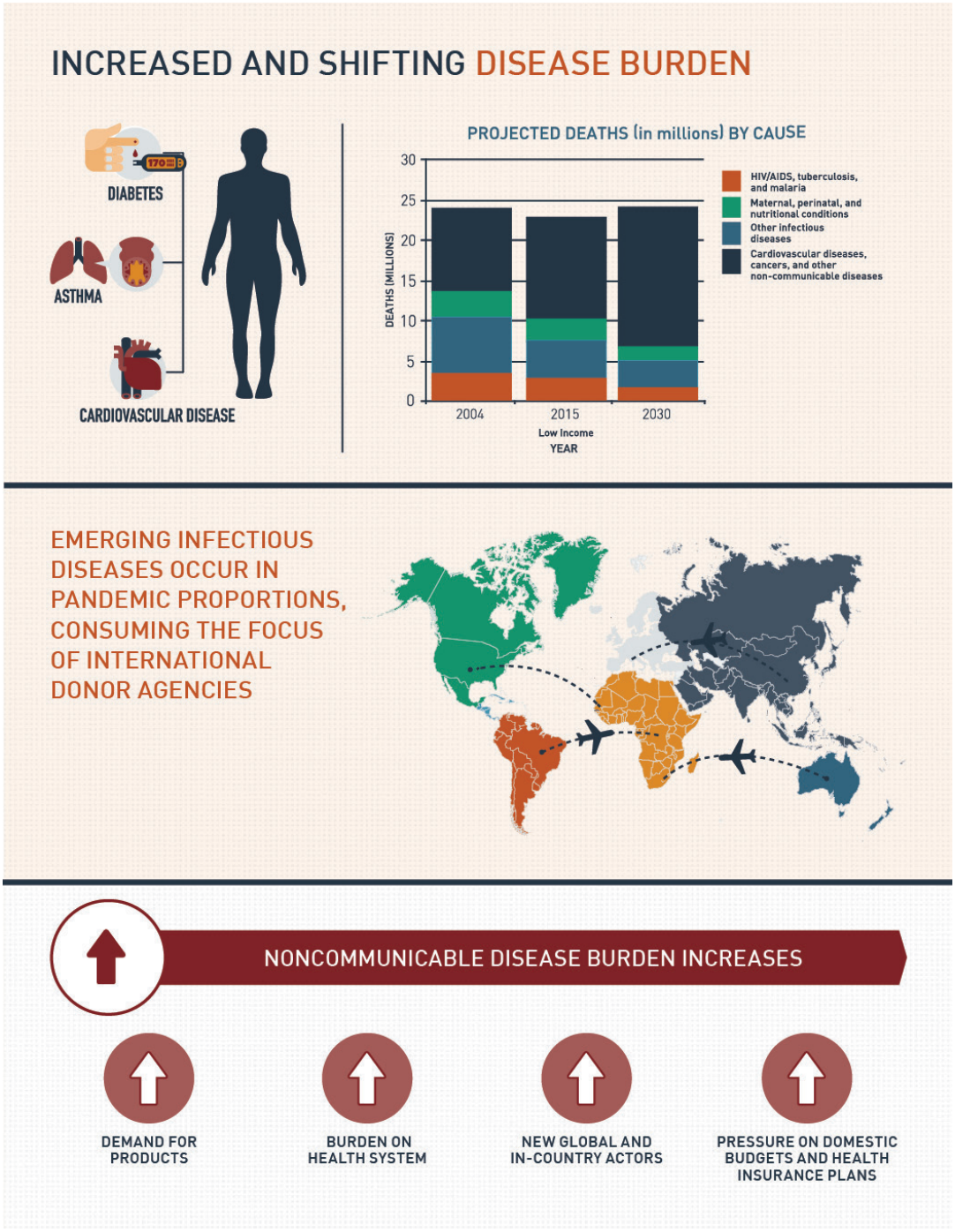
Governments drive healthcare access for refugees.

Refugees now live in established settlements which are often run by local NGOs or international agencies. Patients in these settlements have access to traditional healthcare support as well as telemedicine and internet-based healthcare. This has enabled them to stay informed and obtain diagnostics and medicines online. Extending healthcare to refugees has improved stability and helps contain the spread of new infections.

Global agencies target humanitarian response and global health security efforts.

UN agencies are actively involved in procurement for emergent infections, emergencies related to conflict and climate change, and other humanitarian disasters.

Governments work closely with international agencies to orchestrate coordinated supply arrangements to buffer the impact of humanitarian emergencies and pandemics.



More frequent pandemics and increasing non-communicable disease burden will drive increases in overall health product demand, putting pressure on domestic budgets, health insurance plans, humanitarian response capacity.

Private actors play a role in humanitarian response.

As private actors invest more in new world countries, the resulting infrastructure plays a crucial role in responding to both disasters and refugee crises as well as curtailing the spread of pandemics. Private actors reduce the risk in their manufacturing, sourcing, and distribution networks by coordinating with governments and health agencies to stabilize public health against these challenges.

COMPASS QUESTIONS

Global Agencies: Can governments and global agencies collaborate on supply chain financing strategies to smooth out peak loads as traditional roles change and as governments scale up direct healthcare financing? How can global agencies help governments and private actors plan new processes to match the changing nature of disease burden and respond to anti-microbial resistance?

Governments: Are supply chain services and technical assistance provided today appropriate to deal with increased conflict, emergencies, and mass migration?

Private Actors: Will private wholesalers and retailers find a sustainable way to serve populations in crisis? How can we incentivize them to?

Patients: How can crowd-sourced health awareness drive regional cooperation and response?

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

3. Urbanization

Urban Growth Transforms Healthcare Markets

Urbanization has changed the healthcare landscape by 2030, making it easier to provide services to higher concentrations of people in smaller areas. The share of Africans living in urban areas has grown from 36 percent in 2010 to 50 percent by 2030. By 2050, approximately 70 percent of the world's population will be living in towns and cities.

The impact of urbanization expresses itself differently in each country. On the positive side, urbanization leads to a lower malaria burden and lower fertility rate. In the main, though, it places additional constraints on public health. Infrastructure growth cannot keep up with urban population growth. Congestion and pollution have increased. Urban environments tend to discourage physical activity and promote unhealthy food consumption, leading to "western"-style diseases, including hypertension, heart disease, obesity, diabetes, and asthma. Current population densities mean there is a constant risk of pandemic outbreaks that spread even more quickly than they did in the past. And infectious diseases in new world countries have declined but remain persistent. The burden in many countries forces governments to run supply chains at levels where they are constantly approaching failure under the service volume required.

Cities attract private investment.

Cities attract greater foreign direct investment because of the aggregated consumption markets they create. In faster-growth countries with large populations (such as Nigeria, India, Ethiopia, Kenya, and South Africa), pharmaceutical companies expand their commercial and distribution footprint. Wholesalers, distributors, and other actors working on their behalf have a solid presence except in very rural, remote areas.

Governments create incentives to support rural access.

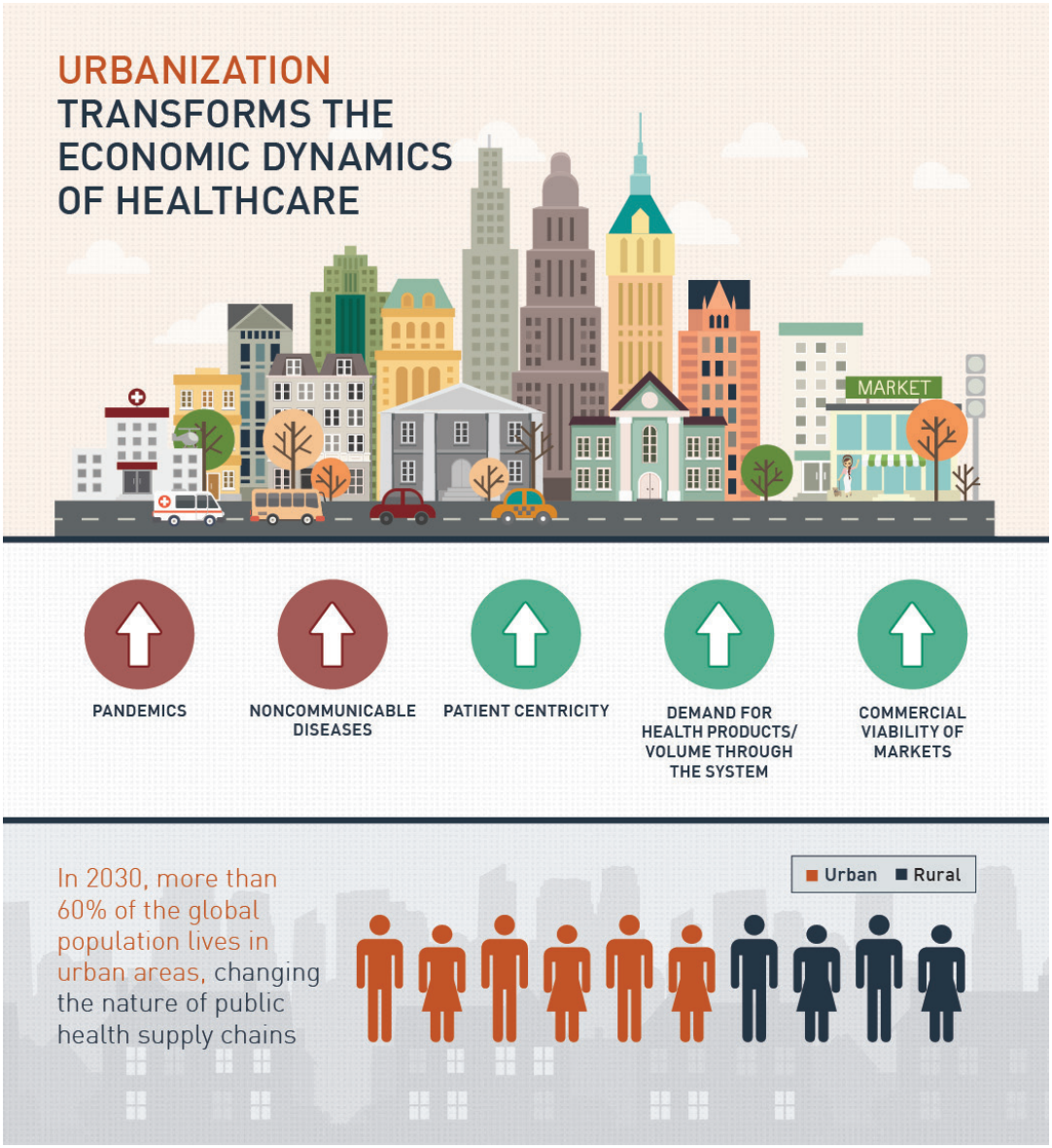
Unlike urban distribution, private sector-led distribution has not developed to serve rural areas without state intervention. Serving populations in rural, remote regions is no longer the primary focus of supply chain design. Declining populations in rural areas have further increased the challenges and costs of providing healthcare in those regions.

In many countries, rural citizens are enrolled in universal health access programs, whereby private healthcare providers are obliged to serve these populations.

Global agencies prop up challenged markets.

As market makers, global health agencies still shepherd areas, urban or rural, where the economics are thin or the disease burden is overwhelming. This permits private actors to invest in multiple countries in a region with lower overall risk. It also helps government nurture national health schemes through an incubation period.

These global firms brought with them advanced technology and sophisticated logistics, invested in internet and information communication technology (ICT) infrastructure, and have helped create a more skilled workforce.



As populations become more concentrated in urban areas, demand for health products and services in these areas will increase, stressing local health infrastructure but also driving innovative new markets and service delivery channels.

Private actors embrace omni-channel strategies.

By 2030, healthcare access has improved through use of omni-channel logistics strategies. With increased investment and concentrated populations, healthcare supply chain costs have increased, but this spending has also driven corresponding improvements in reliability and performance.

Traditional logistics is less relevant and private actors are under pressure to create value in new ways. Wholesalers and distributors have expanded their services to include retail pharmacy chains, including online systems. In some cases, wholesalers have extended upstream into contract manufacturing for pharmaceutical firms. In addition to dispensing health products, pharmacies now work more closely with health providers and offer sophisticated diagnostics services.

COMPASS QUESTIONS

Global Agencies: How can agencies facilitate public and private sector responses to the challenges associated with urbanization – increased inequality, urban poverty, and the proliferation of slums?

Governments: Is your current supply chain design equipped to cover the full spectrum of population needs? How will you better serve urban and rural markets?

Private Actors: How well does existing supply chain infrastructure align with omni-channel strategies and ability to serve rural markets?

Patients: How are governments and private supply chain actors gearing up for a future in which patients obtain health products interchangeably – private and public sources, digital and physical touchpoints?

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

4. Patient-Centric Care

Supply Chains Organize Around Patient Data

Armed with new technologies and increased disposable income, patients and consumers drive the healthcare supply chain as they determine how, when, and where they will seek care. With the roll out of fiber and high-speed wireless data communications across the continent, patients have access to advanced technology. Access paired with education and commercialization has opened the opportunity for patient-centric care.

Patient-centric healthcare supply chains base their design and planning on information emanating from the patient. This model requires supply chains to have a complete understanding of each step of the process – from manufacturing to point of use – with the understanding that "point of use" may be a retail pharmacy, a government clinic, a private hospital, or a patient's home.

Patients know first.

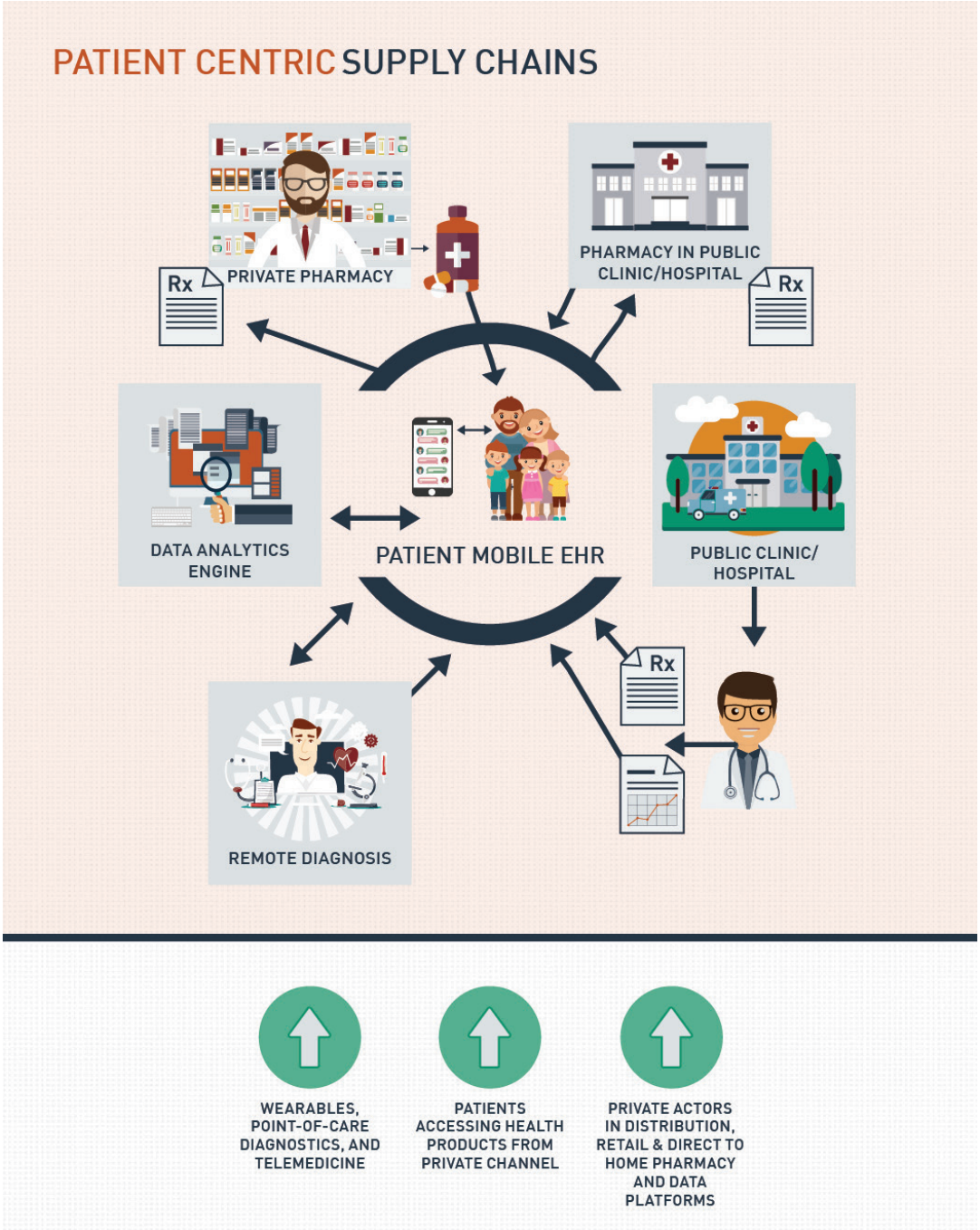
New health technologies, such as wearables, point-of-care diagnostics, and telemedicine have increased the availability and accuracy of healthcare data.

Patients are increasingly aware of their own health conditions and invested in managing their health outcomes. More people are using technology to access healthcare, through such methods as telemedicine, symptom checkers, and connected diagnostics.

Patient experience boosts the growth of omni-channel.

Patients and customers are now used to an omni-channel experience when it comes to health products, whereby they can choose to access diagnoses, consultations, health products, and other services through different channels, while information systems track their experience.

The traditional lines between channels – public, private, online, and physical – have blurred. Private retail chains, direct-to-home, and online pharmacy models developed more quickly than expected. New technologies such as self-testing, point-of-care diagnostics, and virtual doctors' visits have cut down or eliminated transport costs, allowing patients to bypass waiting room delays, and granting them more immediate access to their providers. Patients are ever more concerned with location and simplicity. Omni-channel adoption does not eliminate the need for public sector supply chain but rather acknowledges the multiplicity of choices available to the patients. It encourages a supply chain fabric where public and private supply chains connect at the hip and the overall system is as weak as its weakest link.



Improving technology, education, and commercialization will drive a patient-centric approach to healthcare delivery, requiring supply chains to integrate multiple distribution channels and flexibly navigate multiple points of care.

"Smart" wellness enables ready response.

In some countries, governments and health insurance companies provide wearables for free to promote preventive care through self-monitoring. Despite concerns over cyber security and data privacy, patients are willing to share data from these and other electronic devices in protected environments such as national health platforms.

Although the frequency of pandemics has increased since 2016, individuals leverage at-home diagnostics to rapidly test for infections, share the results electronically, and seek immediate treatment. Social media has accelerated the rate of incident reporting, enabling quicker responses.

Patients demand transparency from products and processes

Authenticity has emerged as a force to be reckoned with. Activist groups have emerged that hold national and international procurers and financiers of health products accountable for demonstrating that their upstream supply chains are ethical and green. Civil society and the media highlight any evidence of child labor, slavery, poor labor conditions, or ecological unfriendly practices. Given this pressure, most national and global procurers have set up sourcing transparency groups. Some UN agencies have also found a role for themselves in this space.

COMPASS QUESTIONS

Global Agencies: How can agencies support standards for patient health data that support patient-centric supply chains? How can they protect the public good in the process?

Governments: Is your supply chain ready to support a highly patient-centric model across public and private channels?

Private Actors: Does your supply chain design account for new forms of feedback (e.g. social media, at-home diagnostics)?

Patients: How can you leverage patient interest in health data to shape healthy patient behaviors? How can you educate patient populations about privacy risks and tradeoffs?

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

5. Generation Data

Competition Thrives with Data Abundance

Data are critical in this new age of healthcare, not only for preventative care and treatment monitoring, but also as a method for tracing products. Many companies track and trace every step from the factory gate to point of use and governments have adopted big data analytics as a fundamental part of their decision making. Zettabytes of information are being collected across the supply chain ecosystem – aided by interoperability standards among previously siloed systems, e.g. electronic medical records (EMR), human resource information systems (HRIS), health management information systems (HMIS), or logistics management information systems (LMIS). New data streams reinforce relationships especially at the patient/provider interface.

Public and private actors compete on analytical expertise.

Historically, investments in the supply chain workforce focused on fulfilling the tactical functions needed for warehousing, distribution, and replenishment. There was little if any focus on data analytics or the development of "soft skills."

By 2030, modeling techniques, simulation, and gaming allow supply chain professionals to rapidly test different scenarios before making investment decisions. Combining very large amounts of structured and unstructured data and quickly sorting through it to make quick supply chain decisions is a competitive advantage for the best performing supply chain companies.

Global agencies and governments have collaborated on programs to cultivate such expertise on a national, sub-national, and regional basis.

Personalized medicine accelerates product introduction.

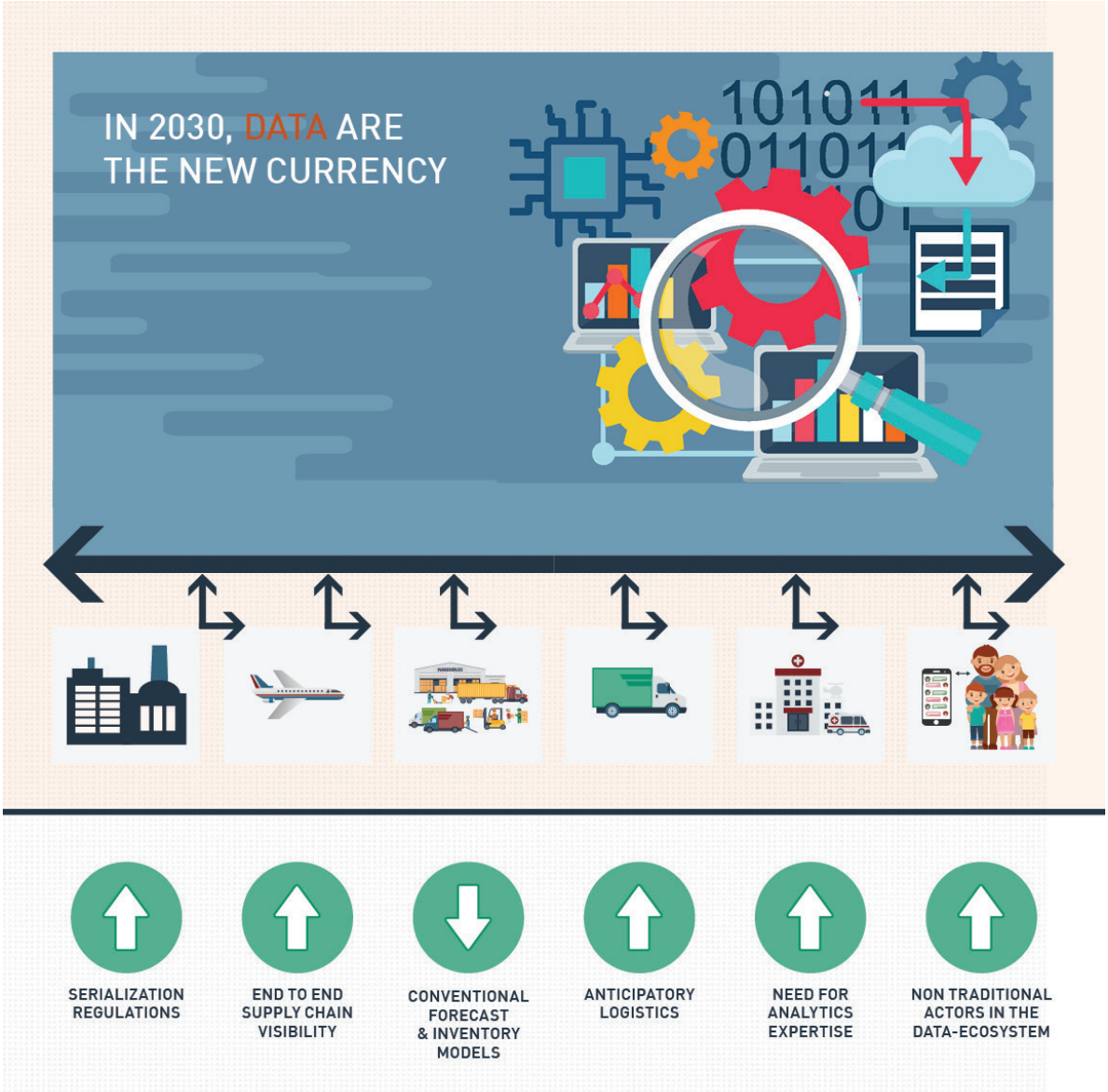
The rise in personalized medicine stemming from breakthrough genetics research means that treatments are now tailored to individual patients based on their genetic make-up.

This has led to a massive influx of health products hitting the market. There are still frequent stock-outs of health products in government-run facilities and more patients are turning to unregulated private pharmacies and healthcare providers.

Serialization takes hold.

The shift towards precision medicine means that many new drugs are reaching the market, tailored to specific patients. The number of outlets where patients and customers can access health services and products has increased. Online sales have also increased, which presents ongoing concerns over the risks of adulterated, fake, and counterfeit health products entering the system.

This increase in the total number of health products, coupled with the need to track health products from manufacturer to patient, has fueled the need for serialization regulations. Some regulatory bodies have engaged with large data companies to minimize the sale of unregistered or poor-quality medicines.



Increasing quantities and varieties of patient data will enable more personalized healthcare delivery and more agile, data-driven supply chain strategies, but will require increasing institutional investment in big data analytics and stronger regulatory infrastructure.

Global agencies lead regional harmonization.

Global agencies have partnered with private actors to help advance regional collaboration with regards to pharmaceutical registration and serialization. This has supported the economic development of decentralized manufacturing and improved data sharing while lowering risks to privacy.

A market emerges for supply chain visibility.

As serialization has gained momentum (either through regulation or initiated by companies), organizations have achieved supply chain visibility.

Data providers are key players in the new system, as well as several non-traditional actors, such as Amazon and Google. Many wholesalers and distributors have entered the business of leveraging supply chain data to provide end-to-end visibility and analytics. These providers combine a wide range of data sets (e.g. logistics, meteorological, patient-level, epidemiology) to enable more targeted strategies in healthcare and supply chain management. Organizations are better able to identify bottlenecks and coordinate responses with rapid predictive analysis.

Control towers provide end-to-end visibility and in many countries visibility and analytics networks (VANs) now function across all aspects of healthcare – from electronic medical records to disease profiles to supply chains.

Private actors pursue predictive supply chain strategies.

In some cases, private actors have moved from reactive to proactive and predictive health management. Retailers are now able to utilize "anticipatory logistics" to predict when an individual customer will place their next order, as well as which commodities they will order. These systems are based on predictive algorithms that consider previous orders, product searches, wish lists, and returns.

Global agencies turn attention to patient-centric technologies.

Global technical agencies such as the World Health Organization (WHO) are more focused on customized health services, precision therapy, new diagnostic technologies, and other personalized health advances.

Although they continue to provide guidance to countries around therapeutic options, these agencies help national, sub-national, and regional authorities keep pace with the complexities of new developments and related risks.

COMPASS QUESTIONS

Global Agencies: How can data and analytics open new market opportunities and impact access to healthcare in your region? Have you considered the lessons from serialization efforts in Europe and the U.S.?

Governments: Are you developing regulatory capacity to provide oversight and governance for patient-centric supply chains?

Private Actors: Have you considered the potential of anticipatory, demand-driven supply chain design for improving your performance in markets you serve today?

Patients: Have you thought about the role of new Internet of Things sensors in your programs? How they could impact your preventive care, vaccine, and asset management programs?

SIX FORCES SHAPING GLOBAL HEALTH SUPPLY CHAINS

6. Innovation's Tempo

New Business Models Rise from New Networks

The emergence of entrepreneurial small or medium enterprises (SMEs) and startups in new world countries has driven the adoption of new ways of doing business – from mobile money to shared economy to data collection and aggregation models. Urban modernization and national healthcare schemes have created opportunities for existing players, including governments, and new entrants to leapfrog ahead, creating better value for patients and payers. The pace of change in the marketplace has increased

Asset-sharing models increase the velocity of change.

Asset-sharing models thrive with the prolific adoption of omni-channel strategies, particularly in Africa and Asia. Owning trucks, warehouses, or other logistics assets has become a thing of the past. This has lowered barriers for new and unexpected entrants.

Production automates further and spreads out to cities.

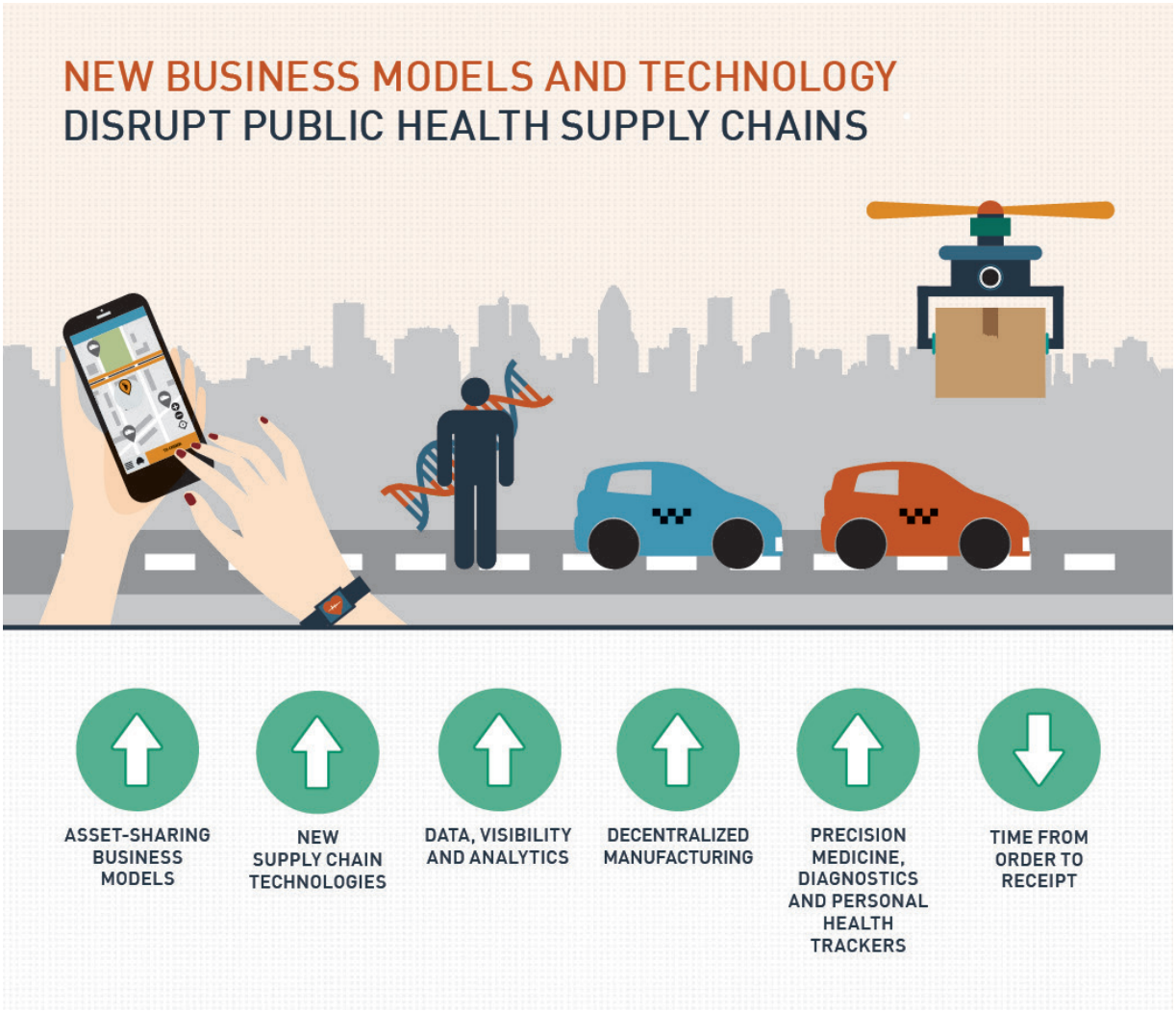
Decentralized manufacturing technology has evolved, whereby fill and finish manufacturing is now located near urban mega centers. Urbanization has resulted in emerging logistics models, including drones, autonomous vehicles, automated dispensing machines, and shared economy models for warehousing and distribution.

Precision medicine and new biologics have led to many new types of drugs flowing through the system, which requires increasingly complex systems and cold chain infrastructure.

Automation increases the importance of workforce investments. Many countries have pursued parallel "moonshot" programs to encourage entrepreneurship and development of nontraditional skills as the need for manual labor has declined sharply. Now that robots and automation have assumed traditional roles in warehousing and distribution, supply chain training now focuses on how to manage automation and how to analyze, interpret, and benefit from the data emerging from the health system. Algorithmic replenishment has reduced traditional forecasting activities as well as the reliance on the traditional monthly reporting from the facilities.

Market-making innovations generate purchasing efficiencies.

With countries purchasing most of their health products nationally or at decentralized, sub-national levels, GPOs and e-marketplaces have evolved to create purchasing efficiencies. National or private insurance companies reimburse most of the payments for health products. Payment processes from business and government to retail pharmacies have become a large market. New fintech companies that work on supply chain financing have evolved to serve the government-to-business, customer-to-government, and customer-to-business interfaces of financial transactions.



Data and technology innovation will continue to push the pace of change in healthcare markets, opening up new supply chain strategies and business models, and requiring greater organizational adaptability and collaboration.

International agencies cultivate collaborative expertise.

Public health organizations have developed new specialized teams focused on the technical and networking skills required to identify new opportunities for partnership, co-development, licensing, or acquisition. This permits them to cultivate the outsourcing, partnership models, and mutual value creation that are now essential to every part of the supply chain – from manufacturing to transport and distribution. This innovation has left many NGOs and global agencies behind as their traditional hierarchies have struggled to assimilate change.

Outmoded private actors struggle to transition.

Closer communication and risk sharing with suppliers and distributors have become the norm to cope with the nature of demand. In many of these countries, the "product hand-off model" – from manufacturer to the government – now happens at a much lower point in the supply chain (at the district or clinic level) as compared to a national, port-of-entry-based product handoff model. The traditional model whereby the purchaser (such as a country government or global agency) uses a tendering process which focuses on the lowest bid, while maintaining a relative distance from suppliers, is the least competitive route in 2030.

Long-established domestic private actors (including manufacturers, wholesalers, distributors, and service providers) have been forced to rethink their models. The size that offered advantages to many of the organizations that improved supply chains in low- and lower-middle-income countries has become a liability. Governments and international agencies play a role in reengineering the vital functions these organizations once performed.

COMPASS QUESTIONS

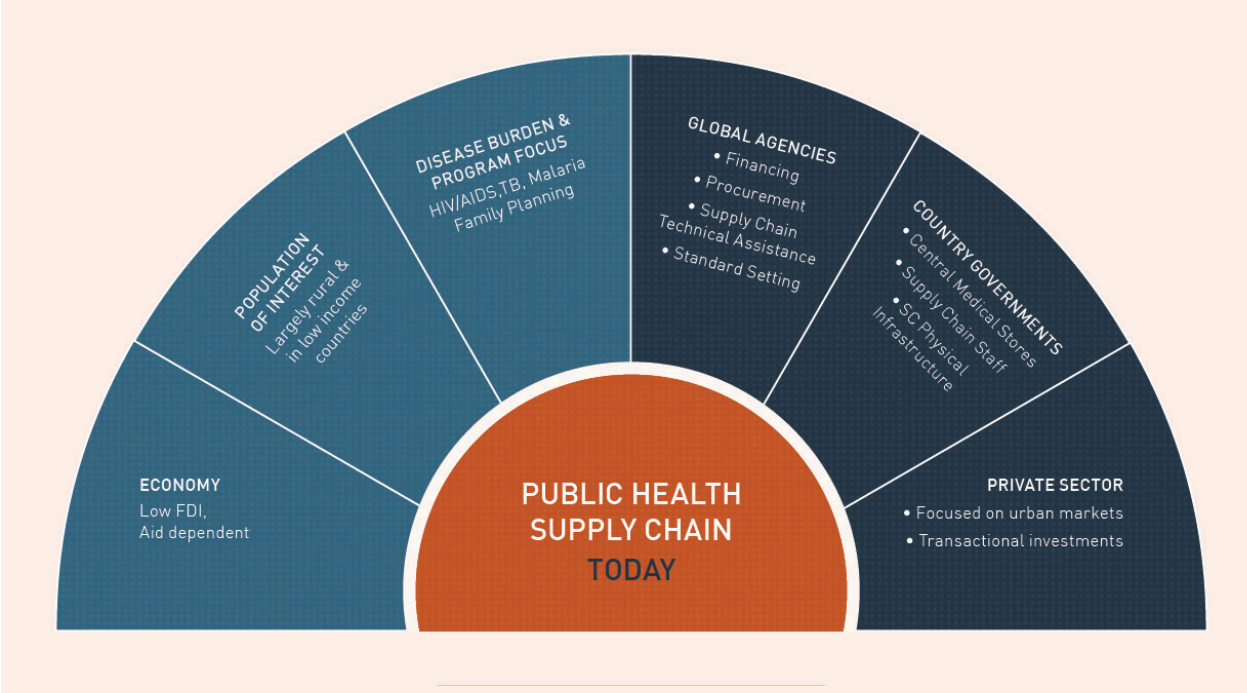
Global Agencies: Is your organization ready to act as a catalyst in faster-paced markets? Can you adopt more collaborative strategies to avoid becoming a constraint on progress? Do you have the specialists required to respond to tomorrow's supply chain priorities? Are they empowered to act?

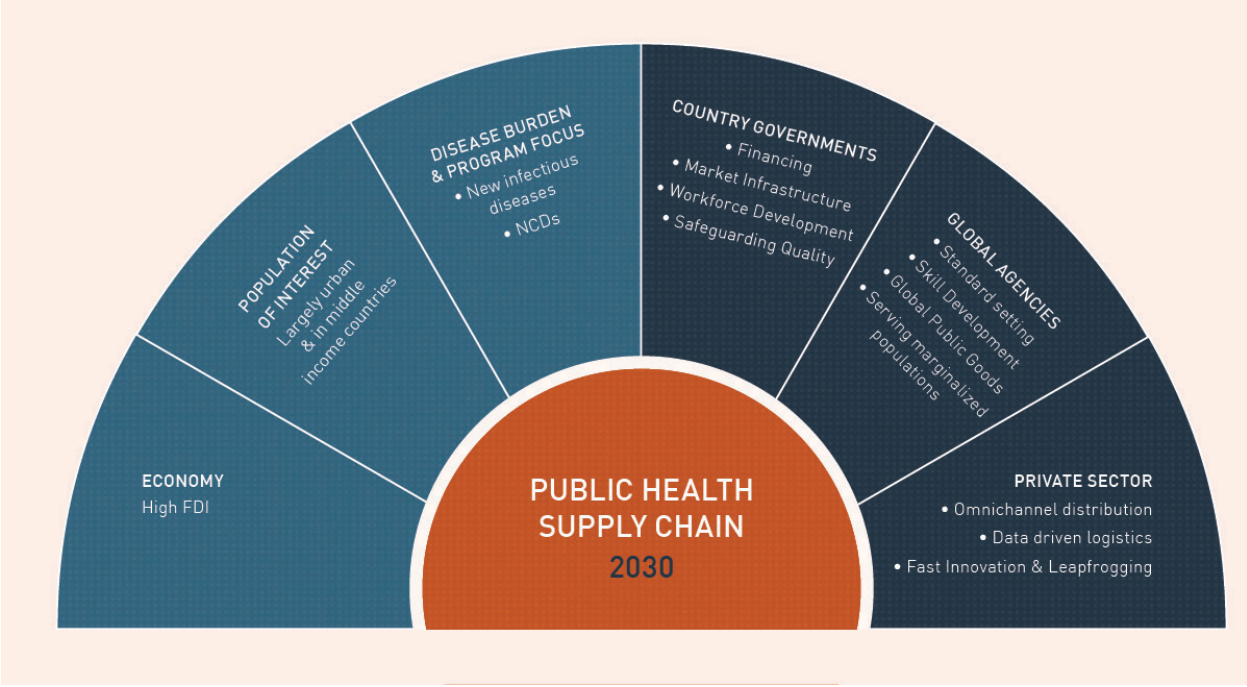
Governments: How are you creating supply chain capacity that recognizes the shifting need of skills in future supply chain talent? How are you creating incentives for new market entrants? How ready is your supply chain for marketplace procurement practices? Do you have a workforce development plan for managing the tradeoffs that will accompany greater automation?

Private Actors: Are you evolving the core of your business model to sufficiently align with emerging technologies in decentralized manufacturing, transport, and distribution?

Patients: Have you considered which populations are best aligned to benefit from new innovations? As new business models emerge, how will you create incentives to serve all segments of the patient population?

PUBLIC HEALTH SUPPLY CHAINS: Today and c. 2030





INVESTMENT RECOMMENDATIONS

Over the next two decades, the supply chain "ecosystem" – meaning both the players involved and the roles they play – will change dramatically.

Without adequate planning, these changes are likely to sow confusion. While it is impossible to predict the exact state of the future, one thing we know for sure is that there will be greater turbulence in healthcare supply chains.

Here's what we foresee as potential risks for not adapting supply chains for 2030:

- Hyper Fragmentation, Isolated Progress: Unregulated private markets become the mainstay of treatment seeking. New technology and innovation permeate the commercial private sector and improve productivity. The public sector counterparts continue to function using archaic processes, and technology and service levels in public clinics remain low.
- Talent Capital Shortages: With shortages in data skills, governments and global agencies get bogged down in data, struggling to translate data potential into supply chain improvement.
- Traditional Labor Upheaval: Innovator markets shed traditional supply chain workers. Fewer jobs in trucking, warehouse operator, data entry, and inventory management generate resentment and friction.
- Rural Areas Face Public Jeopardy: Lack of clarity of public/private roles and a diminished public sector further marginalize rural, remote, already underserved populations.
- Incomplete Global Coordination: Multinational organizations fail to provide technical know-how, financial resources, and coordination to fulfill new needs to countries.

On the following pages we propose initiatives in four focal areas that governments, global agencies, and private actors should undertake to mitigate these risks and build capacity for 2030.

PATIENT-CENTRIC SUPPLY CHAIN DESIGN

Governments and international agencies should prepare for the inevitable transfer of accountability by thinking broadly about how to redesign systems to keep pace with changes. In new world countries, understanding the full range of applications for patient-centric care (e.g. urban, rural, humanitarian settlements and/or preventive services vs. pandemic response) will be crucial to this generational shift.

We need to design supply chains that start from the patient and work backwards – mixing government and privately run channels – both bricks and mortar and online. Urbanization and the shifting disease burden make it critical to examine the suitability of supply chain design to future demand, both in terms of volume and location of demand. A preliminary exercise to demonstrate this was carried out adjunct to this study.

We propose the following areas of inquiry:

- Research demand-side journeys to align business models with patient needs.
- Model channel agnostic supply chains for urban and rural settings.
- Model public health supply chains that adapt to the coming shift in disease burden.
- Model the potential impact of omni-channel strategies to illustrate the opportunities for supply chain efficiencies.

We suggest funding a small group of highly qualified advanced analytical strategists supported by modeling teams who can investigate these scenarios and develop core supply chain design best practices.

CROSS-SECTOR DATA PARTNERSHIPS

Supply chains that rely on long-term forecasts must now give way to supply chains that can respond more quickly and nimbly. Government-run health supply chains lack timely feedback, requiring too much time to detect or understand any changes in demand and/or supply.

As new technologies generate richer data streams, it will be even more critical to examine why data that are currently available aren't yet being used. In some cases, to improve our data systems, it may be necessary to "de-innovate" and remove outdated systems and practices.

Next-generation supply chain efficiencies, incentives, and oversight will require a leveling of expertise across sectors.

We propose the following initiatives:

- Build partnerships between institutions engaged in building advanced anaIytics and ICT capacity along with supply chain organizations.
- Encourage centers of excellence among global agencies and governments to drive regional best practices and technical sharing.

These initiatives should function as human capital platforms for developing and promoting best practices that will foster functioning health data markets.

CAPACITY BUILDING FOR NEW ERA SKILLS

The risk of conducting business as usual is increasing. Change is going to create new opportunities for individuals in governments, international agencies, and private actors – whether they like it or not.

Global agencies should help people explore and organize around the skills needed for the future. The expansion of market capacity will be fueled by both public and private organizations working smarter to build not just individual and organizational capacity but with specific interventions to enhance the capacity of the overall market.

We propose the following initiatives:

- Model the required national and sub-national capacity in strategic procurement, market shaping, financial management, and budgeting.
- Embrace the emergent learning/training tools that will allow private actors and governments to ramp up quickly and keep pace with changing disciplines.
- Create a dedicated fund for supply chain innovation to encourage unconventional entrants to experiment.
- Promote efforts to encourage existing private market actors to innovate, e.g. to develop and facilitate group purchasing organizations (GPOs).
- Foster new career pathways for professionals across sectors that reward the ability to extract knowledge from data. These should encourage lifelong continuous learning.

Capacity building can help accelerate positive impacts in new world countries. Human capital at all levels will be essential to developing organizations flexible enough to withstand significant transformations.

PUBLIC-PRIVATE MARKET CROSSOVER

Government and private supply chains running in parallel will be more vulnerable in an era of increased urbanization and shifting disease burden. Conversely, combined public-private investments in supply chain infrastructure have the potential to drive economic development.

Global agencies should help people explore and develop models for effective public-private supply chain collaboration and unlock greater private capital investments in healthcare supply chains.

We propose the following initiatives:

- Governments working in partnership with global agencies should create organizational pathways to ensure faster and easier adoption of engagement models that leverage a combination of government-run and private channels to serve the patient.
- Explore how government efforts can help incubate innovative private actors. Create better ways for mainstream private actors to understand how government financing for healthcare works, its investment priorities, how governments make buying decisions, how the budget cycle works, and their constraints.
- Define best practices for encouraging investments in private markets for health products (retail pharmacies, wholesalers, and distribution) while protecting the common good and equity in the provision of health products.

CONCLUSION

By anticipating future global health supply chain scenarios, we can focus on adapting to change.

The greatest area of uncertainty is the extent to which all countries will participate in economic growth. How the trends will converge in each country is unpredictable.

The dilemma of uncertain growth underscores the need to invest in more agile and flexible supply chains. Innovation will only create opportunities for fast and flexible decision-making. Organizations need to reorganize to act upon those opportunities.

In some cases, this will come at an additional cost. Donors, country governments, and private companies will need to pay these upfront costs to enable greater savings. That is the only way to ensure increased, equitable access to high-quality health products in the future.

We do know for certain that the future will not be evenly distributed. This makes it imperative that supply chain actors transform ahead of 2030.

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