



Too little, too late: Outpaced by COVID-19

COVID-19 outpaced efforts to strengthen medical supply chains and brutally exposes vulnerabilities due to the general lack of preparedness.

In 2018 CNN reported that “high-income countries are facing an epidemic of drug shortages”. In Europe ‘shortages are occurring across the supply chain and all classes of medicines are affected, from complex chemotherapy agents and anesthetics to diabetes, hypertension, and asthma medication’.¹ Drug supply chains appear to have become vulnerable to even small disruptions, further questioning preparedness for larger disruptions such as epidemics and hurricanes.

The above sentences were written last year. They prompted a research projectⁱ in which INSEAD’s Humanitarian Research Group (HRG) collaborates with, among others, BI Norwegian Business School, Norwegian Institute of Public Health, Lancaster University and Rotterdam School of Management to study causes, consequences and interventions around drug and vaccine shortages. The objective was to provide greater support for policymakers to prevent health supply disruptions, particularly in times of crisis. Unfortunately, we were outpaced by the novel coronavirus which crippled global supply chains and confined half of the world’s population. Recently, we received funding to expand our current project to investigate how the new coronavirus impacts supply

chains, and to evaluate the efficacy of a range of interventions to ensure better security of supply.² In this vignette, we describe the learnings from the initial phases of our non-pandemic research project and relate them to the current COVID-19 pandemic.

Drug/health supply chains are complex.

Drug and other health supply chains are globally connected, strongly interdependent, and involve many stakeholders, making them particularly complex, opaque and therefore vulnerable. Manufacturing capacity shortages, short product shelf lives, lack of transparency, limited suppliers, poor governance and weak solidarity add to their vulnerability. They feature among the principal causes of the global health shortages, even during regular times and in developed economies like the EU. To design sustainable solutions, process understanding should transcend typical supply chain issues, asking questions like what are the active ingredients in the product, are there alternative treatments, how will patients respond to a shortage, what is the influence of legislation? These questions prompted our 6-country research project last year (Norway, Sweden, The Netherlands, UK, Belgium and France).

ⁱ The MIA (Measures for Improved Availability of medicines and vaccines) research project is funded by the Research Council of Norway’s HELSEVEL-program for a period of four years from 1 January 2020, while GLOBVAC in RCN funds the expansion for a period of 2 years from 1 May.

Governments fail to consider the full picture in non-crisis times.

Our research quickly revealed that the problem of medicines and vaccines shortages was being acknowledged, local health organizations were aware something needed to be done, and remedies were suggested in multiple reports. We found ample examples of reasons for shortages originating all over the medical supply chain, with seemingly small hiccups like a strike at a major supplier, a change in border regulations due to Brexit, leading to temporary challenges. To curb these shortages, we found that governments typically consider a plethora of "interventions". A closer look revealed that they are very reactive and portray a linear view of the world. This embodies the weaknesses of the current systems, even in normal times.

A good friend in humanitarian logistics once told us: "Never time to do it right, always time to do it over". Policy makers, too, prefer to wait it out. Our research showed that they typically tend to react, e.g. by replacing, allocating and rationing when monitoring has detected acute shortages. Policy makers in our 6 case countries had only recently started discussions around more proactive strategies like flexible supply and quality standards, strategic stocks and collaboration. Although these discussions are a step in the right direction, they are too little, too late. Are policy makers unaware of what needs to be done or, to paraphrase Jean-Claude Juncker's infamous statement, do they simply ignore what needs to be done because they do not know how to get re-elected after doing the right things? The answer to that question remains open but COVID-19 has certainly outpaced the governments, hit the population hard, and brutally exposed the lack of preparedness in some countries.



Figure 1

In-depth exploration of the typically reactive government interventions in our 6 case countries showed a very linear perspective on drug and vaccine shortages as the left picture shows. Actions A, B, and C are assumed to directly and independently influence shortages. Although these linear relations are in se correct, they paint an incomplete picture of a complex dynamic situation and overly simplify action-outcome links. In practice yesterday's actions create new and sometimes unexpected situations which alter today's assessment of the problem, as well as tomorrow's decisions. In short, the situation is more like the picture on the right where actions A, B and C

interact in affecting shortages. Decisions also have side effects triggering yet other actions. This leads to complex chains of actions/reactions, especially since all this happens between many independent stakeholders and decision makers. Without understanding the complex interactions, or causal loop diagrams, we are bound to get locked into low leverage, short-term solutions, which may worsen the problem in the long run. It might also lead to remedies for only one part of the system, merely shifting the problem to another part, a bit like a waterbed, wobbly when only triggered on one side. To see the world as such a complex system, to understand that "you can't just do one thing" and that "everything is connected", to avoid a wobbly waterbed, a feedback view of the system is required.

Analyzing the feedback relationships between the causes and effects of the interventions in the 6 case countries, allowed us to discover instances where an effect of an effect mentioned in one report was described as a cause in another. This exercise uncovered multiple cause and effect relationships constituting feedback loops, also known as virtuous or vicious cycles. There are loops that counteract change: a hiccup or action in one of the elements in the loop is dampened by the rest of the loop; and loops that amplify change: actions in one of the elements of the loop are amplified by the rest of the loop. The latter are especially tricky as they can spin a system out of control.

Our research identified feedback loops that can be categorized in four archetypes.

Decision makers in our 6 case countries typically used four action archetypes to curb shortages: (1) Let the market handle it; (2) Search for alternatives; (3) Bend the rules; (4) Make it worse. Whereas the first three are balancing loops that attempt to move from the current state to a desired state and may have the intended effect, i.e. resolve shortages, the fourth archetype explains when shortages risk spiraling out of control.

The first two archetypes *let the market handle it* and *search for alternatives* are similar to actions any commercial supply chain would undertake in case of a hiccup. The former describes market dynamics: how demand and supply interact and determine prices. The latter describes finding alternative sources of raw materials or adopting different treatments for the same disease. The third and fourth intervention archetypes, *bend the rules* and *make it worse*, differ from regular commercial supply chain management. *Bending the rules* refers to governments changing legislation or temporarily allowing exceptions to alleviate shortages, for example by facilitating imports/exports of medicines or raw materials. The *make it worse* archetype describes interventions

that exacerbate the situation, i.e. where a shortage may cause more shortages to occur. Hoarding, a typical panic response that occurs when non-medical products like food items are running short, is a clear example. When, due to a medicine shortage, a disease further spreads or intensifies, demand can skyrocket and turn the initial shortage into an acute crisis. This is something typical of medical supply chains.

When assessing these loops, it is important to distinguish short term from long term effects. It is known that complex systems often react to a policy change in the long run in a way opposite to their short-term effects. The linear interventions described above can ‘infect’ one another leading to ‘worse-before-better’ scenarios or, even more worrisome, ‘better-before-worse’ scenarios where balancing loops ‘infect’ spiraling loops, bringing about unintended and unexpected dire consequences.

To understand the situation a feedback view is required.

If people had a holistic worldview, it is argued, they would act in consonance with the long-term best interests of the entire system, identify its high leverage points, and avoid policy resistance. Yet, the policy makers’ linear view of the world is fragmented, leading to learning disabilities; ambiguity about what is going on leads to decisions without the desired effect. This may even go unnoticed, so one does not learn from the past and is bound to repeat suboptimal

decisions. Our comprehensive approach identifies complex relationships between different causes and analyzes groups of interventions from the perspective of various actors. This can support evidence-based decisions transcending the current simplified linear thinking in order to sustainably reduce drug shortages in non-crisis situations and be better prepared for the next crisis. In the light of the ongoing pandemic, we argue that such a holistic system approach is paramount to act and learn.

Linking our research findings and approach to the current situation clearly indicates the lack of system thinking.

A pandemic raises havoc with systems that have received insufficient attention, or have even been outright neglected, e.g. by severe budget cuts in many countries and global organizations, and supply chain shortages can add to mortality. Many countries report a lack of PPE, basic items like masks and gloves for medical staff, shortages of diagnostics and testing tools, lack of respiratory equipment and intensive care units, i.e. pretty much everything necessary to effectively fight the pandemic, but even generic drug chains are under strain. The production of insulin and antibiotics, for example, relies on Indian and Chinese components and could be severely affected by lockdowns or reduced trade flows.

The resilience of supply chains is being put to an extreme test and the robustness of our global supply

Bending the rules and Making it worse: nationalistic measures and trade restrictions³

A once-in-a-lifetime pandemic has resulted in a surge in demand for medical consumables, including personal protective gear, medical equipment, and medicines, and created a scramble for supplies. This has led to elevated prices in many cases, and even accusations of piracy and other sharp practices. Resort to export bans has disrupted the public health plans of trading partners and put lives at risk.

Currently, at least 75 governments have restricted exports of medical supplies and medicines. Some have adopted explicit bans on exporting these products, others have used more subtle means including export authorization rules, threatening the license to operate of local producers if they continue to export, and requiring that all local production be bought by a state agency that, in turn, refuses to export these goods.

The nub of the matter is more availability than price. Health professionals at the front line of the fight against COVID-19 need protective equipment to reduce the risk of getting infected. Export bans on masks erode the capability of trading partners to cope with the spread of COVID-19. Rather than beggar-thy-neighbor, export bans of medical supplies amount to sickening-thy-neighbor. It reflects fear-driven policymaking and ignores the insights that have been gleaned from previous, largely unsuccessful attempts to “secure” supplies by grabbing whatever product is currently on the national market or in transit through the nation.

Current failures to secure enough medical supplies have led in certain quarters to calls for greater self-reliance, “strategic autonomy,” “repatriated supply chains,” and other euphemisms that will threaten the commercial viability of existing supply routes without guaranteeing enough medical kit for the next wave of COVID-19 or the next pandemic. And such calls won’t produce any medical ventilators now, won’t devise a vaccine for COVID-19, and ultimately do little to alleviate current suffering. It is worth remembering that the central priority is to narrow the gap between supply and demand for medical products. The UN Sustainable Development Goals slogan “Leave no one behind” appears to be conveniently shoved under the rug.

networks is clearly insufficient. The absence of a system-wide view, adequate decision support tools, and solidarity through good governance have become painfully apparent. The reaction of decision makers to the COVID-19 crisis provides examples of all four archetypes of feedback loops, with a clear dominance of *bend the rules* and sometimes blatantly of the *making it worse* type.

Think of hoarding or refusing solidarity actions even when legally binding. Keeping internal production for the home country only, outbidding others to monopolize access to short supplies, and creating severe shortages elsewhere. We hear governments make statements fitting the scarcity situation more than medical correctness, e.g. claiming that wide testing is not a good idea to downplay an acute shortage of testing equipment, or politicians bragging about shaking hands and/or making ill-informed statements about appropriate treatments.

A prominent example of an intervention that is incoherent with the medical response and aggravates the situation can be found within the nationalistic trade policy response of different governments, see box 1. Two headlines of the Financial Times on April

For too long, we have allowed a cycle of panic and neglect when it comes to pandemics: we ramp up efforts when there is a serious threat, then quickly forget about them when the threat subsides. It is well past time to act.⁴

Will COVID-19 be yet another ignored reminder, or will it be a wake-up call? Although the cycle of panic-first, then-forget has become routine⁵, the myriad of optimistic opinion articles with titles hinting that we are *living a pivotal moment*, and that *nothing is going back to normal* tries to convince us otherwise. We, and history, are more hesitant to make such claims. People, and particularly global leaders, be they politicians or business managers, tend to forget extremely quickly, focusing on short-term elections or quarterly results. The truth of the matter is that time and again we fail to learn. As the late Sir John Templeton once commented: “the four most expensive words in the English language are ‘this time it’s different.’”

Research has shown what needs to be done. We certainly understand how to handle systems from a supply chain perspective. The medical world also

3rd provide an indication: “Medical gloves maker accuses EU governments of hampering supply” and “White House tried to force 3M to send masks from Singapore to US”

By bending the rules, nations can sometimes successfully curb shortages in the short term. This is a beautiful example of a balancing loop. However, as argued in the box below, this can trigger the ‘make it worse’ loop and result in aggravated shortages in the long term. This is a disturbing example of a so-called ‘better-before-worse’ scenario. As some of the interventions are already backfiring, today’s situation is a stark reminder of policy makers’ lack of system understanding of side-effects and feedback loops, and oftentimes indeed *making it worse*.

Handling shortages requires a multi-actor and multidisciplinary global and forward-looking preventative approach, not ‘panic football’ when one faces the unimaginable scenario of half of the world’s population under confinement. “Making it worse” is not the right archetype response world citizens expect from their leaders, which is even more worrisome in light of the much-needed preparations for the second wave of this pandemic.

knows how to protect us, provided we give them time and money to scan pathogens and develop appropriate vaccines to prevent a pandemic outbreak. We hope our 6-country research project on medical supply shortages and its COVID-19 extension will modestly contribute to mastering these complex dynamic systems. We can only hope that we shall surmount this crisis with a renewed belief in science and a political will to say, “never again”.

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1 PGEU. 2018. Medicine Shortages is a Global Health Problem. 28.11.18: <https://www.pgeu.eu/en/policy/20:medicine-shortages.html>

2 “Funding for Coronavirus Supply Chain Task Force”, Norwegian Business School, May 8th 2020

3 Data from “Tackling Coronavirus”, “Tackling Coronavirus Together” and “Preparing for a Second Wave of COVID-19”, Global Trade Alert, March-April 2020

4 Global Preparedness Monitoring Board. A world at risk: annual report on global preparedness for health emergencies. Geneva: World Health Organization; 2019.

5 Jacobsen, Kathryn H. «Will COVID-19 generate global preparedness?» The Lancet (2020).