Vaccines policy in Canada: International and Domestic Comparisons.

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ABSTRACT

This paper compares the policy environments for vaccines in Canada, Australia, United Kingdom, New Zealand, and the United States. It focuses on processes for regulatory approval, health technology assessment, and procurement and funding. Expenditures on vaccines, and routine immunization schedules are also compared. It further examines Canada's policy environment for vaccines versus other types of pharmaceuticals. OBSERVATIONS: Canada's process for approving and covering new vaccines under publicly funded immunization programs is among the more complex of the 5 systems reviewed. National expenditures on antibiotics and vaccines together account for 0.49 percent (<1%) of national health expenditure in Canada, and 0.46 percent on average across all five countries. The US national immunization schedule includes twice as many vaccines as any other jurisdiction. Several vaccines recommended by Canada's National Advisory Committee on Immunization (NACI) are not publicly funded in some provinces. The UK National Health Service constitution requires all vaccines on the national immunization schedule (NIS) to be procured by the Department of Health. In Canada, it is not mandatory for provincial and territorial governments to procure all vaccines on the NIS. Vaccines technical advisory bodies in AUS (ATAGI), UK (JCVI), NZ (PTAC), and the US (ACIP), include members representing consumers and patients, in addition to immunization experts. Canada's NACI does not include layperson representatives. Canadian policy treats vaccines differently than other pharmaceuticals, maintaining separate processes regarding HTA, procurement, and funding. Vaccines, like other drugs, are subject to federal drug price regulation, but questions have been raised as to whether the pharmacoeconomic factors applied under regulatory guidelines are appropriate for vaccines.

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Introduction

This paper examines the process for making vaccines available to the Canadian population. Access to vaccines is an important public health issue. According to the World Health Organization, vaccines currently prevent 2 to 3 million deaths every year from diseases like diphtheria, tetanus, pertussis, influenza, and measles. (WHO 2020) A study by the US Center for Disease Control estimated that, among children born during 1994 to 2013, vaccination would prevent an estimated 322 million illnesses, 21 million hospitalizations, and 732,000 deaths over the course of their lifetimes, at a net savings of US$295 billion in direct costs and US$1.38 trillion in total societal costs. (CDC 2014) Vaccines are one of the most cost-effective public health interventions. Vaccines prevent diseases that would otherwise increase health and economic costs for individuals, the health care system and society. [TABLE 1a] Vaccines are also often less costly than other types of public health interventions. [TABLE 1b] Policies and processes that delay access to new vaccines risk jeopardizing the health and economic benefits associated with immunization.

This paper provides a quick comparison of the policy environments for vaccines and immunizations in five countries including Canada, Australia, United Kingdom, New Zealand, and the United States. Countries are compared on the basis of the process for regulatory approval of new vaccines, health technology assessment (HTA) for new vaccines, the process for procuring and funding vaccines, expenditures on vaccines, and routine immunization schedules. Canada's policy treatment for vaccines is compared and contrasted with its policy treatment for other pharmaceuticals. Observations are briefly discussed.

TABLE 1a: Value for money from vaccination.

Immunization program	Cost saving per $1 spent
Influenza for adults 65 years of age and older	$45
Measles, mumps, rubella for children	$16
Pneumococcal polysaccharide for adults 65 years of age and older	$8
Diphtheria, pertussis, tetanus for children	$6

TABLE 1b: Cost per life year saved: vaccines versus other interventions.

Public health intervention	Cost per life year saved
Vaccines	
Hepatitis B screening in pregnancy and immunization of children of carriers	$164
Human papillomavirus vaccine for 12-year old girls in a school-based immunization program	$12,921
Varicella vaccine for children	$16,000
Pneumococcal conjugate vaccine for children	$125,000
Other interventions	
Mandatory seat belt law	$69
Chlorination of drinking water	$3,100
Smoking cessation counseling	$1,000 to $10,000
Annual screening for cervical cancer	$40,000
Driver and passenger air bags/manual lap belts (vs. airbag for driver only and belts)	$61,000
Smoke detectors in homes	$210,000
Crossing control arm for school buses	$410,000
Radiation emission standard for nuclear power plants	$100,000,000

SOURCE: Public Health Agency of Canada (2016).

Regulatory, HTA, and Funding Process for New Vaccines

Canada

In Canada, the federal, provincial, and territorial (F/P/T) governments have different authority and responsibility for vaccines and immunization programs.

Health Canada's (HC) Biologic and Radiopharmaceutical Drugs Directorate (BRDD) is the federal agency that has responsibility for certifying the safety and effectiveness of new vaccines and approving new products before they can be used by Canadian patients.

All new vaccines sold in Canada are subject to price regulation by the federal government's quasi-judicial tribunal known as the Patented Medicine Prices Review Board (PMPRB).

The Public Health Agency of Canada (PHAC) is the federal agency responsible for immunization. PHAC is supported by the National Advisory Committee on Immunization (NACI), which conducts clinical and economic reviews for new vaccines and makes recommendations regarding their addition to the national immunization schedule. NACI membership is comprised of 16 experts in the fields of pediatrics, infectious diseases, immunology, pharmacy, nursing, epidemiology, pharmacoeconomics, social science and public health. There are no consumer or patient representatives on the NACI.

Immunization policies and programs are coordinated through the National Immunization Strategy (NIS), which is intended to facilitate the development of consistent and equitable approaches to planning, vaccine purchasing, program delivery and education. In addition, the Pan-Canadian Public Health Network (PHN) was established by Canada's F/P/T Ministers of Health to further facilitate intergovernmental cooperation on public health matters. However, P/T governments are not required to publicly fund drugs recommended by the NACI.

P/T governments are separately responsible for the administration and cost of publicly funded immunization programs for the populations in their jurisdictions. Immunization policies and schedules are independently developed by P/T governments. All vaccines listed on each P/T immunization schedule are publicly funded.

Provinces and territories are responsible for buying the vaccines that they use in their programs. The federal government manages a centralized Bulk Procurement Program (BPP) for vaccines through Public Services and Procurement Canada (PSPC), which utilizes a tendering process to negotiate prices, and award contracts on behalf of the provincial and territorial governments. The P/T governments use these contracts to purchase vaccines for public programs and then supply them to local public health clinics, doctors' offices, and pharmacies.

Australia

The Therapeutic Goods Administration (TGA) is responsible for assessing vaccines and other medicines before they can be used in Australia. The TGA's decision of whether to register a vaccine for use in Australia is informed by the advice of the Advisory Committee on Vaccines (ACV). The ACV is an independent committee appointed by the Australian Government Minister for Health. The TGA monitors vaccines for safety after they are supplied in Australia, publishing reports in the Database of Adverse Event Notifications (DAEN).

Under the framework of the National Immunisation Program (NIP), the Australian Technical Advisory Group on Immunisation (ATAGI) develops guidelines and provides technical advice to the Australian Government Minister for Health on the medical administration of vaccines available in Australia. In addition to technical experts, ATAGI's membership includes a consumer and general practitioners. All vaccines listed on the national immunization schedule are publicly funded.

The National Partnership on Essential Vaccines (NPEV) describes the arrangements for the funding and delivery of vaccines covered by the NIP, including the roles and responsibilities of the Australian government, and states and territories. The national government has responsibility for actually purchasing vaccines under the NIP, and it makes them available to the States free of charge for administration to patients in their areas. The National Immunisation Committee (NIC) facilitates national consistency in the availability and pricing of vaccines, and developing national policies. The NIC

reports to the Australian Health Protection Principal Committee of the Australian Health Ministers' Advisory Council through the Communicable Diseases Network Australia.

New vaccines also undergo evaluation of cost-effectiveness by the Pharmaceutical Benefits Advisory Committee (PBAC). Before a vaccine is funded through the NIP or subsidized under the Pharmaceutical Benefits Scheme, the PBAC assesses the cost-effectiveness. The PBAC then provides advice to the Minister for Health.

United Kingdom

New vaccines are approved for use and sale by the national Medicines & Healthcare products Regulatory Agency (MHRA).

The development and implementation of immunization policy is led and coordinated by the Department of Health (DH). All vaccines listed on the national immunization schedule are publicly funded by the National Health Service (NHS).

The Joint Committee on Vaccination and Immunisation (JCVI) considers the cost-effectiveness of new vaccines and provides recommendations and advice to the UK Health Ministers on the national immunization schedule. The JVCI is the only UK body that makes immunization recommendations. The JCVI is comprised of 16 members, 15 of which are immunization experts, and one is a consumer representative.

In addition to the JCVI assessment, the DH is also required to undertake a Policy Impact Assessment, which includes a cost benefit analysis. Policy Impact Assessments are designed to ensure that best policy-making practice is adopted, and they take a wider societal perspective than the perspective adopted by the JCVI. If the JCVI recommends the use of a vaccine, then the DH is required by the NHS Constitution to procure it. The DH can reject a JCVI recommendation on the basis of the Impact Assessment. The DH may also procure vaccines that are not yet supported by cost-effectiveness evidence when costs are considered secondary to public health, particularly for vaccines for emergencies. Otherwise, the DH ensures that the JCVI's recommendations are implemented with funds from within the overall health care budget.

Public Health England (PHE) undertakes the purchase, and distribution of most vaccines at a national level. The prices of vaccines covered by the NHS are determined via centralized procurement based on competitive tender. For new vaccines, prices are subject to the Pharmaceutical Price Regulation Scheme (PPRS).

New Zealand

MEDSAFE, a division of the Ministry of Health, is the government agency responsible for approving new vaccines for use in New Zealand.

The Ministry of Health is responsible for and manages the National Immunisation Programme. All vaccines listed on the national immunization schedule are publicly funded.

The government organisation responsible for determining which medicines will be publicly funded is PHARMAC. PHARMAC assesses the vaccine, on the advice of the immunisation subcommittee of the Pharmacology and Therapeutics Advisory Committee [PTAC]. The immunization subcommittee is comprised of 12 immunization experts. A separate standing Consumer Advisory Committee provides advice to PHARMAC regarding consumer perspectives related to medicines, including vaccines.

All publicly funded vaccines are listed on PHARMAC's Pharmaceutical Schedule, and the district health boards (DHBs) are responsible for funding these once PHARMAC has listed them.

United States

The Food and Drug Administration (FDA) Center for Biologics Evaluation and Research (CBER) is responsible for regulating vaccines in the United States. After approving a new vaccine, the FDA continues to monitor the safety of the product through the Vaccine Adverse Event Reporting System (VAERS).

Recommendations for vaccine use in the United States are the responsibility of the Centers for Disease Control and Prevention (CDC) through its Advisory Committee on Immunization Practices (ACIP). The ACIP includes 15

voting members responsible for making vaccine recommendations. The Secretary of the U.S. Department of Health and Human Services selects these members following an application and nomination process. Fourteen of the members have expertise in vaccinology, immunology, pediatrics, internal medicine, nursing, family medicine, virology, public health, infectious diseases, and/or preventive medicine; one member is a consumer representative who provides perspectives on the social and community aspects of vaccination. In addition to the 15 voting members, ACIP includes 8 ex officio members who represent other federal agencies with responsibility for immunization programs in the United States, and 30 non-voting representatives of liaison organizations that bring related immunization expertise. Members and representatives serve on the Committee voluntarily.

The prices of vaccines are not regulated in the United States. Prices are determined through negotiations between manufacturers and public or private payers.

Section 317 of the Public Health Service Act authorizes the federal purchase of vaccines to vaccinate uninsured or underinsured children, adolescents, and adults. Section 317 includes provisions for federal funding of mass vaccinations regardless of insurance status, for children, adolescents, and adults during outbreaks of diseases. Section 317 discretionary funding also supports immunization program operations at the local, state, and national levels.

The Vaccines for Children (VFC) program is a federally funded entitlement program that provides vaccines at no cost to eligible children. CDC provides the routinely recommended childhood and adolescent vaccines at no charge to participating VFC providers. Children are eligible for the VFC Program if they are younger than 19 years of age and are eligible for Medicaid or are deemed to be uninsured or underinsured for the necessary vaccines.

Regulatory Approvals Performance

Each country studied, publishes data on the performance of its regulatory approval process. However, the data are not standardized across jurisdictions. There are substantial differences regarding the level of detail made publicly available. No jurisdiction publishes data specific to vaccines. Canada is the only jurisdiction that publishes separate data for biologics. There is also no congruence regarding the statistical measures used to assess performance, with some jurisdictions using medians and others using means to mark processing time, and there are varying definitions of which stages of the process are included in time measurements. Nevertheless, some rough comparisons can be made using the most recent available data from each jurisdiction.

The most recent publicly available data for Canada were current to the fiscal year ending March 31, 2020. The data included 11 approved biologic drugs classified as New Active Substances (NAS). The time taken by the regulatory process is defined as the total number of calendar days between the date a submission is filed and the date it is approved, including processing, screening, review and any time taken by the company to respond to notices of deficiency or non-compliance. Regulatory processing time per approved NAS, ranged from 221 days to 1033 days in 2019-2020. The median regulatory processing time was 346 days, and the average was 389 days. (Health Canada 2020a)

The most recent publicly available data for Australia's regulatory process covered the two fiscal years ending June 30, 2020. The data included all new chemical entities or new biological entities approved during the time frame. Processing and approval times are defined as the number of working days from the acceptance of an application until formal notification of decision, excluding time waiting for the sponsor to provide additional information, pay fees, mutual clock stop, public holidays, and weekends. Median regulatory approval process time ranged from 196 days to 202 days. Australia is unique among the five jurisdictions studied because it has legislated time frames for completion of the regulatory approvals process: maximum 40 working days for notification of whether the application has passed preliminary assessment, plus 255 working days for completion of the evaluation and notification of the

decision for standard reviews, and 150 working days for priority reviews. (TGA 2020)

The most recent publicly available data for the regulatory approval process in the UK covered the fiscal year ending September 30 , 2020. The UK regulator, MHRA, provides little detail regarding its performance. Summary charts were available that showed the time to determine the outcome of an application for a new marketing authorization for a drug product. Data were not shown separately for biologic products. The available data show that 90% of applications are completed within a range of about 270 days to 475 days. No definition of regulatory process time was included in the available document, nor were any details publicly available from the MHRA. (GOV.UK 2020)

The most recent publicly available data for the regulatory approval process in New Zealand cover the calendar year 2017. New Zealand's regulator, MEDSAFE, does not report performance data for new active substances, new chemical or biological entities, or new molecular entities. Data are reported for "new and changed medicines" together and classified according to high versus intermediate risk, or priority status. Data are further classified by "full" versus "abbreviated" evaluation status. Data were published for "total time" are calculated from the date of payment of the application fee, to the completion of evaluation, including time taken by the applicant to respond to any request for information. Separate data are published for processing time defined as the number of calendar days that the regulator spent on evaluating applications excluding time taken by the applicant. Data for total time, full evaluation, high and intermediate risk applications showed mean regulatory approval process time ranging from 503 days to 711 days. Data specific to the regulators time, full evaluation, high and intermediate risk applications showed mean regulatory approval process time ranging from 342 days to 516 days. (MEDSAFE 2018)

The most recent publicly available data for the regulatory approval process in the United States were current to the fiscal year ending September 30, 2019. The data included all filed new drug applications (NDA) and biologic license applications (BLA) together, with 13 new molecular entities (NME) separately indicated. Approval time includes time with the FDA, time with the sponsor, and the total time on the application. The data show the median regulatory approval process time for all NME submissions ranged from 156 days to 336 days in 2018-2019. The median time was 241 days, and the average was 232 days. (FDA 2019)

National Expenditures on Vaccines

There is no published source of reliable data on the global market for vaccines, nor for sales of vaccines across the five countries studied. A variety of estimates for the global market have been published which show little consistency. IQVIA is considered to be one of the most authoritative sources of proprietary data on pharmaceutical sales. IQVIA has not published any data specific to vaccines that is readily available in the public domain, but has made some data publicly available on global sales of all pharmaceuticals, and for antibiotics and vaccines together. From these data, a rough estimate of expenditures on vaccines can be extrapolated.

IQVIA estimates that global sales of pharmaceuticals in 2018 were US$1,204.8 billion. Of this, the United States

TABLE 2: Antibiotics and Vaccines Share of National Health Expenditure, US$ millions, 2018.

	AUS	CAN	GBR	NZL	USA
Estimated national expenditure on antibiotics and vaccines.	$596.2	$975.6	$1,300.0	$43.4	$21,800.0
National health expenditure.	$124,027.4	$195,939.5	$285,100.8	$19,481.6	$3,475,021.5
Antibiotics and vaccines share of national health expenditure.	0.48%	0.49%	0.46%	0.23%	0.63%

SOURCES: IQVIA 2019; OECD 2020.

accounted for US$484.9 billion or 40.3 percent, the United Kingdom US$28.4 billion or 2.4 percent, Canada US$22.2 billion or 1.8 percent, and Australia US$13.1 billion or 1.1 percent. Comparable data were not publicly available from IQVIA for New Zealand. Data from the OECD show that pharmaceutical sales in New Zealand in 2018 were US$0.91 billion or 0.08 percent of the global total reported by IQVIA. (IQVIA 2019; OECD 2020)

Further, based on a sample of 8 developed countries including the United States, France, Germany, Italy, Spain, United Kingdom, Japan, and Canada, plus 6 emerging countries including China, Brazil, Russia, India, Turkey, and Mexico, IQVIA reported 2018 spending on antibiotics and vaccines was 4.5 percent of the total spent on all pharmaceuticals by these countries (IQVIA 2019). Extrapolating the percentage of total spending in 2018 among these countries against total global pharmaceutical sales in 2018 produces an estimate of US$54.2 billion for global sales for antibiotics and vaccines. Applying the percentages of total global pharmaceutical sales for each of the countries studied, produces an estimate of spending on antibiotics and vaccines in 2018, by country as follows: Australia US$596.2 million, Canada US$975.6 million, New Zealand US$43.4 million, United Kingdom US$1.3 billion, and the United States US$21.8 billion.

Based on published data sources, this estimate is as close as possible for total market spending on vaccines by country, yet it still represents an over-estimate because it includes spending on antibiotics, which could not be separated from the data. Nevertheless, national expenditures on antibiotics and vaccines together account for 0.49 percent (<1%) of national health expenditure in Canada, and 0.46 percent on average across all five countries. [TABLE 2]

Routine Immunization Schedules

TABLES 3a and 3b show the routine immunization schedules (RIS) for the 10 provinces and three territories, and the national immunization schedule recommended by NACI in Canada. Also shown are the national immunization schedules for Australia, United Kingdom,

TABLE 3a: Adult Routine Immunization Schedules: Coverage of 23 available vaccines.

VACCINES -ADULT	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YT	NT	NU	CAN/NACI	AUS	GBR	NZL	USA
HepA																	O	X
HepA-HepB																		X
HepB																	O	X
Hib																	O	X
HPV																	O	X
IIV (Inf) inactive																X	X	X
Inf	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
LAIV (Inf) Live																		X
MenACWY																		X
MenB-4C																		X
MenB-FHbp																		X
MMR																		X
P (Pertussis-Preg W)															X	X		
PCV-13															X		O	X
Pneu-P-23 (USA-PPSV23)	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X
RIV (Inf)																		X
RZV (zos)																		X
TB																	O	
Td	X	X	X	X	X	X	X	X			X		X	X				X
Tdap		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
VAR																	O	X
Zos						X								X				
ZVL (zos)															X	X	X	X
FULL ACCESS (X)	3	4	4	4	4	5	4	4	3	3	4	3	4	5	3	4	3	19
SPECIAL ACCESS (O)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0

SOURCES: Government of Canada (2020b, 2020c); US HHS (2020); Australian Government (2020); Ministry of Health NZ (2020); UK NHS (2020).

New Zealand and the United States. Childhood vaccines are shown separately from those recommended for adults.

International schedules vary significantly. New Zealand's schedule contains many vaccines recommended for special cases only. The US schedule includes the largest number of available vaccines; twice as many as recommended by Canada's NACI.

In Canada, NACI recommendations are designed to encourage uniformity across the various provincial and territorial routine immunization schedules. However, there is only a moderate degree of congruence between NACI recommendations and vaccines listed on provincial-territorial RIS. There are several vaccine products that have been recommended by the NACI that are not uniformly covered by the provincial and territorial governments.

TABLE 3b: Childhood Routine Immunization Schedules: Coverage of 35 available vaccines.

VACCINES-CHILD	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	YT	NT	NU	CAN/NACI	AUS	GBR	NZL	USA
BCG													X	X		O		
DT																		X
DTaP															X			X
DTaP-HB-IPV-Hib	X	X				X			X		X			X	X	X	X	
Dtap-HepB-IPV																		X
DTaP-IPV-Hib	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
HA																	O	X
HAHB						X								X				
HB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		O	X
Hib/MenC																X		
Hib (PRP-OMP)																		X
Hib (PRP-T)															X		X	X
HPV	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IIV (inf inactive)																O		X
LAIV (inf live)																X		X
MenACWY															X	X	O	
MenACWY-CRM																		X
MenACWY-D																		X
MenB-4C																X		X
MenB-FHbp																		X
Men-C-ACYW-135	X	X	X	X	X		X	X	X	X	X	X	X	X				
Men-C-C	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
MMR	X				X						X			X	X	X	X	X
MMR-V	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X
Pneu-C-10						X								X			X	
Pneu-C-13	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X
IPV (Poliovirus)																		X
Rota	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
RV1																		X
RV5																		X
TB																	O	
Td						X								X				X
Td/IPV																X		
Tdap	X	X	X	X	X		X	X	X	X	X	X	X	X			X	X
Tdap-IPV	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Var	X		X		X	X	X				X		X	X			X	X
FULL ACCESS (X)	13	11	11	10	12	13	11	10	11	10	13	9	12	17	9	11	9	25
SPECIAL ACCESS (O)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0

SOURCES: Government of Canada (2020b, 2020c); US HHS (2020); Australian Government (2020); Ministry of Health NZ (2020); UK NHS (2020).

Comparing Canadian Policy for Vaccines versus other Pharmaceuticals

The Canadian policy environment for vaccines differs substantially from the policy environment applied to other types of pharmaceutical products. This section of the paper examines key differences regarding regulatory approval, price regulation, health technology assessment, public procurement and funding mechanisms, and spending on vaccines versus total pharmaceutical spending and total health spending.

Regulatory Approval

As described earlier, new vaccines are classified as biologic pharmaceutical products, and therefore receive regulatory approval from Health Canada's BRDD. All non-biologic pharmaceutical products receive regulatory approval from Health Canada's Therapeutic Products Directorate (TPD). The most recent data from the fiscal year ending March 31, 2020, show that in 2019-2020, the BRDD received 13 submissions for new active substances and approved 11 (85 percent) for a notice of compliance. By comparison, the TPD received 31 submissions for new active substances in 2019-2020 and approved 24 (77 percent) for a notice of compliance. For the drugs that were approved, it took the BRDD from 221 days to 1033 days (average 389 days) to approve a new biologic drug product. By comparison, it took the TPD from 205 days to 1121 days (average 376 days) to approve a new biologic drug product. (Health Canada 2020a, 2020b)

Price Regulation

All biologic and pharmaceutical products, including vaccines are subject to price regulation by the Patented Medicine Prices Review Board (PMPRB). In January 2021, the PMPRB will implement revised regulatory guidelines governing price controls for patented prescription drugs. The guidelines introduce several rule changes, one of which is the addition of pharmacoeconomic value assessment to determine regulated prices. In a submission to the PMPRB Draft Guidelines Consultation, the Public Health Agency of Canada's (PHAC) Centre for Immunization and Respiratory Infectious Diseases (CIRID 2020) expressed reservations regarding the proposed regulatory changes and their particular impact on vaccines. CIRID noted that the pharmacoeconomic methods that the PMPRB intends to use are not entirely relevant to vaccines because several pharmacoeconomic factors were excluded that should be considered for vaccines including costs and effects outside the health care system, population level benefits, herd effects, coverage levels, waning immunity and need for booster doses and disease carriage. CIRID also argued that the cost per quality adjusted life year (QALY) threshold for vaccines is too rigid.

The revised regulatory guidelines also impose significant further price reductions for drug products with larger patient populations. The PMPRB refers to the rule as the market size factor. Industry groups have raised concerns that the PMPRB's market size threshold conflicts with the Public Health Agency of Canada vaccination rate targets, because the rule penalizes manufacturers when revenues hit a certain threshold. This disincentives companies from providing higher volumes of vaccines, and conflicts with the public health mandate to achieve herd immunity, which requires large volumes of vaccine to protect the population. (VIC 2020)

Health Technology Assessment

All drugs, including vaccines, are subject to health technology assessment (HTA) before they become eligible for public funding. However, the process is different for vaccines. New vaccines are subject to HTA evaluation by the NACI. All other new medicines are subject to HTA evaluation by the Canadian Agency for Drugs and Technology and Health (CADTH).[1]

NACI differs from CADTH in several ways, including its mandate, membership, and process. The key differences between the NACI and the CADTH are summarized in TABLE 4.

Notably, while both the NACI and the CADTH use pharmacoeconomic evaluation, the NACI has only

[1] INESSS for Quebec.

recently stated its intention to use such methods. Concerns have been expressed that NACI's mandate to conduct pharmacoeconomic assessments is currently under development and there is no clear deadline for implementation. An industry analysis found that the NACI currently can take up to 650 days to publish its scientific recommendations. The worry is that subjecting vaccines to pharmacoeconomic analysis will unnecessarily further delay access to vaccines, which are typically priced well below cost effectiveness thresholds. (VIC 2020)

TABLE 4: Comparison of the NACI and the CADTH.

	NACI	*CADTH*
Mandate	• Provide the PHAC with ongoing and timely medical, scientific, and public health advice relating to immunization. Decision factors include: the burden of disease, vaccine characteristics, and factors affecting publicly funded vaccine programs at provincial and territorial levels like economics, ethics, equity, feasibility, and acceptability.	• Conduct clinical and economic evaluations for drugs and provide reimbursement recommendations to federal, provincial, and territorial publicly funded drug plans.
Membership	• 16 appointed volunteer members based on expertise. No public members.	• The Canadian Drug Expert Committee (CDEC) is an appointed, pan-Canadian advisory body to CADTH composed of 15 individuals with expertise in drug therapy, drug evaluation and drug utilization, and public members. • The Patient and Community Advisory Committee (PCAC) provides CADTH with advice on issues relevant to its mandate, from the perspective of those using the Canadian healthcare system. • The Pharmaceutical Advisory Committee comprises representatives from the F/P/T publicly funded drug plans and other related health organizations. It provides strategic advice on drug policy issues, including cancer-specific issues and drug topics, to CADTH and its Board. • The Pharmaceutical Advisory Committee Formulary Working Group for Health Technology Assessments (FWG-HTA) represents health ministries, and provides advice on CADTH optimal use projects. • The pan-Canadian Oncology Drug Review (pCODR) Expert Review Committee (pERC) assesses the clinical evidence and cost-effectiveness of cancer drugs in order to make recommendations to the provinces and territories to help guide their drug funding decisions. Comprised of 18 individuals with expertise in cancer drug therapy, drug violation and utilization, plus public members.
Process	• Voting at 3 meetings per year. • No timelines for reviews. • Work Plan subject to change according to priorities. • Summary of discussions sometimes posted online. • Unclear and changing process. • Unclear accountability. • No submission guidelines. • No comments on submission. • No appeal mechanism.	• Ongoing submission process with specific timelines attached to each step. • Clear process and submission guidelines. • Status of reviews available online. • Performance metrics. • Call for public inputs. • Layers of review to ensure objectivity. • Appeal mechanism. • Reports on manufacturer submission.

SOURCES: NACI and CADTH websites.

Public Procurement and Funding

Provincial and territorial governments procure vaccines based on non-mandatory recommendations made by NACI. Federal, provincial, and territorial public drug plans determine which prescription pharmaceuticals are included on the public formularies, based on non-mandatory recommendations made by CADTH. Public funding for vaccines is structured differently than public funding for pharmaceuticals. There is no dedicated budget for vaccines procurement that is comparable to the annual dedicated budgets that support public drug plans for their reimbursement of prescription drugs. Vaccines are funded out of public health budgets.

Expenditure

Spending on vaccines also differs in magnitude from spending on other prescribed drugs. A breakdown of national health expenditures by the use of funds is shown in TABLE 5. Using a similar calculation as the international estimates presented earlier, the most recent data from IQVIA suggest that national expenditures on antibiotics and vaccines in Canada are together about C$1.3 billion[2] (US$1.0 billion) in 2019 (IQVIA 2020), which amounts to 9.0 percent of the C$14.4 billion spent in Canada to support public health programs and immunization, and approximately 3.8 percent of the C$34.4 billion spent on prescribed drugs other than vaccines.

Summary Observations

- Canada's process for approving and covering new vaccines under publicly funded immunization programs is among the more complex of the 5 systems reviewed.
- The Australian regulatory process for granting marketing approval to a new drug is unique because it is subject to legislated timeframes for the completion of the evaluation and notification of regulatory approval.
- Extrapolating from available data, national expenditure on vaccines accounts for less than half of 1 percent of national total health expenditure in Canada and on average across all five countries.
- There is significant variation between the national immunization schedules of the countries reviewed.

TABLE 5: Total Health Spending by Use of Funds, 2019.

	EXPENDITURE [C$ millions]		Percentage of total
Hospitals	$	70,335	26.6%
Physicians	$	39,808	15.1%
Prescribed drugs	$	34,349	13.0%
Other institutions	$	28,884	10.9%
Other	$	20,617	7.8%
Dental services	$	16,852	6.4%
Public health	$	14,373	5.4%
Capital	$	9,092	3.4%
Administration	$	7,680	2.9%
Other services	$	6,413	2.4%
Non-prescribed drugs	$	5,992	2.3%
Vision care services	$	5,635	2.1%
Health research	$	4,406	1.7%
total	$	264,436	100.0%

SOURCE: Canadian Institute for Health information (2019).

[2] Bank of Canada. Average annual Canadian dollar to US dollar exchange rate 2019, 1.3269.

The United States schedule includes twice as many vaccines as any other jurisdiction.

- In Canada, there is moderate uniformity with NACI across provincial and territorial routine immunization schedules. However, several vaccines recommended by the NACI are not publicly funded in some provinces.
- The United Kingdom's National Health Service constitution requires all vaccines recommended by the JCVI for the national immunization schedule to be procured by the Department of Health. In Canada, it is not mandatory for provincial and territorial governments to procure the vaccines recommended by the NACI.
- Vaccines technical advisory bodies in Australia (ATAGI), United Kingdom (JCVI), New Zealand (PTAC), and United States (ACIP), include members representing consumers and patients, in addition to immunization experts. Canada's NACI does not include representatives for consumer and patient perspectives.
- Canadian policy affects vaccines differently than other pharmaceuticals:
- The PMPRB's pharmacoeconomic methods are not relevant to vaccines because several pharmacoeconomic factors were excluded that should be considered for vaccines.
- Unlike other pharmaceuticals, vaccines are purchased through a national Bulk Procurement Program using a competitive tendering process.
- Vaccines are funded without separate dedicated budgets as there are for pharmaceuticals through the F/P/T publicly funded drug plans.
- In Canada, spending on vaccines accounts for a very small percentage of total health spending, total spending on prescribed drugs, and total spending on the public health interventions.

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