INSTITUT C.D. HOWE INSTITUTE

POLICY SEMINAR REPORT

PHARMACEUTICAL SUPPLY CHAIN SUSTAINABILITY

Contents

The C.D Howe Institute thanks the speakers at the Special Policy Seminar, drawn from leading universities, the industry, the OECD, and the Institute staff, for their insightful presentations, as well as participants in the stimulating discussions.

An Overview

On September 29, 2021, the C.D. Howe Institute invited trusted experts in both the public and private sectors to participate in a Special Policy Seminar on the sustainability and resiliency of Canada's pharmaceutical supply chains and issues surrounding domestic manufacturing. Held in a virtual forum, the discussions were organized under several key themes: What was the state of Canadian drug and medical supplies prior to the COVID-19 pandemic? What changes need to be made to strengthen Canadian pharmaceutical and medical supply chains? And would increasing domestic drug manufacturing capacities solve our problems?

There was general agreement among presenters and participants that increasing domestic manufacturing capacity, improving emergency preparedness and investment in monitoring and tracking drug supply inventories and shortages would be beneficial. Further, there is a role for government to provide leadership, oversight and investment to improve emergency preparedness in the form of vaccine development and manufacturing as well as emergency stockpiles of essential medical supplies.

AGENDA

SPECIAL POLICY SEMINAR: PHARMACEUTICAL SUPPLY CHAIN SUSTAINABILITY

Wednesday, September 29, 2021 from 9:30 am to 12:30 pm EST

Via Zoom

INSTITUT C.D. HOWE INSTITUTE

9:30 am - 9:40 am	WELCOMING REMARKS **William B.P. Robson,** Chief Executive Officer, C.D. Howe Institute **Dr. David Goodman,** Chief Executive Officer, Pharmascience Inc.
9:40 am - 10:30 am	**Session I— The Perfect Storm: The State of Canadian Drug and Medical Supplies Prior to March 2020**
	Key discussion questions: • *What systemic factors contribute to drug shortages in Canada?* • *How has the global pandemic affected international supply chains and contributed to further drug and medical device shortages?* Moderator: **William B.P. Robson,** Chief Executive Officer, C.D. Howe Institute Presenters: **Dr. Wei Zhang,** Assistant Professor, School of Population and Public Health, University of British Columbia; Program Head, Health Economics, CHÉOS **Dr. Jacalyn Duffin,** Professor Emerita, Hannah Chair of the History of Medicine, Queen's University **Dr. Aidan Hollis,** Professor of Economics, University of Calgary; President and Director, Incentives for Global Health
10:30 am – 11:20 am	**Session II— Hindsight is 20/20: What Changes Need to be Made to Strengthen Canadian Pharmaceutical and Medical Supply Chains?**
	Key discussion questions: • *What action needs be taken to address long-standing issues around drug shortages in Canada?* – *Healthcare procurement practices* – *The role of technology, innovation and policy in ensuring a secure, modernized supply chain* – *Predictable, sustainable regulatory and reimbursement landscape* • *What lessons can be learned from Canada's management of the National Emergency Strategic Stockpile (NESS) during the pandemic?* Moderator: **Daniel Schwanen,** Vice President, Research, C.D. Howe Institute Presenters: **Angelique Berg,** Senior Vice-President of Stakeholder Engagement, Canadian Association for Pharmacy Distribution Management **Joseph Berger,** Director, Public Policy & Research, McKesson Canada **Alain Boisvert,** Head of Government & Public Affairs, Pharmascience Inc.

Presentations and discussions will be closed to media and off-the-record.

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11:20 am - 11:35 am	BREAK
11:35 am – 12:25 pm	**Session III—Would Increasing Domestic Drug Manufacturing Capacity Solve Our Problems?**

Key discussion questions:

- *Canada's inability to manufacture domestic COVID-19 vaccines has been a point of contention throughout the pandemic. What are the benefits of investing in domestic vaccine development and production?*
- *What type of strategy would be best; public agency, crown corporation or arms-length institution, public private partnerships, some other approach?*
- *Are there viable alternatives to domestic development and production?*
- *What can we learn from the experiences in other jurisdictions?*

Moderator:

Daniel Schwanen, Vice President, Research, C.D. Howe Institute

Presenters:

Fabien Marino, Vice President of Industrial Affairs and Toronto Site Head, Sanofi

Dr. Paul Grootendorst, Associate Professor, Leslie Dan Faculty of Pharmacy, University of Toronto

Dr. Ruth Lopert, Senior Health Analyst, Organisation for Economic Co-operation and Development (OECD)

12:25 pm – 12:30 pm	CLOSING REMARKS

William B.P. Robson, Chief Executive Officer, C.D. Howe Institute

Sponsored by:

pharma science

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Rapporteur's Report:

The COVID-19 pandemic highlighted vulnerabilities in Canada's medical supply chains. Global medical supply chains were disrupted in manufacturing and shipping products and some governments implemented export restrictions to protect domestic markets. Canada was affected by shortages of medical supplies at various points throughout the pandemic. Personal protective equipment was in short supply across the globe during the initial wave and some essential medicines were as well. Later in the pandemic, shortages of supply delayed or hampered vaccine rollouts. Ensuring that Canada has stable and resilient pharmaceutical and medical supply chains should be a priority for emergency preparedness planning, while contributing to growing the life-sciences and biotechnology sectors.

Trusted experts in both the public and private sectors gathered in a virtual forum to discuss the sustainability and resiliency of Canada's pharmaceutical supply chains and issues surrounding domestic manufacturing. Each session focussed on different aspects of supply chain issues in Canada, addressing drug and medical supply shortages, ways to strengthen domestic pharmaceutical supply chains and increase domestic capacity, and strategies to improve stability within the context of complex global supply chains.

There was general agreement among presenters and participants that increasing domestic manufacturing capacity, improving emergency preparedness and investment in monitoring and tracking drug supply inventories and shortages would be beneficial. However, Canada is a relatively small market, representing only 2 percent of global pharmaceutical sales, and is dependent on international markets for many aspects of the drug development and production process. Many of the challenges affecting pharmaceutical supply chains in Canada are global in nature. Presenters stressed that strategies to improve the stability of Canada's medical supply chains must incorporate the complexities of global pharmaceutical markets. Some presentations also highlighted pre-pandemic market pressures, in the form of reduced prices and increasing costs, are threatening the stability of pharmaceutical supply chains. These market pressures lead to few suppliers in the global market or discontinuation of medications altogether, increasing the vulnerability of global supply chains.

Government's role is to provide leadership, oversight and investment to improve emergency preparedness in the form of vaccine development and manufacturing as well as emergency stockpiles of essential medical supplies. Strategies to maintain emergency supplies of essential medical products and inputs should involve private sector stakeholders to ensure that inventory continues to shift through supply chains and stockpiles are constantly renewed without incurring significant additional costs. Similarly, vaccine manufacturing facilities would need to remain in constant operation to maintain regulatory approval and retain the needed expertise.

Overall, there would be many benefits to increasing domestic pharmaceutical and medical manufacturing capacity. In addition, supply chain vulnerabilities highlighted by the COVID-19 pandemic should be addressed and emergency preparedness improved. Achieving these targets will require strategic cooperation between governments and with private sector stakeholders to ensure sustainability and resiliency in the long term.

Session I – The Perfect Storm: The State of Canadian Drug and Medical Supplies Prior to March 2020

Drug and medical supply shortages were highlighted and exacerbated by the COVID-19 pandemic, but they are a pre-existing problem. Presentations during the first session of the conference provided insights about the nature and scope of drug shortages in Canada, their impact on the health of Canadians and the early evidence of the effects of the pandemic on Canada's drug and medical supplies. In addition, panelists provided context for how Canada's medical supply chains are integrated with, and affected by, international governments and market factors.

Drug shortages are not a new problem and can cause significant harm to patients. A presenter highlighted several examples: shortages of epilepsy drugs resulting in seizures, lack of arthritis medication causing flare-ups, and risks to the progress and stability of people taking medication for mental health diseases. Additional costs can then result, if people require hospitalization, face longer recovery times, and reduced quality of life as a result of worsening health. These issues cannot be decoupled from the functioning of the overall system.

Canada currently does not measure the health impacts of drug shortages and information about the shortages themselves is limited. Reporting actual and expected drug shortages became mandatory in 2017. although a voluntary reporting database has existed since 2012. A panelist noted that there is very little aggregated reporting or monitoring of drug shortage information in Canada. The system lags the US where the FDA has dedicated staff responsible for the coordination of drug shortage prevention and mitigation activities, the monitoring of ongoing shortages and monitoring the supply of products with recently resolved shortages.

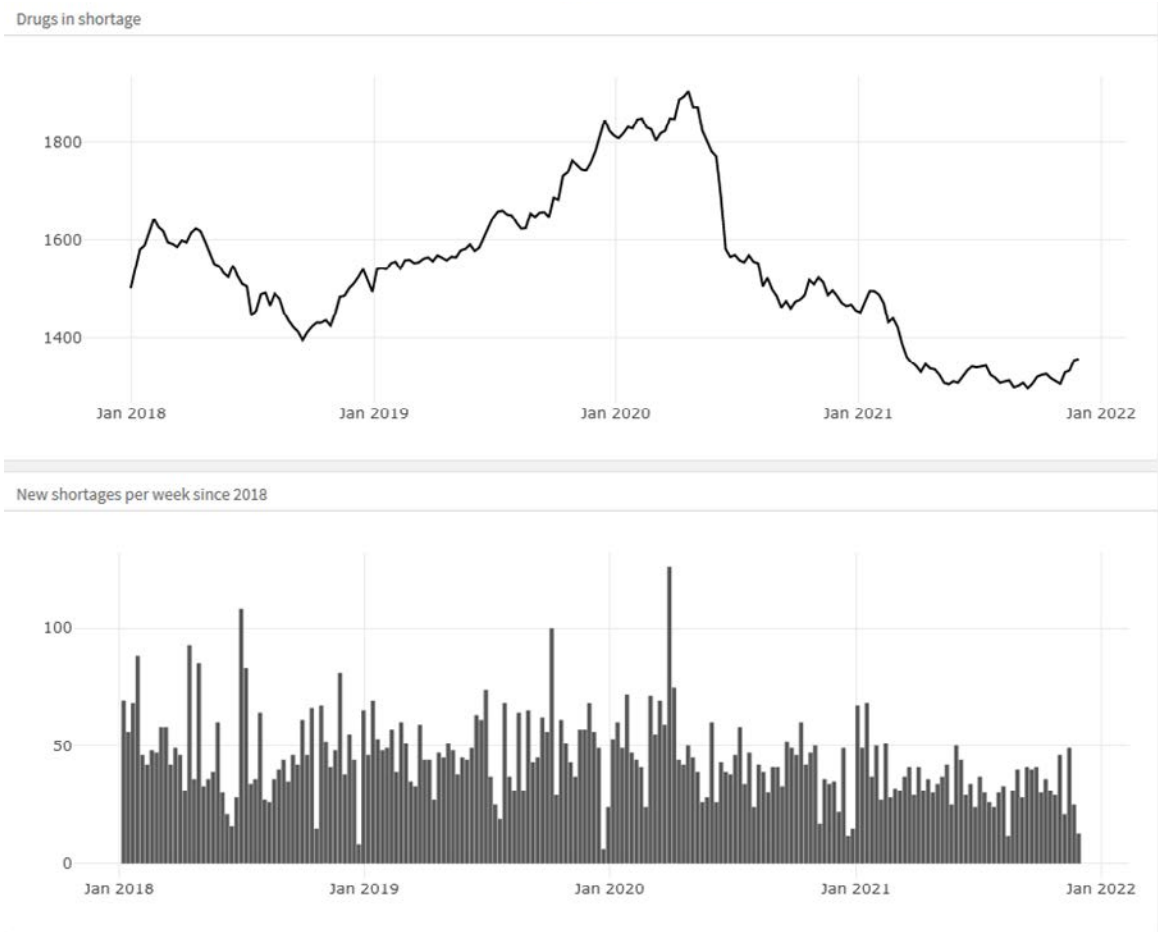
Participants heard that there are more than 1,000 drug shortages per year on average in Canada.[1] There are hundreds of shortages occurring at any given time, with more than 1,200 products affected over a three-year period. Overall, 70 percent of shortages were for generic medicines and 30 percent for patented medicines, matching their respective market shares. At the time of the seminar, there were about 1,400 actual shortages and 41 anticipated ones. Many shortages have been "resolved" by discontinuation, meaning they are permanently in shortage and unlikely to be available. Currently, there are about 1,430 active drug shortages with 23 expected shortages.[2] 480 shortages of essential medicines have occurred this year.

It is difficult to analyze the causes of drug shortages in Canada. Though manufacturers submit reasons for anticipated and actual shortages, classification is limited to a relatively limited set of factors: demand increases, manufacturing disruptions, ingredient shortages, manufacturing practices, shipping delays, or other. However, more than 17 distinct causes of drug shortages have been identified by research in Canada and other countries. One panelist presented research analyzing prescription drug availability in Canada over a 1.5-year period (2017-2018) that showed products with single generic manufacturers were more likely to be in shortage; as were those with complex routes of

1 Shortages reported by drug identification number (DIN), meaning that a single medicine might result in numerous shortage reports due to different dosages and delivery methods receiving unique DINs.

2 Data updated as of time of writing (December 1, 2021) from resource provided during presentation. Sources: Pipitone 2021. For more information, see Donelle, Jessy, Jacalyn Duffin, Jonathan Pipitone, and Brian White-Guay. "Assessing Canada's Drug Shortage Problem." C.D. Howe Institute Commentary 515, 2018. and https://drugshortages.pipitone.ca/#shortages

Figure 1: Drug Shortages Before and During the Pandemic



Source: Pipitone, Jon. 2022. "Assessing Canada's Drug Shortage Problem." Available at: https://drugshortages.pipitone.ca/#shortages.

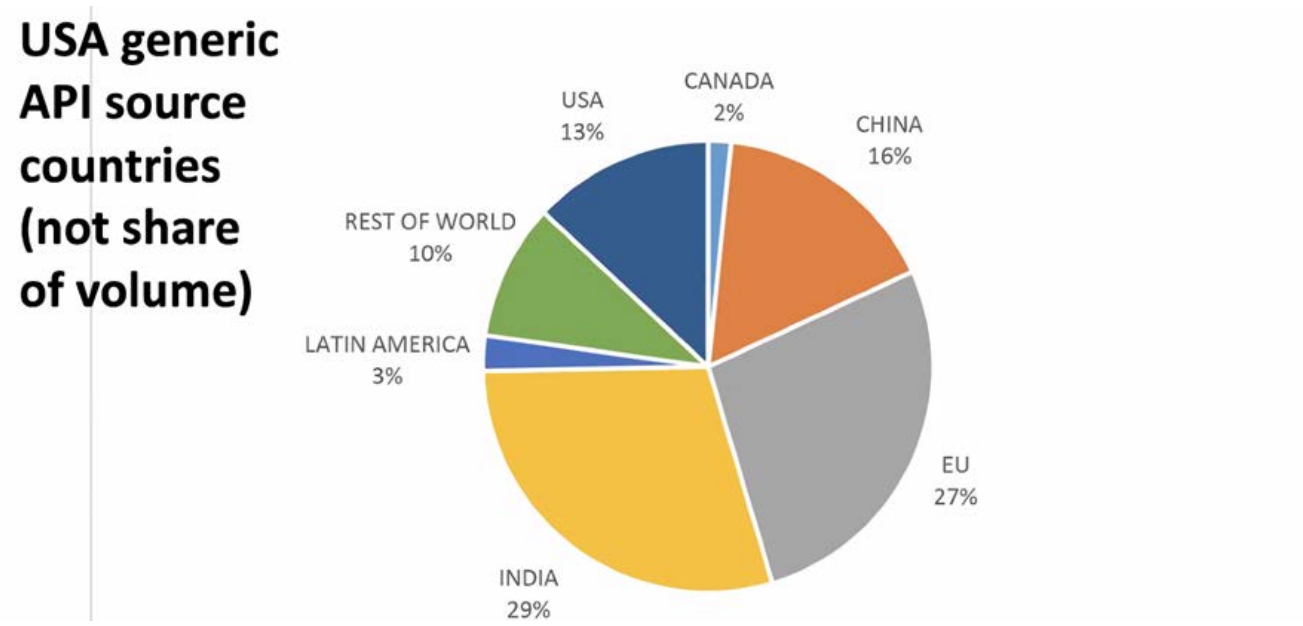
administration or dosage form, certain therapeutic classes, and products in high demand.

Panelists provided information about the impacts that COVID-19 has had on drug shortages. Drug shortages peaked early in the pandemic and subsequently decreased to pre-pandemic levels for the most part (see Figure 1). The disruption to manufacturing, demand increases for various drugs, and delays in shipping were the main reasons reported for drug shortages.

Strategies to address drug shortages and supply disruptions in the Canadian market should consider the complex and global nature of the pharmaceutical and medical device industry. Canada accounts for a small share of the global market: about 2 percent by value, even less by volume since prices are generally above average.

The presenter also discussed stages in pharmaceutical supply chains and provided some insights about Canada's advantages and disadvantages that could inform policy strategies to improve medical supply chain resiliency and sustainability in Canada. Pharmaceutical supply chains begin with raw materials manufacturing, followed by the of refining chemicals, formulation, the manufacturing of active pharmaceutical

Figure 2: Share of Manufacturing Facilities for Active Pharmaceutical Ingredients (APIs) of Generic Drugs, March 2021.



Source: White House, 100-Day Reviews under Executive Order 14017, June 2021.

ingredients, packaging and, finally, retail. The presenter noted that Canada has advantages in chemical formulation, packaging and retail, but is highly dependent on international markets for raw materials, chemical inputs, and active pharmaceutical ingredients (Figure 2). There are a number of market factors that contribute to China and India largely conducting the earlier stages of the pharmaceutical production process. These are lower wages, tighter geographic integration with bulk chemical manufacturers, lower environmental standards and less frequent inspections of facilities; all of which contribute to lower manufacturing costs in these countries.

The presentation featured a number of more detailed examples illustrating how the complexity of pharmaceutical supply chains interacts with market factors to result in shortages of particular medicines. Of 118 drugs in shortage on the FDA's "essential" medicine list, 32 were sterile injectables. Sterile injectables are complex to manufacture, most of the medicines were older (off-patent) and procured through tendering agreements at low prices. As a result, there are very few manufacturers for these drugs. In 2017, there was a global shortage of penicillin G, a treatment for rheumatic heart disease and syphilis. Quality control issues resulted in two Chinese manufacturers not meeting European or North American production standards. A shortage resulted because the one remaining manufacturer in Europe could not produce enough supply to meet global demand.

The panelist concluded with some discussion points for potential strategies for Canada to improve the resiliency of medical supply chains and recommended collaboration with reliable trading partners that are addressing similar challenges – the problem is global in nature, the solution will also require international cooperation. In particular, a key strategy will beforming agreements about

trade and access to production inputs and finished products, particularly for essential medicines. Many drug shortages are the result of production issues and a limited number of suppliers. The limited number of suppliers is related to prices of medicines and the attractiveness of markets to producers. The panelist recommended supporting the pharmaceutical industry to ensure sufficient supplies of essential medicines, as well as support for competitive supply.

Session II – Hindsight is 20/20: What Changes Need to be Made to Strengthen Canadian Pharmaceutical and Medical Supply Chains?

The second session of the seminar featured presentations from Canadian pharmaceutical manufacturers and distributors discussing the impacts of the pandemic on medical supply chains, lessons learned about the National Emergency Strategic Stockpile and actions to address long-standing issues related to drug shortages in Canada. Presenters highlighted the initial disruption that COVID-19 caused to pharmaceutical demand and distribution.

Disruptions to manufacturing and shipping resulted in some short-term shortages and demand significantly increased. Some of the increased demand was for hospital critical care units and treating COVID-19 patients, but much of it can't be explained by changing health factors. The presenter suggested that, much like toilet paper, consumers were likely stockpiling medications due to fears about future supplies and their ability to refill prescriptions in the midst of uncertainty. To respond to short-term supply shortages and ensure stability, distributors changed dispensing policy to limit people to 30- day prescription refills (when they are normally 90 to 100 days). By the summer of 2020, demand had returned to 2019 levels and 90-day prescription dispensing was restored (Figure 3). While the disruptions caused by COVID-19 were anything but predictable, another presenter noted that disruptions could be better managed through improved communication and information sharing throughout the supply chain. Since pharmaceutical manufacturers and distributors plan based on historical demand and the industry operates on a "just-in-time" inventory model, changes in demand must be communicated to enable production volume adjustments, and more efficient inventory management.

Panelists discussed a number of market forces that threaten the long-term resiliency and stability of medical supply chains. Similar to the discussion of drug shortages, there is an inextricable link between prices, access and availability. One panelist noted that there were a significant number of products (748) discontinued in the European market following generic price reforms in 2018. Since 2008, there has also been an increase in the number of drugs with only one or two suppliers, which are more at risk of being in shortage than those with many suppliers. Reductions in drug prices have affected both manufacturers and distributors. Lower prices reduce the incentive to produce and fewer suppliers can profitably operate, increasing the risk of supply disruptions and shortages. The distribution of medicine in Canada is funded through percentage-based reimbursement, meaning that lower drug prices also reduce revenues for distributors.

Meanwhile, costs have been increasing due to technological advancements and regulations. Biologic medicines might have specific temperature conditions that need to be tracked and maintained from manufacture through storage, shipping, distribution and delivery. While regulations have been in place since 2005 requiring distributors and manufacturers to ensure appropriate temperature and sanitary storage practices throughout drug supply chains, a presenter noted that the guidance for the regulations had recently been updated to require the documentation and digital monitoring

Figure 3: COVID-19 First Wave – Drug Supply Pressure

Source: McKesson Canada. See: https://www.mckesson.ca/documents/59196/0/McKesson+Canada+COVID-19+Supply+Stability+White+Paper+2020-10+FINAL.pdf/09ab39c5-45fc-603d-f94c-000a4c7d7d02

of temperatures. The technological advancements in biologic medicines provide huge benefits for society, the most recent example being vaccines to fight COVID-19. They also require significant investment in equipment, digital monitoring infrastructure, and changes to distribution and storage practices that increase costs. The panelist said that operating costs have increased 2.5 times faster than volumes over the past five years in Canada. As cost pressures increase, distributors might eliminate or reduce the frequency of deliveries in costly regions, affecting access and availability of medicine in rural and remote communities.

There are significant market pressures affecting Canadian drug manufacturers as well, according to the final panelist presentation. Historically, Canada was a relatively high-priced market for generic pharmaceuticals, but prices declined 60 percent from 2010-2020. From the producer perspective, the decision of where to produce a drug is predominantly decided by costs of manufacturing and market-access considerations (transportation/ shipping costs, regulatory approvals, quality and dependability of inputs, etc.). The costs of manufacturing in Canada are much higher than in competing countries (India and China), while prices have declined to closer to the international average, resulting in the vast majority of medicines being produced abroad.

Collectively, the panelists highlighted a number of market trends straining the medical production and distribution industries in Canada (and the EU). While lower prices and more transparent supply chains have benefits for patients and insurers, they have also increased the risk of drug shortages and medical supply disruptions as producers exit the market or move production to lower-cost jurisdictions. Panelists also made a number of suggestions for potential strategies to improve the resiliency and stability of medical supply chains in Canada, particularly in crisis situations. The recommendations put forward for discussion included:

- Create a funding pool to support operations and infrastructure development/improvement

for pharmacy distribution. A panelist suggested that this funding could be distributed based on mutually agreed standards that ensure all regions of Canada are served by comprehensive pharmaceutical distribution, noting that such a framework is already operational in Australia.

- National Federal Stockpile:
  - Health Canada should continue to develop the Essential Medicines List to inform critical drug stockpiles. Stockpiling should be proactive so critical supplies are available when an emergency happens. In addition, emergency supplies should be expanded to consider community-based demand and not only hospital drugs.
  - Government and industry should cooperate on the implementation of a critical drug stockpile to ensure that inventory continues to move through the market while maintaining critical supplies to prevent them from expiring. As well, distribution centres should be partially repurposed for perpetual warehousing.
  - Defining who is responsible for costs and sharing the financial risks will be critical to success.
- Public procurement, particularly for hospital drugs, could be leveraged to support Canadian manufacturing. Hospital drug purchases are normally awarded through public procurement contracts. It is already common practice to award supply contracts to multiple suppliers for critical medicines. They could also include reserving partial tenders to companies conducting some of their production activities in Canada or otherwise incentivize Canadian production.
- Create a predictable and sustainable regulatory and reimbursement environment.
- The federal government should work with international partners and agencies to ensure access to critical inputs for the manufacture of essential medicines. COVID-19 illustrated the risks of dependence on China and India for global supplies of chemical entities and active pharmaceutical ingredients. The pandemic and public policy decisions by foreign governments directly affected medical supply chains in Canada.

Session III – Would Increasing Domestic Drug Manufacturing Capacity Solve Our Problems?

Presentations during this session discussed the benefits of investing in vaccine development in Canada, some strategies for doing so, and reinforced the need for an international strategy.

The presentations began with the benefits of investing in domestic production: less dependence on other nations for stable supply chains, export tax revenues, growing domestic expertise and talent, employment opportunities and innovation. However, the presenter cautioned that it is important to understand the problem we would be trying to solve by increasing domestic manufacturing: is it preparing for the next crisis, growing the biotech sector to increase access to therapeutics, or attaining a leadership position in the industry? Since Canada accounts for 2 percent of the global market, it is hardly a biotech superstar.

To grow the biotech and life-sciences industry, the presenter suggested that a stronger alignment between ministries of health and economic development would be needed at both the federal and provincial levels. They noted the current spending to grow the domestic life-sciences industry is at odds with proposed PMPRB regulations that would significantly reduce prices. The federal government has a role to play in coordination, since healthcare systems varying by province. The Biomedical Advanced Research and Development Authority (BARDA) in the US was provided as an example of a government agency providing funding and strategic direction.

Another panelist focussed their remarks on vaccines for health emergencies, underscoring the importance of having plans in place to provide timely access. Canada simply does not have the resources to fully develop and produce a vaccine during an emergency. Vaccine development projects have a high failure rate and launching enough to

reach a high probability of success wouldn't be feasible, meaning that Canada will have to depend on vaccines developed elsewhere. That presenter suggested that increasing domestic production capacity could be an effective strategy for improving access to vaccines developed predominantly outside our borders. Vaccines are complex to manufacture and could be produced using any of the three main platforms: nucleic acid, RNA and DNA based, and viral vector or whole virus. To be prepared for an unknown pathogen, Canada would need sufficient production capacity in each platform. This new capacity would need to be utilized continuously to maintain expertise and regulatory certification. To be commercially viable, vaccine manufacturing facilities must produce in high quantities and so must be competitive in the global market. The presenter concluded that for a domestic manufacturing strategy to be successful a number of questions remain to be addressed:

- How quickly could production be repurposed to produce new pandemic vaccines?
- What additional costs would be incurred to maintain this flexibility?
- How would risks and costs be shared between government and producers to maintain flexible production capacity and ensure availability for crisis situations?

The final presentation focused on the benefits on international cooperation and OECD research analyzing global value chains. Concerns about domestic supply and discussion of comparative advantage are understandable, but research supports interconnected supply chains for both efficiency and stability of supply chains. The OECD study suggested that greater localization fails to achieve better security and stability of supply chain. Not all stages of production are likely to be undertaken in Canada, and trading intermediate inputs and raw materials will continue to play an important role in domestic production. Greater localization is also likely to involve greater reliance on fewer sources, and often more expensive inputs. When disruption occurs somewhere in the supply chain, fewer suppliers means it would likely be more difficult and more costly to source materials. Overall, the presenter concluded, localization of the supply chain isn't likely to deliver greater security and certainty, pointing instead to international efforts to increase manufacturing capacity for the global market.

Summary prepared by Rosalie Wyonch, Senior Policy Analyst, C.D. Howe Institute, with assistance from Research Interns Ji Yoon Han and Udita Upadhyay.

Biographies of Presenters and Moderators

Special Policy Seminar: Pharmaceutical Supply Chain Sustainability

Wednesday, September 29, 2021 from 9:30 am to 12:30 pm ET

Via Zoom

INSTITUT C.D. HOWE INSTITUTE

SPEAKERS

WILLIAM B.P. ROBSON

Bill Robson took office as CEO of the C.D. Howe Institute in July 2006, after serving as the Institute's Senior Vice President since 2003 and Director of Research from 2000 to 2003. He has written more than 240 monographs, articles, chapters and books on such subjects as government budgets, pensions, healthcare financing, inflation and currency issues. His work has won awards from the Policy Research Secretariat, the Canadian Economics Association, and the Donner Canadian Foundation. He is a Senior Fellow at Massey College and holds an ICD.D designation from the Institute of Corporate Directors. He is a member of the Panel of Senior Advisors to the Auditor General of Ontario and the Ifo World Economic Survey expert group, and a regular commentator on BNN/Bloomberg. Bill taught undergraduate public finance and public policy at the University of Toronto from 2000 to 2003, and a Master's level course in public finance at the University of Toronto's Munk School of Global Affairs and Public Policy from 2014 to 2019.

DR. DAVID GOODMAN

Dr. David Goodman is Chief Executive Officer of Pharmascience Inc., which is today the 2nd largest privately-owned pharmaceutical company in Canada.

Dr. Goodman obtained his Bachelor degree in Commerce from McGill University, and his Ph.D. in pharmacology from the University of Virginia. Upon graduation, he began his career at Pharmascience Inc. in Business Development and has gained significant experience in progressively senior international and domestic roles.

Under Dr. Goodman's leadership, Pharmascience Inc. has gone from being a strictly Canadian company to becoming an important player on the global stage. Pharmascience Inc. strives to be the first company to launch its generic pipeline in Canada, Europe and various markets throughout the world.

Dr. Goodman's success is his belief and insistence on major and constant investment in internal and external R&D programs, as well as in employee development.

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DR. WEI ZHANG

Dr. Wei Zhang is an Assistant Professor in the School of Population and Public Health (SPPH) at the University of British Columbia (UBC), a Scientist and Program Head of Health Economics at the Centre for Health Evaluation and Outcome Sciences (CHÉOS), and a Michael Smith Foundation for Health Research (MSFHR) Scholar. She started her career as a health economist at Elizabeth Bruyère Research Institute in Ottawa. Then she moved to Vancouver in 2006 and worked at CHÉOS. She earned her master's degree in Economics from the University of Ottawa and PhD in the SPPH of UBC, and received postdoctoral training at CHÉOS and UBC.

Dr. Zhang's research aim is to integrate theoretical and empirical findings with health policies, services, and practices through the application of economic theories and methods in health research. Her primary research interests include measurement and valuation of work productivity loss among patients and their caregivers, economic evaluation of health care interventions, and pharmaceutical policy.

A list of Dr. Zhang's publications can be found here.

DR. JACALYN DUFFIN

Jacalyn Duffin, MD, PhD, is a hematologist and historian who held the Hannah Chair of the History of Medicine at Queen's University from 1988 to 2017.

A former President of both the American Association for the History of Medicine and the Canadian Society for the History of Medicine, she is the author of eleven books and many articles, holds several awards for teaching and research. She is a Member of the Order of Canada (2020) and a Fellow of both the Royal Society of Canada (2012) and the Canadian Academy of Health Sciences (2013). In May 2019, she received the Lifetime Achievement Award of the AAHM (from historians) and was inducted into the Canadian Medical Hall of Fame (from physicians). A supporter of medical humanities, she has been a contributing editor of the online Literature, Arts and Medicine database since 1995.

Her research focuses on disease, technology, religion, and health policy. She runs an activist website for the current drug shortage problem and a collaborative translation project for the 17th-century Latin author Paolo Zacchia. Her latest book Stanley's Dream (2019) is on the history of the Medical Expedition to Easter Island, led by Canada in 1964-65.

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DR. AIDAN HOLLIS

Aidan Hollis was educated at Cambridge University and the University of Toronto, where he obtained a PhD in Economics. His research is broadly in the area of industrial organization, and is particularly focused on competition and innovation issues in pharmaceutical markets.

He is President and a Director of Incentives for Global Health, a non-profit whose chief objective is the promotion and development of the Health Impact Fund.

Prof. Hollis has also published on electricity market restructuring, international aspects of competition policy, and the economics of a historical microcredit institution. For the academic year 2003-4 he was appointed TD MacDonald Chair of Industrial Economics at the Competition Bureau, Industry Canada.

DANIEL SCHWANEN

Daniel Schwanen is an award-winning economist with a passion for international economic policy. He is spearheading Institute programs focused on the link between Canada's international trade and investment policy and Canadians' standards of living.
Having earned degrees in economics from the Université de Montréal and Queen's University, Daniel began his career in the financial services industry, becoming International Economist at the CIBC in 1986. He first joined the C.D. Howe Institute in 1990, producing widely-cited research on international trade, Canada's economic union, climate change policy, and the economics of cultural policy. His work in the 1990s earned him foreign visitorships in the United States, Japan and Australia.

After joining the Institute for Research on Public Policy in 2001, Daniel earned the Policy Research Initiative's Outstanding Research Contribution Award for his paper "A Room of Our Own: Cultural Policies and Trade Agreements," and produced, with co-editors Thomas Courchene and Donald Savoie, a major series of papers on North America after NAFTA. In 2007, he co-wrote the independent review of Australia's Progress to Achieve APEC Goals, presenting the report at APEC's Senior Officials meeting as part of APEC's peer review process.

Daniel joined the Centre for International Governance Innovation (CIGI) in Waterloo, Ontario in 2005, serving in a number of senior research and executive positions. Most recently, his work there focused on the G20 and international economic policy coordination.

Daniel returned to the C.D. Howe Institute in March, 2011 as Associate Vice President, Trade and International Policy. He was promoted to Assistant Vice President, Research in January 2013, and currently holds the position of Vice President, Research, as of June 2014.

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ANGELIQUE BERG

Angelique is a business development leader harnessing over 20 years of experience in the pharmaceutical and not-for-profit health sectors. Angelique brings expertise in revenue growth, government and stakeholder relations, and strategic communications at the executive level of leading health organizations, including the Canadian Orthopaedic Foundation, Diabetes Canada, and most recently as the CEO at Hypertension Canada.

In addition to building high performing teams and creating award-winning programs, she has a proven track record in driving sustainable growth and innovation to inspire change. Angelique has served on multi-sector collaborations that accelerated health care system and patient care improvements, including the Wait Times Alliance, the Bone and Joint Decade Canada, Health Quality Ontario's Hypertension Quality Standard Advisory Committee, and Health Canada's Multi-Stakeholder Committee on Drug Shortages.

She also served on the board of the Best Medicines Coalition, and for over 10 years as a member of the Health Charities Coalition of Canada.

JOSEPH BERGER

Joseph Berger leads McKesson Canada's though leadership work, as the director of public policy and research in its Government Affairs team. Since joining the team in 2017, Joseph has helped McKesson Canada navigate the opportunities and challenges related to healthcare public policy in Canada, working on national pharmacare, drug price evolution, medication distribution, pharmacist scope of practice, COVID-19 response, and more. Joseph has a Master's degree in public policy and public administration, and has written extensively on social policy issues related to higher education, healthcare and federal-provincial policymaking in Canada.

BIOGRAPHIES OF PRESENTERS AND MODERATORS

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ALAIN BIOSVERT

Senior pharmaceutical manager with extensive experience on leadership teams of pharmaceutical firms in Canada. Chief executive of a pharmacy licensing body for ten years. Also acted as a pharma policy and reimbursement consultant.

Exhaustive experience in government and public affairs, as well as pharmaceutical market access.

Currently Head of Government and Public Affairs at Pharmascience Inc., one of Canada's leading generic firms. Has held the position of Vice-President, Market Access and Public Affairs with Bristol-Myers Squibb Canada (2011-2016) and Vice President, Policy and Reimbursement at Novartis Pharma Canada (2005-2011). Also contributed to Merck Canada as Director of Corporate Affairs (1997-2005). Led the Quebec Order of Pharmacists as Director General and Secretary from 1988 to 1997.

Licensed pharmacist, with a Masters' degree in Pharmacy. Louis-Hébert Award (2000). Fellow of the Quebec Order of Pharmacists (2017).

FABIEN MARINO

Fabien Marino is the Vice President Industrial Affairs and Site Head for Sanofi Pasteur Limited, the Canadian vaccine division of Sanofi, where he has led all industrial functions since 2018. A proven team builder and high energy leader, his vision is to strengthen industrial scale biotechnology manufacturing in Canada. He holds a successful track record in leading and transforming large and complex site and global operations into recognized best in class and high performing organizations.

Under his leadership, the campus has become a top vaccine global performer attracting $2 billion in investments to build new modern biomanufacturing infrastructure representing the largest biotech investments in Canadian and Sanofi history to-date.

Fabien's business experience spans multiple sectors: global oil and gas, life sciences and pharmaceutical companies, in both start-ups and established corporations. A Canadian citizen, he has worked extensively in both Canada and the U.S. Among his past roles are Head of Canadian operations for Merck KGaA Crop BioScience and Head of Operations, Southern California for Merck KGaA life sciences.

He holds three degrees from McGill University in science and engineering and professional certification in supply chain and project management.

Biographies of Presenters and Moderators

Special Policy Seminar: Pharmaceutical Supply Chain Sustainability

Wednesday, September 29, 2021 from 9:30 am to 12:30 pm ET

Via Zoom

INSTITUT C.D. HOWE INSTITUTE

DR. PAUL GROOTENDORST

Area of Research
Paul Grootendorst examines economics issues in the pharmaceutical sector, with a particular focus on drug pricing, insurance and the provision of community pharmacy services. His work helps to inform public policy related to pricing, reimbursement and coverage.

Research Challenge
Economics is premised on the assumption that actors (individuals, businesses and organizations) make decisions that further their goals (e.g., businesses are assumed to maximize profits). Public policy can affect the net benefit of different decisions or courses of action to an actor; these effects can be intended or unintended.

Grootendorst's research examines the impact of public policy and regulations on the behaviour of actors in the pharmaceutical sector and the attendant effects on pharmaceuticals spending, the quality of health care and other outcomes. For instance, lower reimbursement prices for generic drugs lowers drug plan spending, but can lead to shortages if lower prices make the production of some drugs unprofitable. Expanding the number of pharmacists licensed to practice in Ontario can increase accessibility to pharmacy services, but will also drive down pharmacist wages, which may lead to lower morale and the departure of the most capable pharmacists from the community sector.

Proposed Solution
Grootendorst uses survey and administrative data to examine the impact of policies on the behavior of actors in the pharmaceutical sector and the attendant effects on policy relevant outcomes.

A current focus is the economics of community pharmacies. This area has received little academic attention, so he is addressing the most basic questions: 1) How much is spent on pharmacy services in Canada? 2) Does the geographic distribution of pharmacies match the geographic distribution of health care needs? 3) The number of pharmacists licensed to practice in Canada and the share of pharmacists who trained outside of Canada have both grown in recent years. Where have all these new entrants to the profession ended up? What fraction are practicing in community pharmacy? What has been the impact on pharmacist wages?

Grootendorst also studies pharmacare policies, specifically looking for forms of pharmacare – such as coverage targeted on expensive drugs – that may be feasible in the event that provincial governments reject a fully comprehensive national plan.

Impact To Date
Grootendorst has published numerous papers and reports on drug pricing strategies and other pharmaceutical economics topics. His work has informed government generic drug reimbursement and procurement policy. He is a recognized expert in the field, and he is often called upon for comment in media stories related to the topic.

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INSTITUT C.D. HOWE INSTITUTE

DR. RUTH LOPERT

Ruth Lopert is a public health physician and pharmaco-economist and currently leads the OECD's work on pharmaceuticals and medical devices. She is also a chercheur associé principal at the University of Strasbourg, and an adjunct professor in the Department of Health Policy & Management at George Washington University, in Washington DC. From 2008-11 Ruth was the chief medical officer in the FDA's Australian counterpart, the Therapeutic Goods Administration, and prior to that established and directed the pharmaceutical policy unit in the Australian Department of Health

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