


# Projected health and economic outcomes of extending public funding of pharmacy services to include administration of Pneu23 and Td/Tdap immunizations by pharmacy practitioners in New Brunswick

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Expanding scope of practice permits pharmacy professionals to provide an increasing array of services; however, these often lack public funding, which may limit accessibility. This study aims to support evidence-informed funding decisions for pharmacy services by modelling costs and benefits of extending public funding for immunizations administered by pharmacy professionals.

*L'élargissement du champ d'exercices permet aux professionnels de la pharmacie de fournir une plus grande gamme de services; cependant, ces services manquent souvent de financement public, ce qui peut en limiter l'accessibilité. Cette étude vise à soutenir des décisions de financement des services pharmaceutiques fondées sur des preuves en modélisant les coûts et les avantages de l'accroissement du financement public des vaccinations administrées par les professionnels de la pharmacie.*

## ABSTRACT



**Background:** Although legislation permits New Brunswick pharmacy professionals to administer a wide range of immunizations, public funding for these services is currently limited to immunizations against influenza and COVID-19 and was recently extended to include pneumococcal immunization (Pneu23) in individuals aged 65 years or older. We used administrative data to project health and economic outcomes associated with the current Pneu23 program and with extension of public funding to include: 1) younger adults aged 19 years or older in the Pneu23 program, and 2) tetanus boosters (Td/Tdap).

**Methods:** Two model scenarios were compared: a Physician-Only model in which physicians remain the only practitioners to administer publicly funded Pneu23 and Td/Tdap, and a Blended model in which this service is also provided by pharmacy

professionals. Immunization rates by practitioner type were projected based on physician billing data accessed via the New Brunswick Institute for Research, Data and Training in conjunction with trends observed with influenza immunization by pharmacists. These projections were used along with published data to estimate health and economic outcomes under each model.

**Results:** Public funding of Pneu23 (65+), Pneu23 (19+) and Td/Tdap (19+) administration by pharmacy professionals is projected to yield increased immunization rates and physician time savings compared with the Physician-Only model. Public funding of Pneu23 and Td/Tdap administration by pharmacy professionals in those aged  $\geq 19$  years would result in cost savings, owing primarily to productivity losses avoided in the working age population.

**Discussion:** Increased immunization rates, physician time savings and cost savings may be realized if public funding were extended to include administration of Pneu23 in younger adults and Td/Tdap, by pharmacy practitioners. *Can Pharm J (Ott)* 2023;156:215-224.

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## KNOWLEDGE INTO PRACTICE



- In most Canadian provinces, provincial funding only covers immunization by pharmacy professionals for a subset of the vaccines they are permitted to administer under their scope of practice.
- Using New Brunswick as a model, we project that expansion of provincial coverage to include administration by pharmacy professionals of tetanus and pneumonia immunizations in younger adults could be expected to increase vaccination rates, save physician time and yield cost savings for the province.
- These findings are relevant to evidence-informed policy-making surrounding health care spending and to advocacy efforts to support increased public funding of pharmacy services.

## Introduction

Evolving legislation is permitting increasing involvement of pharmacists and pharmacy technicians in the provision of immunization services across Canada. Although most provinces permit pharmacy professionals to administer and even prescribe a wide variety of vaccines, very few vaccines qualify for provincial reimbursement when administered by these professionals. Although pharmacy professionals are paid by all provinces to administer influenza and COVID-19 vaccines, only 4 provinces (New Brunswick, British Columbia, Alberta and Manitoba) pay pharmacy professionals to administer other vaccines; this is currently limited to immunizations against pneumonia, tetanus/pertussis and human papilloma virus.<sup>1</sup> Lack of provincial reimbursement creates a scenario in which patients wishing to take advantage of the convenience and accessibility offered by pharmacy-based vaccination services must pay for most vaccinations (including drug costs and service administration fees) out of pocket, even when, in the case of publicly funded vaccines, these same vaccinations are available through a physician or nurse practitioner (NP) (and in some cases a public health nurse) at no cost to the patient. This situation represents a barrier to accessible health services, particularly for those without a primary care provider, and a missed opportunity to take full advantage of the scope of practice of pharmacy professionals.

Several studies have found evidence of benefits associated with the addition of publicly funded influenza vaccines to the service repertoire of pharmacy professionals, including high patient satisfaction owing to convenience and accessibility,<sup>2</sup> increased vaccination rates,<sup>3-6</sup> reduced burden of illness<sup>6</sup> and cost savings resulting from decreased hospitalizations and reduced productivity losses due to illness and time off work to seek vaccination.<sup>6</sup> Similar benefits might reasonably be expected if public funding were to cover additional vaccines administered by pharmacy professionals.

## MISE EN PRATIQUE DES CONNAISSANCES



- Dans la plupart des provinces canadiennes, le financement provincial ne couvre la vaccination par les professionnels de la pharmacie que pour un sous-ensemble de vaccins qu'ils sont autorisés à administrer dans le cadre de leur pratique.
- En utilisant le Nouveau-Brunswick comme modèle, nous prévoyons que l'élargissement de la couverture provinciale afin d'inclure l'administration des vaccins contre le tétanos et la pneumonie par les professionnels de la pharmacie chez les jeunes adultes pourrait permettre d'augmenter les taux de vaccination, de faire gagner du temps aux médecins et de réaliser des économies pour la province.
- Ces résultats sont pertinents pour l'élaboration de politiques fondées sur des preuves concernant les dépenses en santé et pour les efforts de sensibilisation en faveur d'un plus grand financement public des services pharmaceutiques.

To better understand how expanding publicly funded immunization offerings in pharmacies might affect provincial spending, access to care and health outcomes, we modelled anticipated health and cost-related outcomes associated with the addition of 2 vaccines to the list of publicly funded immunizations available from pharmacy professionals in the province of New Brunswick (NB): pneumococcal polysaccharide (Pneu23) vaccine and tetanus-diphtheria/tetanus-diphtheria-acellular pertussis (Td/Tdap) boosters. As of December 2022, the Pneu23 vaccine is publicly reimbursed for NB residents aged 65 and older when administered by pharmacy professionals. We modelled outcomes associated with this newly implemented program and projected anticipated outcomes if the reimbursement program were expanded to include those aged 19 and older. Td/Tdap boosters are not currently reimbursed when administered by pharmacy professionals in NB. These boosters were selected for analysis owing to their broad indication criteria and ease of assessment for eligibility in a community pharmacy setting, which make them ideal candidates for widespread administration in pharmacies. We projected outcomes anticipated if Td/Tdap boosters were reimbursed when administered by pharmacy professionals to NB residents aged 19 and older, as this is the age group for which the service is most likely to be indicated.

Using administrative data accessed via the New Brunswick Institute for Research, Data and Training (NB-IRD), along with data from the literature, we projected health and cost outcomes associated with Pneu23 and Td/Tdap immunizations in the year 2023 under 2 models: 1) a Physician-Only model, in

which both vaccines continue to be publicly funded only when administered by physicians/NPs and 2) a Blended model, in which both vaccines are publicly funded when administered by pharmacy professionals in addition to physicians/NPs.

## Methods

### *Administrative data sources*

Annual service counts and charges for vaccinations administered by physicians/NPs to NB residents from 2005 to 2018 were obtained from NB physician billing data accessed through NB-IRDT. NB-IRDT data are pseudonymized and accessed according to established protocols to protect individual privacy. Study protocol was approved by the University of New Brunswick Research Ethics Board. Reported dollar values are in CAD. Vaccination counts were randomly rounded<sup>7</sup> to minimize the risk of disclosure associated with cell counts less than 5.

### *Vaccination counts by model and service provider*

The number of Pneu23 vaccinations administered under the Physician-Only model was projected using linear regression based on NB physician billing data for Pneu23 (in individuals aged  $\geq 65$  and  $\geq 19$  years) from 2005 to 2018. Td/Tdap counts under the Physician-Only model were projected by taking the average annual rate of change in Td/Tdap vaccine counts (age  $\geq 19$  years) for 2005 to 2010 and applying it iteratively to the 2018 Td/Tdap count to yield an estimate for 2023. This approach was taken because NB experienced several pertussis outbreaks starting in 2011; projections were made using 2005 to 2010 data as this period reflected linear growth typical of non-outbreak periods.

Previous studies show that when pharmacists began administering influenza vaccines, an overall increase in vaccination coverage was observed ranging from 7.8% to 16.8%,<sup>4,5</sup> presumably owing to the increased accessibility provided by the advent of immunization service in pharmacies. We assumed a similar average increase would occur under our Blended model. Therefore, we applied a 12.3% increase to our Physician-Only model estimates to estimate vaccine counts under the Blended model. Sensitivity analyses were also performed using 7.8% and 16.8% as lower and upper bound estimates.

To estimate the proportion of total immunizations administered by pharmacy professionals under the Blended model, we projected the proportion of influenza immunizations administered by pharmacy professionals in 2023 and assumed they would administer the same proportion of Pneu23 and Td/Tdap. Influenza immunizations by pharmacy professionals and physicians in 2023 were projected using linear regression, based on published service totals for pharmacists from 2014 to 2019,<sup>8</sup> and on NB physician billing claims for ages  $\geq 5$  years from 2014 to 2017, respectively. The proportion of immunizations by pharmacy professionals was calculated as a proportion of the total physician plus pharmacy professional immunizations

in 2023. Sensitivity analyses were also performed using fixed values of 25%, 50%, 75% and 100% for the proportion of immunizations performed by pharmacy professionals.

### *Vaccine acquisition costs*

The costs paid by the province to acquire Pneu23 and Td/Tdap vaccines for use under the 2023 models were estimated based on distributor prices, obtained from McKesson Canada in July 2021. The cost for Td/Tdap was taken as the weighted average of costs for the Td and Tdap products, weighted by the relative proportional use of these products based on 2018 NB physician billing claims. We applied a 42.5% reduction to distributor prices to reflect typical market price discounts on vaccine purchases by Canadian provinces.<sup>6</sup> The resulting prices were multiplied by projected vaccination counts to estimate total acquisition costs in the 2023 models.

### *Vaccine administration service costs*

The cost paid by the province to pharmacy professionals for vaccine administration under the 2023 models was taken as \$13 per dose, which is the currently reimbursed service fee for the Pneu23 vaccine. Since physician service fees change annually, linear regression based on claims from 2005 to 2018 was used to project service fees in 2023. Physician fees vary by vaccine product and whether vaccination is coincident with other services, so separate projections were made for different vaccine products and service contexts. Projected physician and pharmacist fees were multiplied by corresponding vaccine count projections to yield total service cost estimates in the 2023 models.

### *Physician time saved*

Physician time savings under the Blended model was estimated based on the number of vaccinations “taken over” by pharmacy professionals from physicians under this model. The number of vaccinations contributing to physician time savings was taken as the number administered by pharmacy professionals under the Blended model, less the additional 12.3% administered under the Blended model compared with the Physician-Only model (which were assumed to be administered exclusively by pharmacy professionals). A vaccine administration time of 10.4 minutes was used, based on previously reported mean vaccine appointment time for adults.<sup>9</sup> Time savings were calculated by multiplying number of vaccines “taken over” by administration time.

### *Pneumonia hospitalizations avoided and associated cost savings*

Pneumonia hospitalizations avoided under the Blended model were estimated for individuals aged  $\geq 65$  years by multiplying: 1) number of additional Pneu23 vaccinations projected for that age group under the Blended model compared with the Physician-Only model (790); 2) the base risk of hospitalization due to pneumonia for age  $\geq 65$  years in NB in 2023 (974 cases per 100,000 population), estimated using published hospitalization rate

projections<sup>10</sup> and projection of Census population estimates<sup>11</sup> to 2023; and 3) estimated vaccine effectiveness of Pneu23 (0.152).<sup>12</sup> Cost per pneumonia hospitalization in NB in 2023 was estimated at \$10,436.60, using published cost projections for 2015 and 2025<sup>10</sup> and assuming linear annual cost increase. This value was multiplied by hospitalizations avoided to give total cost savings.

#### *Productivity losses avoided—time off work for immunization*

It was assumed that working individuals would take 2 hours off work to be immunized by a physician during office hours,<sup>6</sup> whereas those immunized by pharmacy professionals would avoid missing work by attending a pharmacy during non-working hours. Only those vaccinations “taken over” by pharmacy professionals under the Blended model were considered to contribute to productivity losses avoided in this manner. These numbers were adjusted to include only individuals of working age (19-64 years), based on age-specific projected vaccine counts in 2023, and further adjusted to account for the NB unemployment rate as of June 2021 (0.093),<sup>13</sup> then multiplied by 2 hours to yield total working hours saved. This value was multiplied by the average hourly wage in NB (\$23.90, derived from Statistics Canada annual income in NB<sup>14</sup> projected to 2023 using linear regression and assuming 1950 working hours per year) to yield total avoided productivity losses in dollars.

#### *Productivity losses avoided—time off work due to illness*

Productivity losses avoided associated with time off work due to illness (invasive pneumococcal disease [IPD] and pertussis) were estimated based on the number of additional immunizations administered under the Blended model (considering Pneu23 and Tdap, but not Td), adjusted to reflect the working age population and NB's unemployment rate.<sup>13</sup> The resulting values for Pneu23 and Tdap were multiplied by the corresponding base risk of illness (9.7/100,000 for IPD,<sup>15</sup> 5/100,000 for pertussis<sup>16</sup>) and estimated vaccine effectiveness (0.8 for IPD,<sup>17</sup> 0.753 for pertussis<sup>18</sup>) to yield the number of cases avoided. These values were multiplied by the average time off work per case (45 hours for both community-acquired pneumonia<sup>19</sup> and pertussis,<sup>20</sup> assuming 7.5-hour workdays) and the projected average NB hourly wage, to yield productivity losses avoided in hours and dollars, respectively.

## Results

#### *Vaccination counts by model and service provider*

The number of vaccinations projected to be administered under the Physician-Only model are 6420 Pneu23 to individuals aged  $\geq 65$  years, 9069 Pneu23 to individuals aged  $\geq 19$  years and 11,743 Td/Tdap. Increased vaccination rates are projected under the Blended model owing to the increased accessibility to immunization services afforded by pharmacy professionals, for a total of 7210 Pneu23 in age  $\geq 65$  years, 10,184

Pneu23 in age  $\geq 19$  years and 13,187 Td/Tdap. This represents an additional 790 Pneu23 immunizations (sensitivity analysis range 501-1079) expected to be administered under the current Pneu23 reimbursement program for individuals aged  $\geq 65$  years (Table 1), compared with the Physician-Only model in 2023. The Blended model predicts that this number would increase to 1115 (707-1523) additional Pneu23 immunizations if eligibility were extended to include those aged  $\geq 19$  years. An additional 1444 (916-1973) Td/Tdap immunizations are predicted under the Blended model. Pharmacy professionals are projected to administer 61.1% of all immunizations (i.e., 4404 Pneu23 in age  $\geq 65$  years, 6221 Pneu23 in age  $\geq 19$  years and 8055 Td/Tdap) under the Blended model.

#### *Vaccine acquisition and administration costs*

Combined vaccine purchase and administration service costs are estimated at \$198,409.52, \$279,796.65 and \$414,760.88, respectively, for Pneu23 in  $\geq 65$  years,  $\geq 19$  years and Td/Tdap under the Physician-Only model and \$218,745.11, \$308,785.51 and \$455,148.04 under the Blended model in 2023. Although pharmacy professionals are paid a lower average administration service fee per dose (\$13) compared with physicians (\$13.92, \$13.87 and \$14.32 for Pneu23 in  $\geq 65$  years,  $\geq 19$  years and Td/Tdap, respectively), total costs are nevertheless higher under the Blended model owing to the increased number of immunizations administered, with a similar cost differential anticipated annually. Cost differential between the models is sensitive to both the proportional increase in vaccinations administered and the proportion of immunizations performed by pharmacists under the Blended model (Table 1).

#### *Physician time saved*

An estimated 627 hours, 885 hours and 1146 hours of physician time is projected to be saved associated with Pneu23 in  $\geq 65$  years,  $\geq 19$  years and Td/Tdap, respectively, under the Blended model in 2023 as a result of pharmacy professionals sharing vaccine administration responsibilities, taking over 3615, 5106 and 6611 vaccination appointments from physicians. Similar time savings are anticipated on an annual basis. Physician time saved is sensitive to both the proportional increase in vaccinations administered and the proportion of immunizations performed by pharmacy professionals under the Blended model (Table 1).

#### *Pneumonia hospitalizations avoided*

An estimated 790 additional individuals aged  $\geq 65$  years are vaccinated with Pneu23 under the Blended model, resulting in the avoidance of 1.17 hospitalizations for pneumonia among this age group and an associated cost savings of \$12,201.70 in 2023. Similar avoided hospitalizations and cost savings are anticipated annually. Additional Pneu23 immunizations, pneumonia hospitalizations avoided and associated cost savings are sensitive to the proportional increase in vaccinations administered under the Blended model (Table 2).

**TABLE 1** Projected additional Pneu23 and Td/Tdap vaccinations administered, additional vaccine acquisition and administration service costs and projected hours of physician time saved under Blended model compared with Physician-Only model in 2023: base case and sensitivity analyses

	Additional vaccinations under Blended model (vs Physician-Only)	Additional vaccine acquisition cost under Blended model (vs Physician-Only)	Additional immunization service cost under Blended model (vs Physician-Only)	Total additional immunization cost under Blended model (vs Physician-Only)	Physician time saved under Blended model (vs Physician-Only) (hours)
<b>Pneu23 Age ≥ 65 years: Base case estimate</b> (1.2.3% increase in vaccinations administered; 61.1% administered by pharmacy professionals)	<b>790</b>	<b>\$13,408.80</b>	<b>\$6926.79</b>	<b>\$20,335.59</b>	<b>627</b>
<i>Pneu23 Age ≥ 65 years: Sensitivity analysis</i>					
Proportional increase in number of vaccinations administered under Blended model	501	\$8503.14	\$3067.06	\$11,570.20	646
	1079	\$18,314.46	\$10,786.52	\$29,100.98	607
	790	\$13,408.80	\$9330.36	\$22,739.16	176
	790	\$13,408.80	\$7665.15	\$21,073.95	488
	790	\$13,408.80	\$5999.94	\$19,408.74	800
	790	\$13,408.80	\$3283.18	\$16,691.98	1113
<b>Pneu23 Age ≥ 19 years: Base case estimate</b> (1.2.3% increase in vaccinations administered; 61.1% administered by pharmacy professionals)	<b>1115</b>	<b>\$18,940.71</b>	<b>\$10,048.15</b>	<b>\$28,988.86</b>	<b>885</b>
<i>Pneu23 Age ≥ 19 years: Sensitivity analysis</i>					
Proportional increase in number of vaccinations administered under Blended model	707	\$12,011.18	\$4604.26	\$16,615.44	913
	1523	\$25,870.24	\$15,492.04	\$41,362.28	857
	1115	\$18,940.71	\$13,253.55	\$32,194.26	248
	1115	\$18,940.71	\$11,032.83	\$29,973.54	689
	1115	\$18,940.71	\$8812.11	\$27,752.82	1131
	1115	\$18,940.71	\$6591.38	\$25,532.09	1572

(continued)

TABLE 1 (continued)

	Additional vaccinations under Blended model (vs Physician-Only)	Additional vaccine acquisition cost under Blended model (vs Physician-Only)	Additional immunization service cost under Blended model (vs Physician-Only)	Total additional immunization cost under Blended model (vs Physician-Only)	Physician time saved under Blended model (vs Physician-Only) (hours)
<b>Td/Tdap: Base case estimate</b> (12.3% increase in vaccinations administered; 61.1% administered by pharmacy professionals)	1444	\$30,333.04	\$10,054.12	\$40,387.16	1146
<i>Td/Tdap: Sensitivity analysis</i> Proportional increase in number of vaccinations administered under Blended model					
7.8% increase	916	\$19,235.59	\$2913.23	\$22,148.82	1182
16.8% increase	1973	\$41,430.49	\$17,195.01	\$58,625.50	1110
<i>Td/Tdap: Sensitivity analysis</i> Fixed proportions of vaccinations administered by pharmacy professionals					
25%	1444	\$30,333.04	\$16,332.70	\$46,665.74	321
50%	1444	\$30,333.04	\$11,982.86	\$42,315.90	893
75%	1444	\$30,333.04	\$7633.02	\$37,966.06	1464
100%	1444	\$30,333.04	\$3283.18	\$33,616.2	2035

Pneu23, pneumococcal polysaccharide; Td/Tdap, tetanus-diphtheria/tetanus-diphtheria-acellular pertussis.

**TABLE 2** Projected additional Pneu23 vaccinations and pneumonia hospitalizations avoided in  $\geq 65$ -year age group and associated cost savings, under Blended model compared with Physician-Only model in 2023—base case and sensitivity analyses

		<b>Additional Pneu23 vaccinations in <math>\geq 65</math>-year age group under Blended model (vs Physician-Only)</b>	<b>Pneumonia hospitalizations avoided in <math>\geq 65</math>-year age group under Blended model (vs Physician-Only)</b>	<b>Cost savings associated with hospitalizations avoided under Blended model (vs Physician-Only)</b>
<b>Base case estimate</b> (12.3% increase in vaccinations administered)		<b>790</b>	<b>1.17</b>	<b>\$12,201.70</b>
<i>Sensitivity analysis</i>	7.8% increase	501	0.74	\$7737.66
Proportional increase in number of vaccinations administered under Blended model	16.8% increase	1079	1.60	\$16,665.74

Pneu23, pneumococcal polysaccharide.

### *Productivity losses avoided*

Appointments for 1353 Pneu23 and 4607 Td/Tdap immunizations in employed individuals aged 19 to 64 are projected to be taken over by pharmacy professionals from physicians under the Blended model in 2023. Assuming that physician appointments would have required time off work, whereas pharmacy appointments would occur outside of working hours, we estimated productivity losses of 2705 and 9215 working hours corresponding to \$64,650.42 and \$220,230.12 for Pneu23 and Td/Tdap immunizations, respectively, would be avoided under the Blended model in 2023. Although increased vaccination rates are projected under the Blended model, estimated IPD and pertussis cases avoided and associated productivity losses avoided are negligible, owing largely to the low base risk of illness for these conditions. Similar productivity loss avoidance is anticipated annually. Productivity losses avoided are sensitive to both the proportional increase in vaccinations administered and the proportion of immunizations performed by pharmacists under the Blended model (Table 3).

### *Summary*

Compared with the Physician-Only model, our Blended model predicts an estimated 790 additional Pneu23 immunizations administered, 627 physician hours saved and \$8133.89 in net additional costs in 2023 associated with the recently implemented program that reimburses NB pharmacy professionals for Pneu23 administration in individuals aged  $\geq 65$  years (Table 4). If the program were expanded to include reimbursement for individuals aged  $\geq 19$  years, these projections are anticipated to change to 1115 additional Pneu23 immunizations administered, 885 physician hours saved and \$47,887.92 in net cost savings. If a similar program were implemented for

Td/Tdap administration in individuals aged  $\geq 19$  years, our Blended model predicts an associated 1444 additional Td/Tdap immunizations administered, 1146 physician hours saved and \$179,883.31 in net cost savings in 2023. Similar additional immunizations, physician hour savings and cost differential would be anticipated annually.

### **Discussion**

Canadian pharmacy professionals have played an instrumental role in administering publicly funded immunizations for influenza and COVID-19 and a limited selection of other publicly funded vaccines in certain provinces. Here we project outcomes and costs associated with a recently implemented pharmacy reimbursement program for Pneu23 and demonstrate the potential value of further extending provincial funding to cover pharmacist/technician administration of Pneu23 in younger adults and Td/Tdap boosters, using the province of New Brunswick as a model. Our projections suggest that these changes in funding policy would yield increased vaccination rates, physician time savings and cost savings for the province. Physician time savings may be used to roster additional patients or to improve access to care for existing patients and are therefore of potentially significant value given the ongoing challenges in access to physician care faced by New Brunswick and other provinces. Notably, our projections suggest that while the current program reimbursing pharmacy professionals for Pneu23 immunization in those aged  $\geq 65$  years is more costly than a Physician-Only approach, cost savings could be realized by expanding the program to include younger adults and Td/Tdap immunization, owing primarily to productivity losses avoided in the working-age population. These findings are relevant to evidence-informed policy-making and

**TABLE 3** Projected illness cases and productivity losses avoided in workforce under Blended model compared with Physician-Only model in 2023—base case and sensitivity analyses

	Productivity losses avoided in workforce due to vaccination appointments under Blended model (vs Physician-Only) (hours)	Illness cases (IPD for Pneu23, Tdap) avoided in workforce under Blended model (vs Physician-Only) (hours)	Productivity losses avoided in workforce due to illness cases avoided under Blended model (vs Physician-Only) (hours)	Total productivity losses avoided under Blended model (vs Physician-Only) (dollars)
<b>Pneu23: Base case estimate</b> (12.3% increase in vaccinations administered; 61.1% administered by pharmacy professionals)	<b>2705</b>	<b>0.023</b>	<b>1</b>	<b>\$64,675.08</b>
<i>Pneu23: Sensitivity analysis</i>				
Proportional increase in number of vaccinations administered under Blended model	2789	0.015	1	\$66,677.01
	2621	0.031	1.5	\$62,673.15
<i>Pneu23: Sensitivity analysis</i>				
Fixed proportions of vaccinations administered by pharmacy professionals	758	0.023	1	\$18,139.87
	2107	0.023	1	\$50,379.76
	3456	0.023	1	\$82,619.66
	4805	0.023	1	\$114,859.56
<b>Td/Tdap: Base case estimate</b> (12.3% increase in vaccinations administered; 61.1% administered by pharmacy professionals)	<b>9215</b>	<b>0.038</b>	<b>2</b>	<b>\$220,270.47</b>
<i>Td/Tdap: Sensitivity analysis</i>				
Proportional increase in number of vaccinations administered under Blended model	9501	0.024	1	\$227,105.98
	8928	0.051	2.5	\$213,434.97
<i>Td/Tdap: Sensitivity analysis</i>				
Fixed proportions of vaccinations administered by pharmacy professionals	2582	0.038	2	\$61,749.37
	7177	0.038	2	\$171,573.82
	11772	0.038	2	\$281,398.26
	16367	0.038	2	\$391,222.71

IPD, invasive pneumococcal disease; Pneu23, pneumococcal polysaccharide; Td/Tdap, tetanus-diphtheria/tetanus-diphtheria-acellular pertussis.



**TABLE 4** Summary of estimated outcomes and associated cost savings under the Blended model compared with the Physician-Only model in 2023

	<b>Pneu23 Age ≥65 years Blended model (vs Physician-Only)</b>	<b>Pneu23 Age ≥19 years Blended model (vs Physician-Only)</b>	<b>Td/Tdap Blended model (vs Physician-Only)</b>
Additional vaccinations administered (Pneu23; Td/ Tdap) (expected annually)	790	1115	1444
<b>Additional costs</b>	<b>-\$20,335.59</b>	<b>-\$28,988.86</b>	<b>-\$40,387.16</b>
Physician hours saved (expected annually)	627	885	1146
Pneumonia hospitalizations avoided (expected annually)	1.17	1.17	—
<b>Cost savings</b>	<b>\$12,201.70</b>	<b>\$12,201.70</b>	<b>—</b>
Lost productivity hours avoided (expected annually)	—	2706	9217
<b>Cost savings</b>	<b>—</b>	<b>\$64,675.08</b>	<b>\$220,270.47</b>
<b>Net cost difference under Blended model (vs Physician-Only)</b>	<b>-\$8133.89</b>	<b>\$47,887.92</b>	<b>\$179,883.31</b>
	<b>Additional Costs</b>	<b>Cost Savings</b>	<b>Cost Savings</b>

Pneu23, pneumococcal polysaccharide; Td/Tdap, tetanus-diphtheria/tetanus-diphtheria-acellular pertussis.

advocacy efforts to expand public funding of pharmacist/technician clinical services across Canada, particularly since provincial funding for such services is limited to only a small number of indications in most jurisdictions.

Our projections rely on several assumptions and are therefore subject to limitations that must be acknowledged. We assumed a proportional increase in Pneu23 and Td/Tdap immunizations under the Blended model identical in magnitude to the increase observed when pharmacists began administering influenza immunizations in Canada. This assumption does not account for the possibility that some number of Pneu23 and Td/Tdap immunizations may be currently administered by NB pharmacy professionals and paid out-of-pocket by patients—a possibility that would result in our approach overestimating the increase in immunizations under the Blended model. The assumption also presumes that sufficient unvaccinated individuals exist in the population to support a 12.3% increase in immunization rate under the Blended model. We also assumed that the proportion of total immunizations administered by pharmacy professionals would be the same for Pneu23 and Td/Tdap as it is for influenza vaccine. It is possible, however, that the public may be less inclined to accept these newly introduced vaccine options from pharmacy professionals, at least initially.

Another assumption was that each immunization taken on by pharmacy professionals under the Blended model would translate to equivalent time saved for physicians. A limitation of this assumption is that some physicians may devote little of their own time to immunizations, instead delegating the task to nurses or physician assistants. Therefore, our estimate of physician time

saved could be viewed as an upper bound, with possibly less time saved depending on how commonly immunization is delegated. Alternatively, we may view time saved under the Blended model as general clinic time saved (by physicians or other staff) that could still be devoted to other tasks, potentially improving efficiency. A further possible limitation of our projections is that the majority of Pneu23 (88%) and Td/Tdap (83%) vaccinations by physicians occur in the context of an existing appointment made for another purpose. These “add-on” immunizations may be more time-efficient than stand-alone immunization appointments, so it is possible that our use of published averages for time-per-immunization may result in overestimation of time savings under the Blended model. Finally, we acknowledge that the accuracy of our projections beyond 2023 is not guaranteed due to shifting regulatory and market conditions. For example, a new pneumonia vaccine, Pneu-C-20, was added to the Canadian market in 2022. If provincial programs shift away from Pneu23 in favour of Pneu-C-20, our projections may be altered due to the new vaccine having a different price point.

## Conclusion

Expansion of public funding for pharmacist/technician immunization services to include broader age group eligibility and additional vaccines may yield increased vaccination rates, physician time savings and cost savings at the provincial level. Further work is required to explore whether these potential benefits are realized in practice and whether similar benefits may be associated with public funding of other pharmacy services. ■

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