Supplementary methods

Data sources and measures

The *Registre de vaccination du Québec* and Ontario's *COVax*$_{ON}$ system are primary databases maintained respectively by Québec's *Ministère de la Santé et des Services sociaux* and Ontario's *Ministry of Health*. These databases contain the most detailed vaccine data and are being used by governments and researchers to study vaccine effectiveness (e.g., Carazo et al., 2023).[1] Further, these databases were used extensively by the Ministries of Health to plan resource allocation, and therefore were regularly checked for data quality and updated as necessary. Note that these data sources are unrelated to COVAX, the World Health Organization's initiative for equitable access to COVID-19 vaccines.

Variables	Source	Definition
Population	Registered-persons databases	Number of people of a given age group in a dissemination area (DA), excluding long-term care home residents. These numbers were adjusted for over-vaccination through the following heuristic: if there were more doses than people in a given age group and DA by the end of the timeseries (Québec: October 23rd, 2021; Ontario: November 13th, 2021), we set the population size to the number of doses observed on that date.
After-tax income, per person equivalent (100% of census sample)	Postal Code Conversion File Plus Version 7A/7D	After-tax income is calculated for each household from the income for all household members. Calendar year 2015 is the reference period for all income variables in the 2016 Census. Single-person equivalent is used to account for households of different sizes. To account for differences in the cost of living, the ranking is calculated exclusively from DAs within the same census metropolitan area.
Proportion of visible minority (proportion racialized in the main text)	2016 Canadian Census *(25% of census sample)*	Visible minority refers to a person's self-identification as a visible minority as defined by the *Employment Equity Act*: "persons, other than Aboriginal peoples, who are non-Caucasian in race or non-white in colour." According to the 2021 Census Dictionary, "the visible minority population consists mainly of the following groups: South Asian, Chinese, Black, Filipino, Arab, Latin American, Southeast Asian, West Asian, Korean and Japanese."

Denominator for vaccination

The denominator used for the vaccination rate and the offset in the regression models was defined as $(population)_{i,a,t} - (cumulative\ number\ of\ first\ doses\ administered)_{i,a,t-1}$, where i is the dissemination area, a is the age group's index, and t is calendar time in weeks. For regression models 2a and 2b (see *Equations* section below), the age group a is omitted.

Identification strategy: interrupted time-series

We use an interrupted time-series approach to identify the impact of vaccine passports on vaccine coverage. This was preferred to a difference-in-difference analysis because of provincial differences in trends in vaccination rates prior to the announcement of vaccine passports (i.e., stable in Québec and decreasing in Ontario), violating the parallel trends assumption. For each province, we modeled the dissemination area (DA)-level weekly vaccination rate using negative binomial regression models to account for overdispersion (Supplementary Figures S12-S14), with an offset term for the population size without a first dose. The relationship between log-vaccination rate and calendar time was modeled using a natural spline (i.e., restricted cubic spline), with three knots placed at the 10th, 50th and 90th quantiles of the pre-announcement period.[2,3] Because pre-announcement vaccine coverage could influence subsequent weekly vaccination rates, we adjusted for DA-level vaccine coverage (age-stratified, except for models 2a and 2b which used vaccine data for the whole DA population) at the start of the study period (i.e., July 3rd, 2021). Baseline vaccine coverage was categorized into six groups: <50%, 50%–59%, 60%–69%, 70%–79%, 80–89%, and ≥90%.

For the interrupted time-series, the impact of the vaccine passport was modeled to have an immediate change in the level and slope of the vaccination rate—as measured by regression coefficients β and δ in the regression formulas (see *Equations* section). Based on inspection of the raw data, vaccine passports had transitory effects on vaccination rates. Additionally, there is evidence from other jurisdictions in Canada and Europe that the effects of proof-of-vaccination policies on vaccination rates are transient. For examples, see Figure 1 in Karaivanov and colleagues[4] and Figure 1 in Mills & Rüttenauer.[5]

The length of this impact period was determined empirically via model comparison (Akaike Information Criterion, Bayes Information Criterion, and visual assessment). In both provinces, the best fit was provided by an impact period of 6 weeks, going from August 14th to September 18th, 2021 (Québec) or September 4th to October 9th, 2021 (Ontario).

Length of study period

The study period was approximately 4 months, from July 3rd, 2021 to October 23rd, 2021 (Québec) or November 13th, 2021 (Ontario). This relatively short study period served two purposes:

1. To estimate and project a valid counterfactual temporal trend by excluding events prior to July that shaped trends in vaccination rates (i.e., age-based prioritization, limited vaccine supply before June 2021, hotspot strategy in Ontario from April to June 2021), and
2. To accurately attribute excess doses to the policy announcement and reduce the risk of confounding by ending the study period before other events that could have impacted vaccination uptake (e.g., approval of vaccines for youth aged 5 to 11, substantial reductions in remote-work policies by employers).

Equations for the interrupted time-series analyses

Main model

The main age-stratified model (model 1) takes the following form:

$$\log(\lambda_{i,a,t}) = \alpha + f(T_t) + \beta P_t + \delta(T_t - I)P_t + \sum_{a'}[\gamma_{a'} + f_{a'}(T_t) + \beta_{a'}P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_{c}(\psi_c \times C_{i,a,c}) + offset(p_{i,a,t}),$$

where $\lambda_{i,a,t}$ is the predicted weekly first-dose vaccination rate in dissemination area i, age group a, and week t; α is the model's intercept; $f(T_t)$ is the natural cubic spline function of calendar time in weeks T_t; β is the level change (for the reference group) in log vaccination rates during the impact period of the vaccine passport (i.e., the six weeks over which the policy is presumed to have an effect); P_t is the indicator variable for the impact period (its value is 1 during the six weeks of the impact period and 0 otherwise); δ is the coefficient for the slope change (for the reference group) in log vaccination rates during the impact period of vaccine passports and I indicates the week during which vaccine passports are announced; $\gamma_{a'}$ is the coefficient corresponding to age group a'; similarly, $\beta_{a'}$ is the coefficient for the age-specific level changes in vaccination rates and $\delta_{a'}$ the coefficient for the age-specific slope changes; $f_{a'}(T_t)$ is the spline function for age group a'; the indicator variable $A_{a,a'}$ is equal to 1 if $a' = a$ and 0 otherwise; ψ_c is the level-change due to differences in baseline vaccine coverage for baseline coverage group c; the indicator variable $C_{i,a,c}$ is equal to 1 if the baseline coverage in DA i and age group a is part of group c and 0 otherwise; finally, $p_{i,a,t}$ is the population size without a first dose in DA i, for age group a and at time t. For the indicator variables $A_{a,a'}$ and $C_{i,a,c}$, the reference group is 1 and the indices a' and $c \in \{2,3,4,5,6\}$.

Models with dissemination area-level income or proportion racialized

The equation above can be adapted to examine if vaccine passports had a differential impact by income quintile (model 2a). In this case, the s subscript indicates that the coefficient is for income quintile s, where $s \in \{2,3,4,5\}$ (quintile 1 being the reference group), and $S_{i,s}$ is equal to 1 if DA i is in income quintile s and 0 otherwise. The equation is the following:

$$\log(\lambda_{i,t}) = \alpha + f(T_t) + \beta P_t + \delta(T_t - I)P_t + \sum_{s}[\gamma_s + f_s(T_t) + \beta_s P_t + \delta_s(T_t - I)P_t] \times S_{i,s} + \sum_{c}(\psi_c \times C_{i,c}) + offset(p_{i,t})$$

Similarly, for the DA-level proportion of racialized residents, the model can be adapted as shown in the equation below (model 2b). The differences being that the v subscript indicates the proportion racialized quintiles and $V_{i,v}$ is an indicator variable for proportion racialized quintiles.

$$\log(\lambda_{i,t}) = \alpha + f(T_t) + \beta P_t + \delta(T_t - I)P_t + \sum_{v}[\gamma_v + f(T_t) + \beta_v P_t + \delta_v(T_t - I)P_t] \times V_{i,v} + \sum_{c}(\psi_c \times C_{i,c}) + offset(p_{i,t})$$

Models with interaction terms between age and dissemination area-level income or proportion of racialized residents

The interrupted time-series models above can be modified to examine if vaccine passports have differential impact by age and our two social determinants of health (i.e., interaction). The notation above applies here and the equation for the model with interactions between age and income quintiles (model 3a) is the following:

$$\log(\lambda_{i,a,t}) = \alpha + f(T_t) + \beta P_t + \delta(T_t - I)P_t + \sum_c (\psi_c \times C_{i,a,c}) + \sum_{a'} [\gamma_{a'} + f_{a'}(T_t) + \beta_{a'} P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_s [\gamma_s + f_s(T_t) + \beta_s P_t + \delta_s(T_t - I)P_t] \times S_{i,s} + \sum_{a',s} [\gamma_{a',s} + f_{a',s}(T_t) + \beta_{a',s} P_t + \delta_{a',s}(T_t - I)P_t] \times A_{a,a'} \times S_{i,s} + offset(p_{i,a,t})$$

Finally, the equation for the model with interactions between age and quintiles of the proportion racialized (model 3b) is:

$$\log(\lambda_{i,a,t}) = \alpha + f(T_t) + \beta P_t + \delta(T_t - I)P_t + \sum_c (\psi_c \times C_{i,a,c}) + \sum_{a'} [\gamma_{a'} + f_{a'}(T_t) + \beta_{a'} P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_v [\gamma_v + f(T_t) + \beta_v P_t + \delta_v(T_t - I)P_t] \times V_{i,v} + \sum_{a',v} [\gamma_{a',v} + f_{a',v}(T_t) + \beta_{a',v} P_t + \delta_{a',v}(T_t - I)P_t] \times A_{a,a'} \times V_{i,v} + offset(p_{i,a,t})$$

In these last two equations, the a', s and a', v subscripts indicate that the coefficients are specific to age group a' and income quintile s (or proportion racialized quintile v).

Sensitivity analyses

Inferences from interrupted time-series can be sensitive to the modeling of the counterfactual scenario.[6] We performed four different sensitivity analyses to estimate how alternative modeling choices would affect model fit, results, and conclusions. For the first two sensitivity analyses, we focus on shifting the impact period by one week given that a larger change would result in including timepoints before vaccination rates stabilized and/or poor model fit (i.e., not capturing the observed patterns in vaccination rates).

First, we determined whether the estimated counterfactual (and thus, estimated impact of the vaccine passport) was sensitive to changing the starting date of the time-series. We compared the starting date of July 3rd, 2021 to models starting one week earlier (June 26th, 2021) or one week later (July 10th, 2021).

Second, we determined whether the counterfactual was sensitive to changing the length of the impact period of the vaccine passport—i.e., the length during which the P_t variable equals 1. We compared the best-fitting model of six weeks to models with an impact period of either five or seven weeks.

Third, we tested whether a simpler model of the relationship between log-vaccination rates and calendar time would be able to capture the observed vaccination rates in Québec and Ontario and replicate our spline-based results. Given the different trends observed in vaccination rates over the summer, we used different models for each province (which we determined heuristically to fit the data well). For Québec, we modeled the log rate-time relationship with a linear trend and an indicator variable for the time period after the impact of the vaccine passport, i.e., after September 18th, 2021. In Ontario, we modeled the relationship with linear and quadratic terms for time, and an indicator variable for the month of July. We also tested a simple model in which the relationship between log vaccination rates and time is modeled via a simple linear relationship, to test whether this simpler model appropriately captured the pre-announcement vaccination trend in each province.

Lastly, despite relatively modest increases in cases when compared to previous waves, we tested whether results changed if we included a measure of SARS-CoV-2 transmission (i.e., weekly COVID-19 reported cases) in the regression model. The equations for these alternative models are provided below.

Best alternative model specifications

For both provinces, the best non-spline alternative model specifications are the same as the age-stratified model 1, except for how the time trend in vaccinations is modeled.

Alternative non-spline model specification for Québec

For Québec, we replace the splines for time $f(T_t)$ and $f_{a'}(T_t)$ by coefficients for time (in weeks) η and η_a. We also allow the intercept and slope of the log vaccination rates after the vaccine passport impact "wears off" to differ from the pre-announcement vaccination rate, via coefficients θ, $\theta_{a'}$, κ and $\kappa_{a'}$. The time period after which the vaccine passport is presumed to have an effect is denoted by R_t, which is equal to 1 after the end of the impact period (Québec: after September 18th, 2021; Ontario: after October 9th, 2021) and 0 otherwise. As before, coefficients without a subscript are the coefficients for the reference age group, and coefficients with the subscript a' are the components of a vector of coefficients for the remaining age groups. The formula for this model is:

$$\log(\lambda_{i,a,t}) = \alpha + \eta T_t + \beta P_t + \delta(T_t - I)P_t + \theta R_t + \kappa(T_t - I - 6)R_t + \sum_{a'}[\theta_{a'} R_t + \kappa_{a'}(T_t - I - 6)R_t] \times A_{a,a'} + \sum_{a'}[\gamma_{a'} + \eta_{a'} T_t + \beta_{a'} P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_{c}(\psi_c \times C_{i,a,c}) + offset(p_{i,a,t})$$

Alternative non-spline model specification for Ontario

For Ontario, the coefficients θ, $\theta_{a'}$, κ and $\kappa_{a'}$ are used to allow the intercept and slope of the vaccination rate to differ in July, denoted by the indicator variable J_t, which is 1 for the timepoints in July (first 5 timepoints). The coefficients for the quadratic term are ω and $\omega_{a'}$, and the formula is:

$$\log(\lambda_{i,a,t}) = \alpha + \eta T_t + \beta P_t + \delta(T_t - I)P_t + \theta J_t + \kappa T_t J_t + \omega T_t + \sum_{a'}[\theta_{a'}J_t + \kappa_{a'}T_tJ_t + \omega_a T_t] \times A_{a,a'} + \sum_{a'}[\gamma_{a'} + \eta_{a'}T_t + \beta_{a'}P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_c(\psi_c \times C_{i,a,c}) + offset(p_{i,a,t})$$

Linear model between log vaccination rates and time

The linear models are as above, except that the spline for time is only replaced by the η and η_a coefficients. No other coefficients or quadratic terms are used.

$$\log(\lambda_{i,a,t}) = \alpha + \eta T_t + \beta P_t + \delta(T_t - I)P_t + \sum_{a'}[\gamma_{a'} + \eta_{a'}T_t + \beta_{a'}P_t + \delta_{a'}(T_t - I)P_t] \times A_{a,a'} + \sum_c(\psi_c \times C_{i,a,c}) + offset(p_{i,a,t})$$

Model with log cases at the "région sociosanitaire" level

Some people may have been motivated to be vaccinated due to increases in SARS-CoV-2 transmission (as measured by reported case counts). To account for this possibility, we conducted an additional sensitivity analysis in which we included a term for the number of weekly reported COVID-19 cases, as has been done in another analysis of the impact of vaccine passports in Canada.[4] Given data availability constraints, this was only done for the province of Québec, using data from the *Trajectoire de santé publique* database, which records all confirmed COVID-19 cases in the province.

Briefly, we compiled the number of reported weekly cases at the région sociosanitaire (RSS) level (i.e., public health unit) for the study period. Québec is divided into 18 RSS, which are provincial administrative units for health and social services and analogous to public health units.[7] If reported cases do indeed impact vaccination uptake, RSS would be the smallest geographic unit for which the average person would be aware of COVID-19 case trends. Given small population sizes and zero case counts for some weeks, we grouped RSS 1, 7, 8, 9, 10, 11, and 18 into a single unit. We then linked each DA to the weekly RSS COVID-19 case counts, using correspondence files maintained by Statistics Canada.[8]

The model specification is the same as model 1 above, with an additional term $\theta \times \rho_{i,t}$, where θ is the coefficient for the effect of log-cases on the log-vaccination rate and $\rho_{i,t}$ is the log of the number of COVID-19 cases reported in the RSS of DA i for week t.

References for the supplementary methods

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Supplementary results

Supplementary Table S1. Population sizes income quintile and proportion racialized quintile in Québec and Ontario, and the Montréal and Toronto census metropolitan areas, 2021.

	Québec			**Ontario**		
Income quintile	**Number of DAs**	**Population (≥12 years)**	**Range ($CAD or %)**	**Number of DAs**	**Population (≥12 years)**	**Range ($CAD or %)**
Lowest	3,081	1,504,053	$9,573–37,698	3,573	2,638,690	$9,875–48,226
2nd lowest	2,942	1,486,438	$24,159–44,377	3,684	2,616,432	$25,719–54,464
Middle	2,717	1,491,665	$25,284–50,964	3,350	2,626,233	$30,331–60,013
2nd highest	2,352	1,490,373	$29,575–59,237	3,105	2,595,959	$34,704–66,962
Highest	2,315	1,475,964	$31,929–181,468	3,660	2,561,954	$36,922–258,867
Proportion racialized quintile						
Highest	2,573	1,488,983	23.0–100.0%	2,626	2,607,673	58.1–100.0%
2nd highest	2,660	1,488,688	8.3–23.0%	3,215	2,606,584	28.3–58.1%
Middle	2,518	1,489,226	2.7–8.3%	4,106	2,608,561	11.9–28.3%
2nd lowest	1,926	1,233,941	0.5–2.7%	4,188	2,602,982	3.2–11.9%
Lowest	3,730	1,747,655	0.0–0.0%	3,237	2,613,468	0.0–3.1%
	Montréal			**Toronto**		
Income quintile	**Number of DAs**	**Population (≥12 years)**	**Range ($CAD or %)**	**Number of DAs**	**Population (≥12 years)**	**Range ($CAD or %)**
Lowest	1,434	742,728	$9,573–32,278	1,190	1,155,623	$11,091–37,836
2nd lowest	1,419	735,817	$32,280–38,468	1,512	1,155,794	$37,845–46,062
Middle	1,306	739,628	$38,475–45,224	1,435	1,166,843	$46,065–52,523
2nd highest	1,107	740,794	$45,230–52,344	1,375	1,144,652	$52,528–60,615
Highest	1,171	737,286	$52,351–181,468	1,821	1,154,642	$60,616–258,867
Proportion racialized quintile						
Highest	1,301	738,091	36.9–100.0%	985	1,155,323	81.9–100.0%
2nd highest	1,263	739,432	22.0–36.8%	1,293	1,155,290	61.8–81.9%
Middle	1,314	739,107	12.3–22.0%	1,399	1,153,338	41.6–61.8%
2nd lowest	1,255	740,134	5.1–12.3%	1,669	1,158,048	22.5–41.5%
Lowest	1,304	739,489	0.0–5.1%	1,987	1,155,555	0.0–22.5%

DA, dissemination area.

Supplementary Table S2. Population sizes and first-dose COVID-19 vaccine coverage for select time points in the Montréal and Toronto census metropolitan areas, 2021.

			COVID-19 first-dose vaccine coverage (%)		
			Start of timeseries	Last pre-announcement time point	End of time-series
Province and age group	**Number of DAs**	**Population (≥12 years)**	**July 3rd 2021**	**August 7th 2021**	**October 23rd 2021**
Québec	**6,437**	**3,696,253**	**78.9%**	**82.2%**	**88.1%**
12–17 years		299,847	60.0%	65.2%	76.3%
18–29 years		639,506	69.1%	74.1%	84.1%
30–39 years		600,349	69.5%	73.9%	82.2%
40–49 years		584,213	78.3%	81.8%	87.8%
50–59 years		543,385	85.2%	87.9%	91.9%
60+ years		1,028,953	93.2%	94.1%	95.6%
			July 3rd 2021	**August 28th 2021**	**November 13th 2021**
Ontario	**7,333**	**5,777,554**	**77.4%**	**82.8%**	**87.2%**
12–17 years		442,406	65.2%	78.9%	86.6%
18–29 years		1,080,806	77.1%	84.8%	91.9%
30–39 years		991,693	72.1%	78.1%	83.8%
40–49 years		881,175	77.0%	81.7%	86.1%
50–59 years		903,509	81.9%	85.7%	88.9%
60+ years		1,477,965	82.2%	84.4%	86.0%

DA, dissemination area.

Supplementary Table S3. First-dose COVID-19 vaccination coverage before the vaccine passport announcement, absolute and relative impact of the vaccine passport in Québec and Ontario by age, income quintile, and proportion racialized quintile.

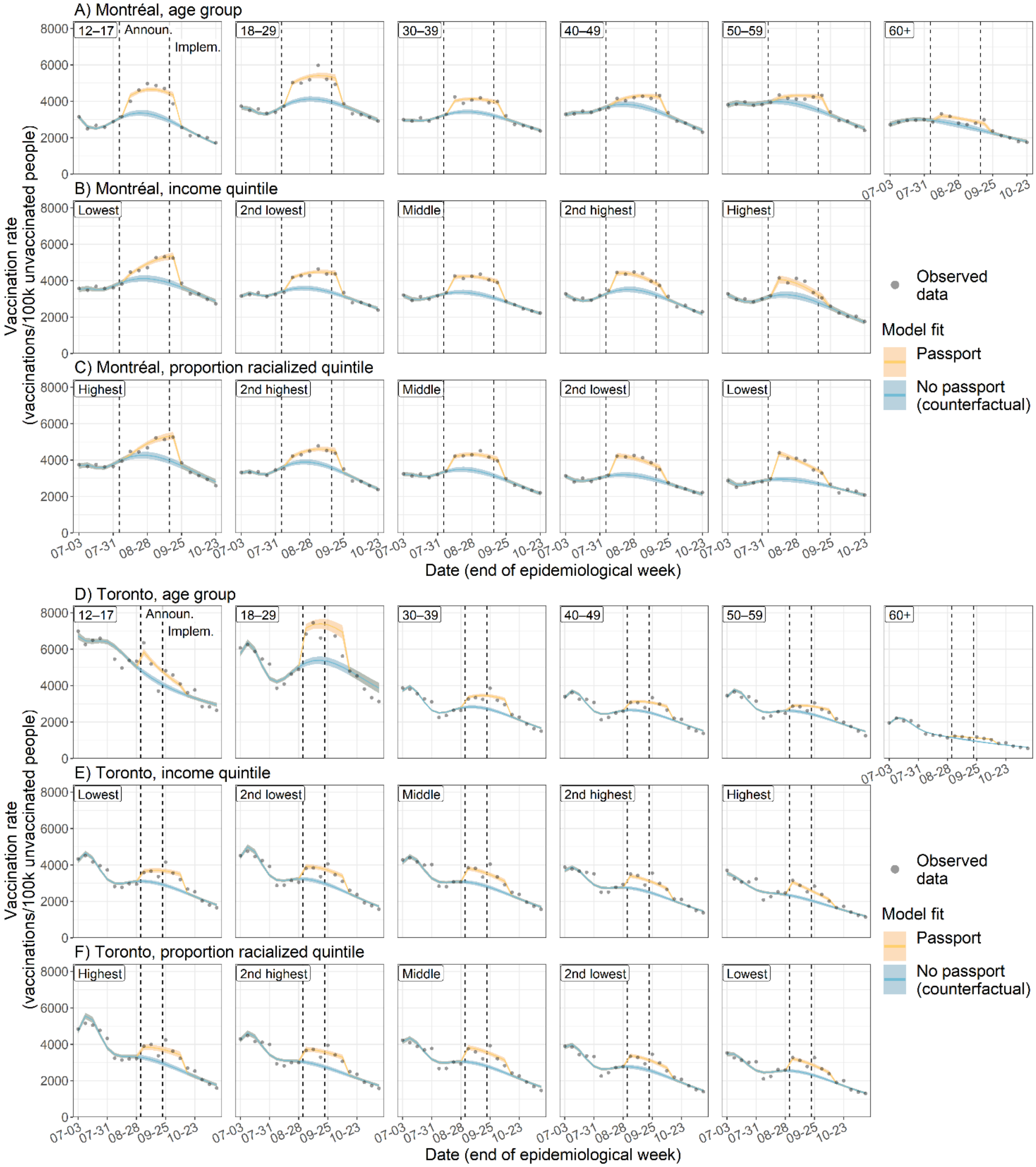
	Québec		
	Pre-announcement vaccine coverage (%)	**Absolute impact (p.p. change in coverage)**	**Relative impact (% increase in doses)**
Age			
12–17	67.6%	2.3 (2.0–2.7)	36 (28–43)
18–29	72.1%	1.8 (1.0–2.5)	28 (13–43)
30–39	72.3%	1.2 (0.6–1.7)	22 (9.9–33)
40–49	80.6%	0.7 (0.1–1.1)	16 (2.3–30)
50–59	87.3%	0.4 (-0.1–0.8)	16 (-1.7–36)
60+	94.3%	0.1 (0.0–0.3)	14 (-2.7–32)
Income quintile			
Lowest	77.3%	1.1 (0.2–1.8)	21 (3.8–40)
2nd lowest	80.6%	0.9 (0.3–1.4)	22 (6.8–38)
Middle	82.5%	1.0 (0.5–1.3)	28 (13–42)
2nd highest	84.4%	0.9 (0.6–1.2)	30 (16–42)
Highest	86.6%	0.7 (0.4–0.8)	27 (15–36)
Proportion racialized quintile			
Highest	78.1%	0.8 (0.5–1.0)	12 (7.5–18)
2nd highest	83.2%	0.8 (0.6–0.9)	21 (16–26)
Middle	84.7%	0.9 (0.7–1.1)	30 (22–39)
2nd lowest	83.5%	1.0 (0.7–1.2)	33 (20–42)
Lowest	82.0%	0.9 (0.4–1.1)	29 (9.8–41)
	Ontario		
	Pre-announcement vaccine coverage (%)	**Absolute impact (p.p. change in coverage)**	**Relative impact (% increase in doses)**
Age			
12–17	76.2%	1.3 (0.9–1.7)	22 (14–30)
18–29	79.9%	1.3 (0.9–1.7)	24 (15–33)
30–39	74.2%	1.0 (0.8–1.2)	21 (17–25)
40–49	80.0%	0.6 (0.4–0.7)	15 (11–20)
50–59	85.9%	0.2 (0.1–0.4)	9.2 (4.8–14)
60+	86.6%	0.1 (0.1–0.2)	12 (6.2–18)
Income quintile			
Lowest	77.7%	0.8 (0.5–1.2)	19 (9.5–29)
2nd lowest	80.8%	0.7 (0.5–0.9)	18 (12–25)
Middle	82.0%	0.8 (0.6–1.0)	24 (18–31)
2nd highest	82.7%	0.8 (0.7–0.9)	27 (21–33)
Highest	84.8%	0.7 (0.6–0.8)	32 (25–40)
Proportion racialized quintile			
Highest	82.6%	0.7 (0.4–0.9)	19 (11–27)
2nd highest	81.9%	0.7 (0.5–0.9)	19 (13–26)
Middle	82.8%	0.7 (0.6–0.8)	23 (17–29)
2nd lowest	81.6%	0.8 (0.6–0.9)	24 (19–29)
Lowest	79.1%	0.7 (0.5–0.9)	19 (12–25)

The pre-announcement vaccination coverage corresponds to the coverage as of August 7th (Québec) or August 28th (Ontario), 2021. Absolute impact was estimated as observed coverage minus modeled counterfactual by the end of the study period, October 23rd (Québec) or November 13th (Ontario), 2021. The relative impact was estimated as the observed number of doses administered divided by the modeled counterfactual number of doses, over the 11 weeks following the passport announcement. Columns for the estimated impact show the point estimate and the 95% confidence intervals (CIs) in parenthesis. 95% CIs were estimated via bootstrap with 1,000 replicates. p.p., percentage points.

Supplementary Table S4. Comparison between impact estimates of the vaccine passport in Québec from the main model and when including regional log-cases in the statistical model.

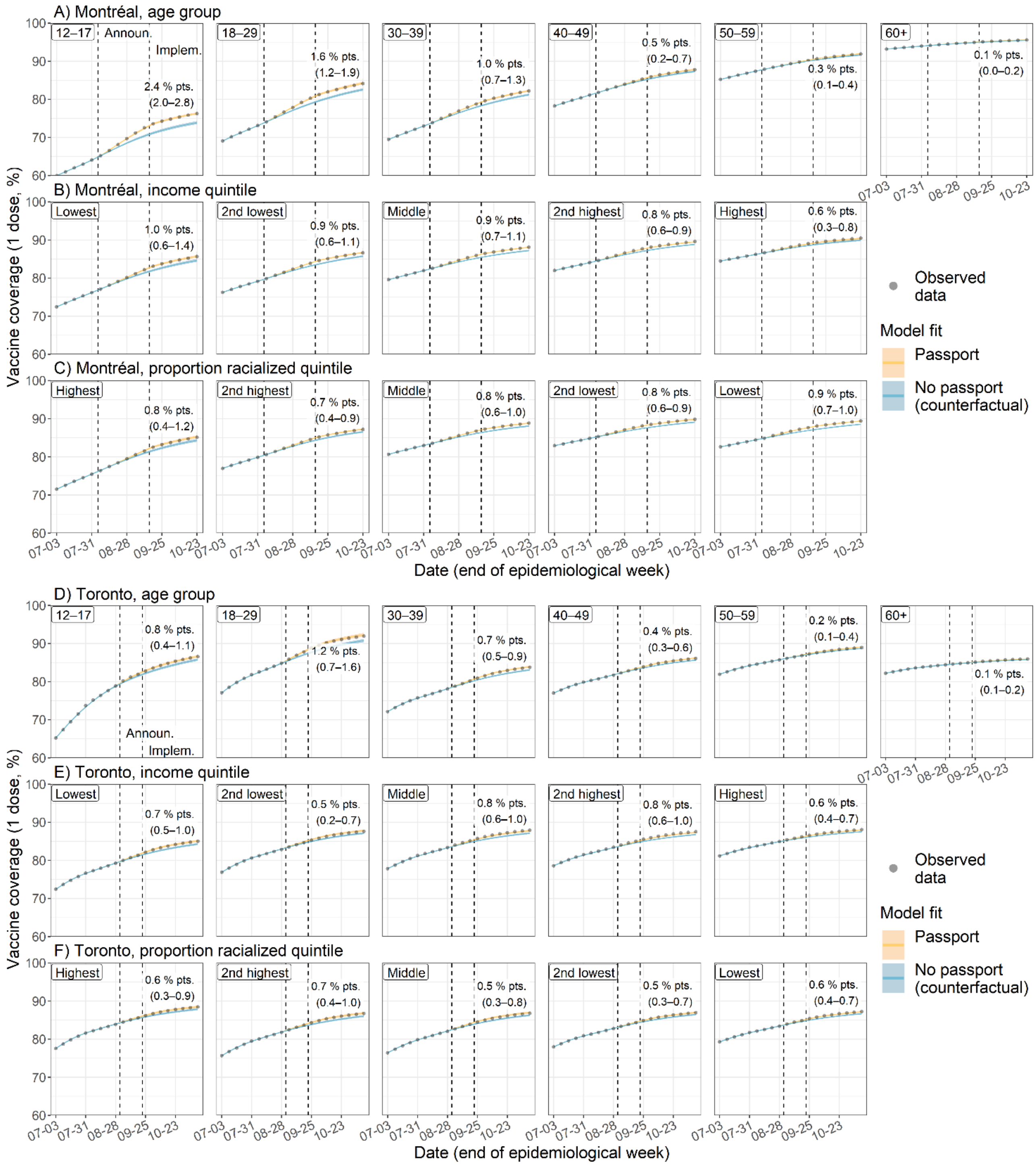
	Québec		
	Pre-announcement vaccine coverage (%)	Absolute impact (p.p. change in coverage)	
Age		Main model	Model with log-cases
12–17	67.6%	2.3 (2.0–2.7)	2.3
18–29	72.1%	1.8 (1.0–2.5)	1.8
30–39	72.3%	1.2 (0.6–1.7)	1.2
40–49	80.6%	0.7 (0.1–1.1)	0.7
50–59	87.3%	0.4 (-0.1–0.8)	0.5
60+	94.3%	0.1 (0.0–0.3)	0.1

p.p., percentage points.

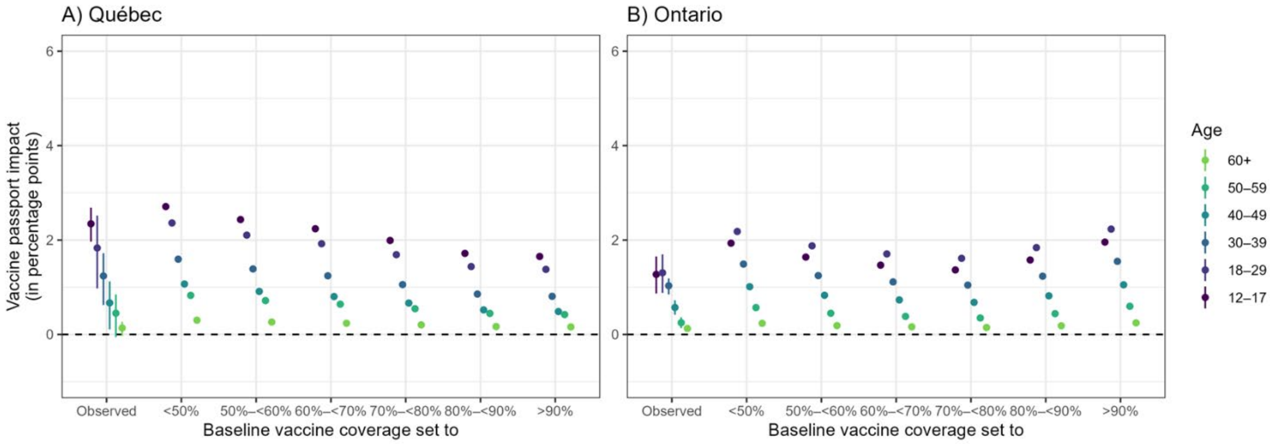


Supplementary Figure S1. Weekly vaccination rates in Montréal (A–C) and Toronto (D–F). Observed (points) and modeled (blue and yellow) vaccination rates over time are shown. Predicted vaccination rates were obtained from three different regression models where the vaccination rate and the impact of the vaccine passport were allowed to vary by age group (A, D), dissemination area (DA)-level income quintile (B, E), or DA-level proportion racialized quintile (C, F). 95% confidence intervals were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport.

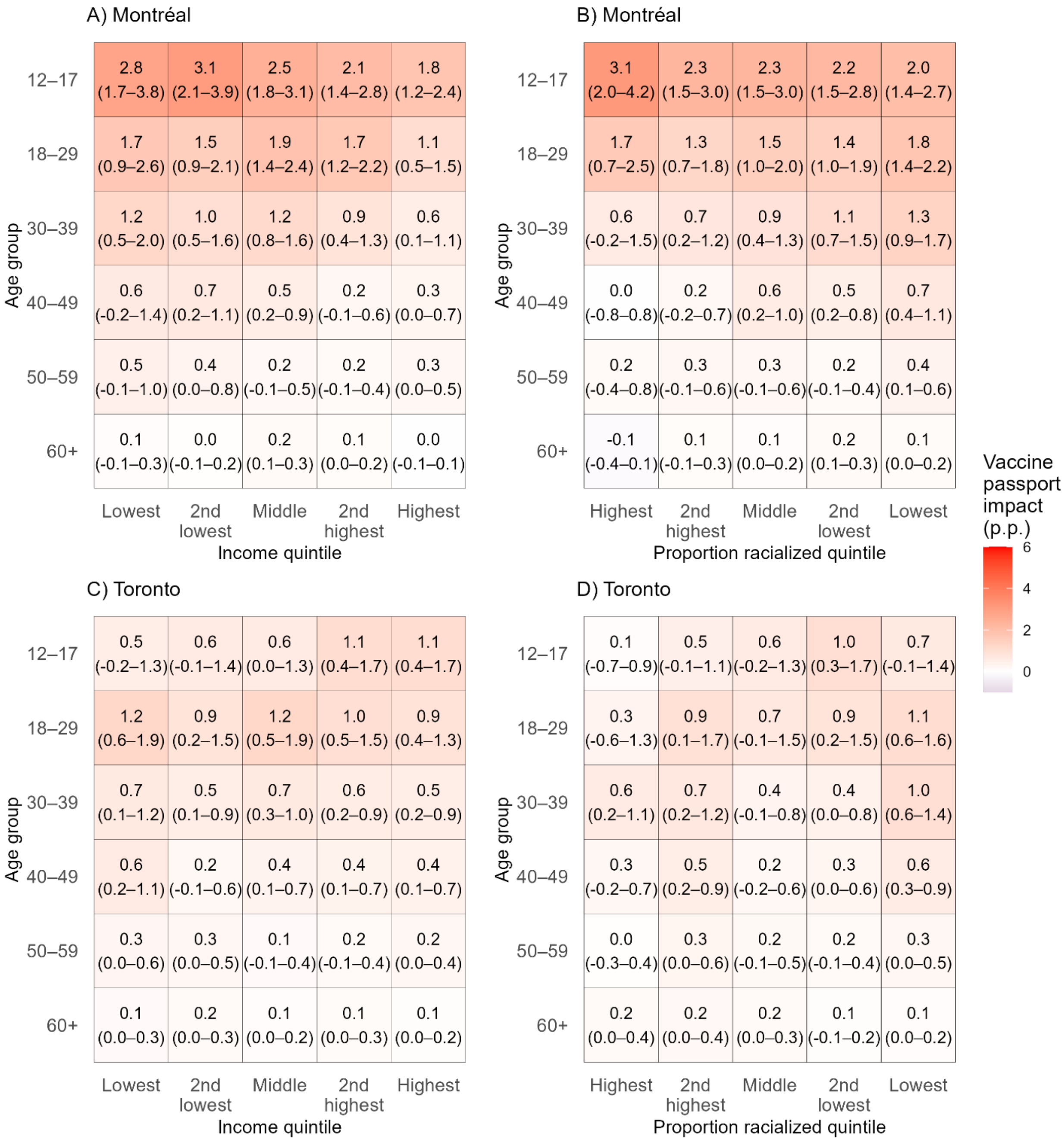
Appendix 1, as supplied by the authors. Appendix to: Flores Anato JL, Ma H, Hamilton MA, et al. Impact of a vaccine passport on first-dose SARS-CoV-2 vaccine coverage by age and area-level social determinants of health in the Canadian provinces of Quebec and Ontario: an interrupted time series analysis. *CMAJ Open* 2023. doi: 10.9778/cmajo.20220242.



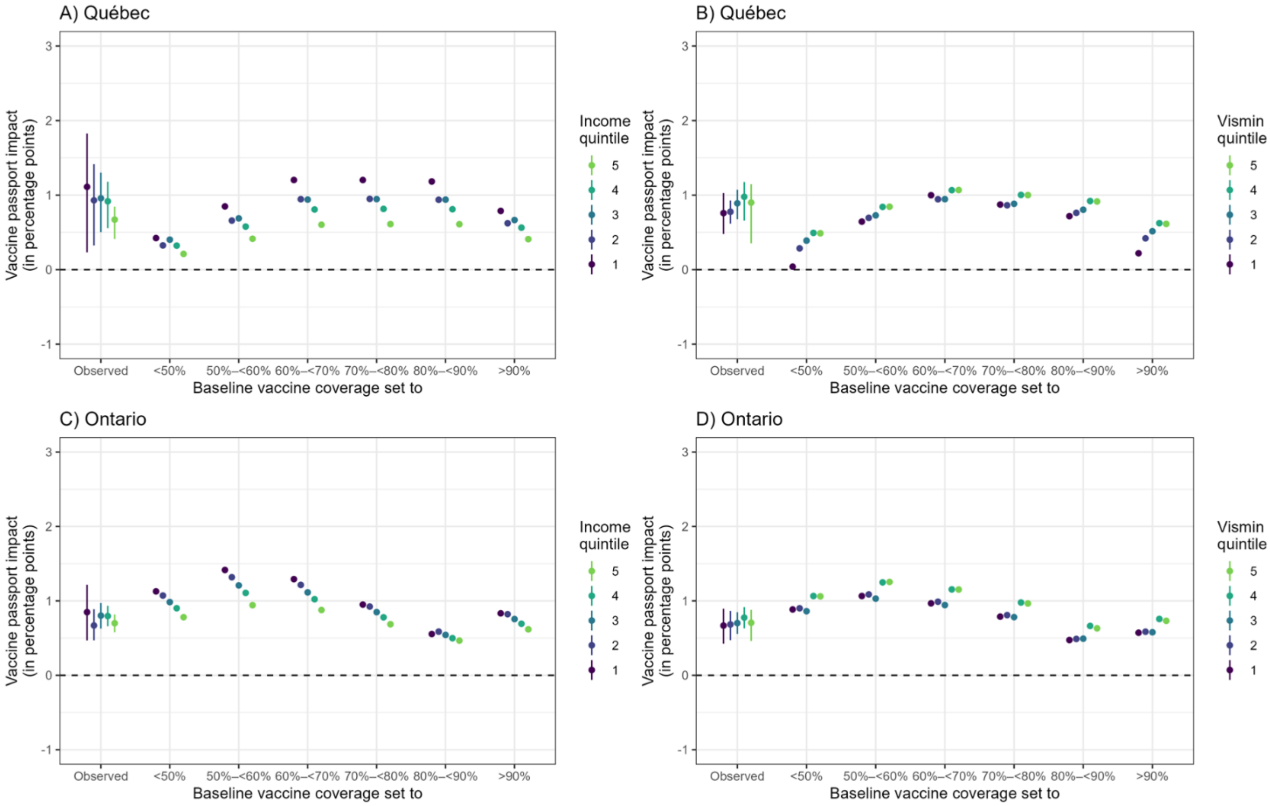
Supplementary Figure S2. First-dose COVID-19 vaccine coverage in Montréal (A–C) and Toronto (D–F). Observed (points) and modeled (blue and yellow) vaccine coverage over time are shown. Predicted vaccine coverage was obtained from three different regression models where the vaccination rate and the impact of the vaccine passport were allowed to vary by age group (A, D), dissemination area (DA)-level income quintile (B, E), or DA-level proportion racialized quintile (C, F). Estimates and 95% confidence intervals (CIs) of the impact of the vaccine passport (observed coverage minus modeled counterfactual) are shown at the right of each panel. 95% CIs were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport; pts., points.



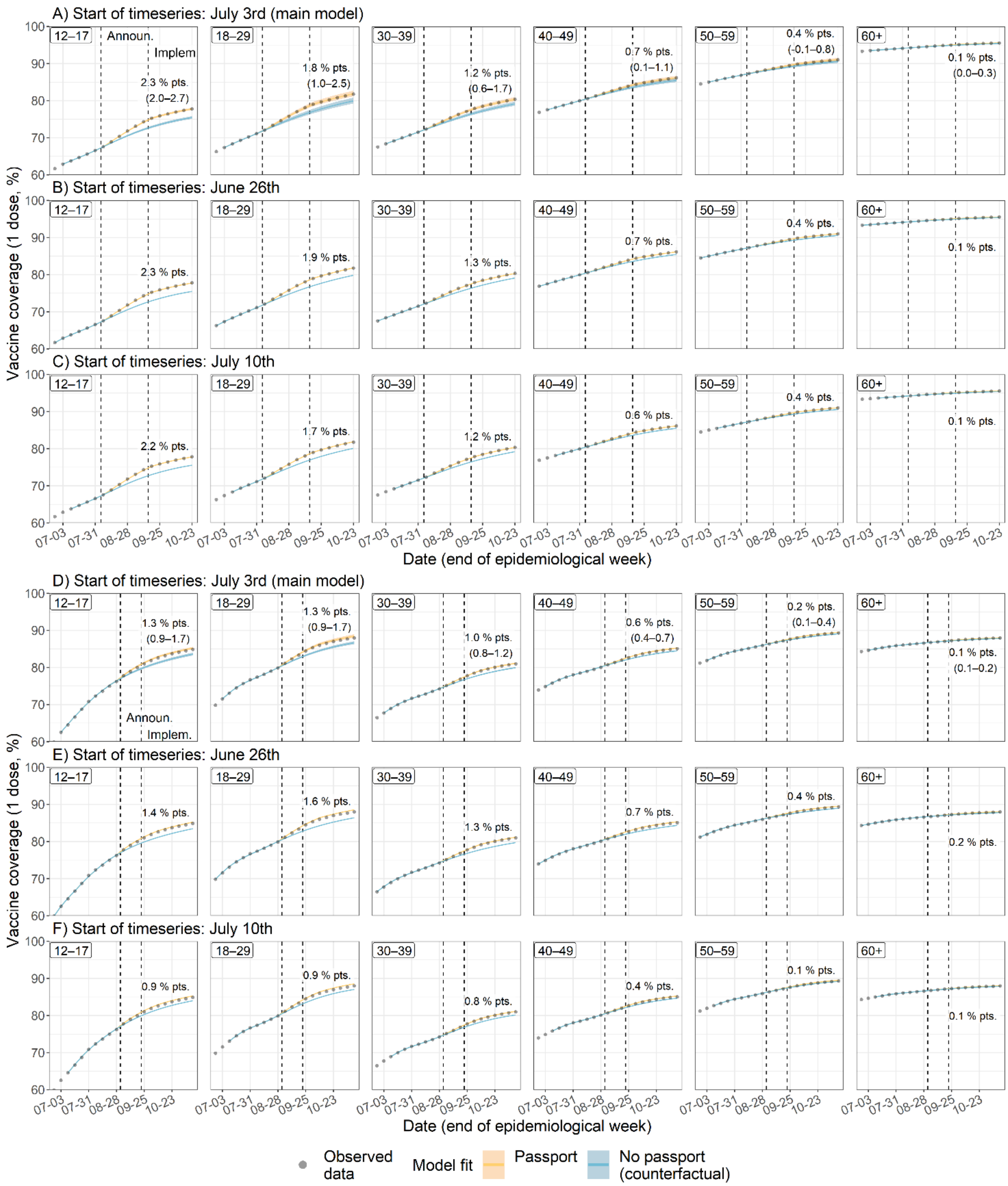
Supplementary Figure S3. Impact of vaccine passport on first-dose coverage of COVID-19 vaccine (in percentage points) across age groups when holding baseline coverage constant for all dissemination areas (DA) in Québec (A) and Ontario (B) by the end of the study period. The vaccine passport's impact (observed [or modeled] vaccination coverage minus the modeled counterfactual coverage in the absence of a vaccine passport) was estimated from a regression model where the vaccination rate and the impact of the vaccine passport were allowed to vary by age group and baseline coverage.



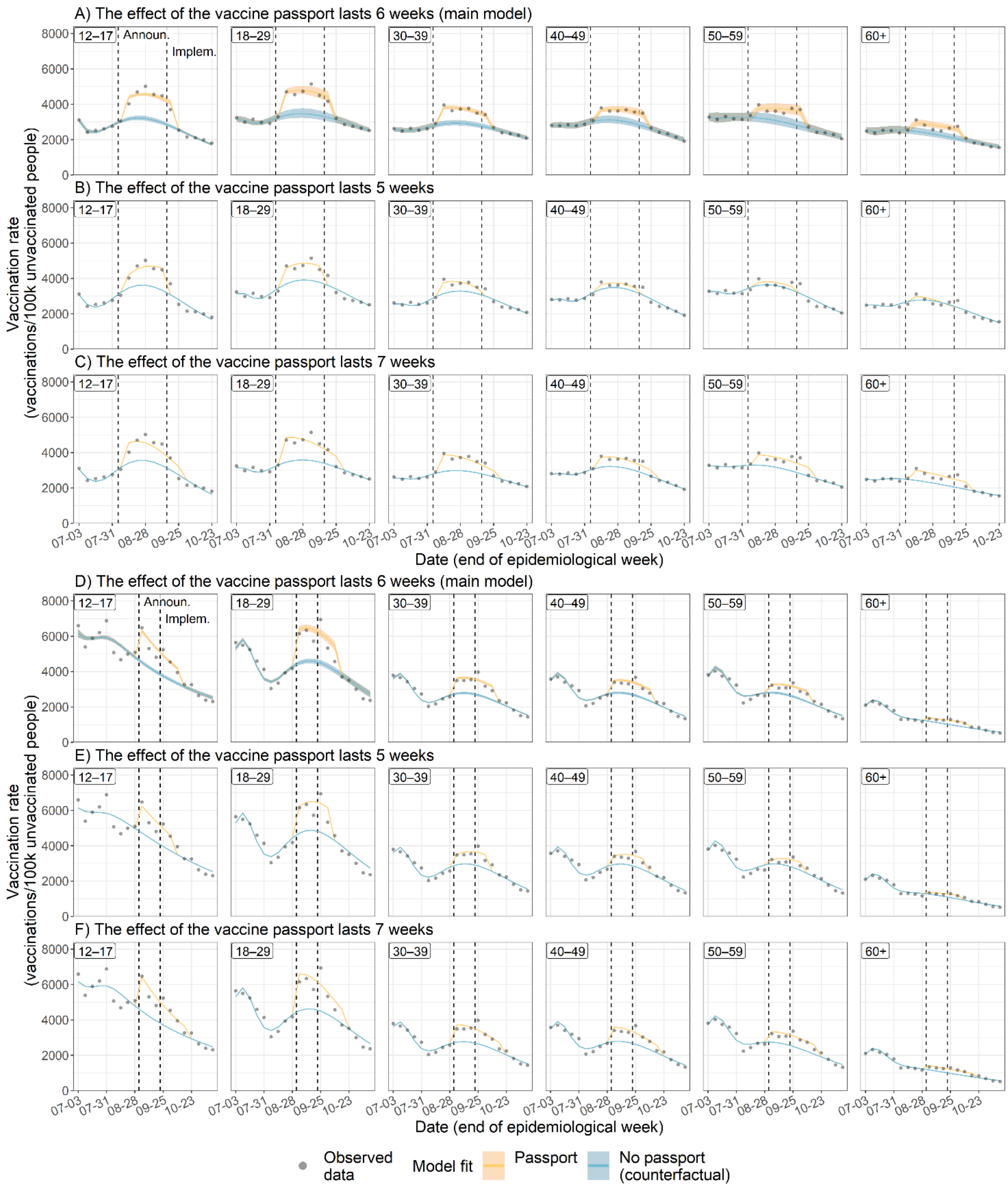
Supplementary Figure S4. Impact of vaccine passport on first-dose coverage of COVID-19 vaccine (in percentage points) across age and by dissemination area (DA) level of income and proportion of racialized residents in Montréal (A, B) and Toronto (C, D) by the end of the study period. The vaccine passport's impact (observed vaccination coverage minus the modeled counterfactual coverage in the absence of a vaccine passport) was estimated from two different regression models where the vaccination rate and the impact of the vaccine passport were allowed to vary by the interaction of age and either DA-level income quintile (A, C), or DA-level proportion racialized quintile (B, D). 95% confidence intervals – shown in parenthesis– were estimated via bootstrap with 1,000 replicates. p.p., percentage points.



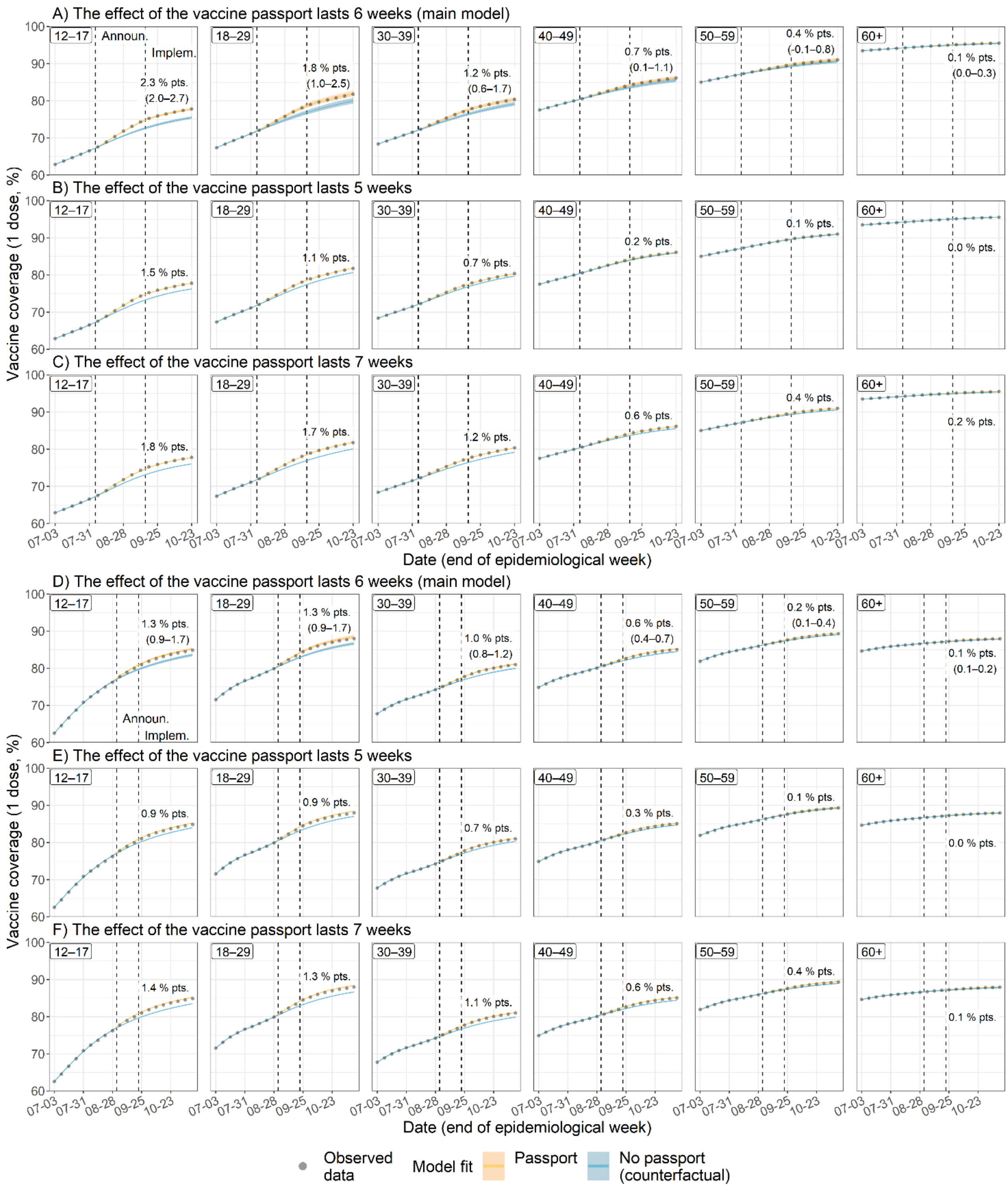
Supplementary Figure S5. Impact of vaccine passport on first-dose coverage of COVID-19 vaccine (in percentage points) across social determinants when holding baseline coverage constant for all dissemination areas (DA) in Québec (A, B) and Ontario (C, D) by the end of the study period. The vaccine passport's impact (observed [or modeled] vaccination coverage minus the modeled counterfactual coverage in the absence of a vaccine passport) was estimated from two different regression models where the vaccination rate and the impact of the vaccine passport were allowed to vary by baseline vaccine coverage and either DA-level income quintile (A, C), or DA-level proportion racialized quintile (B, D).



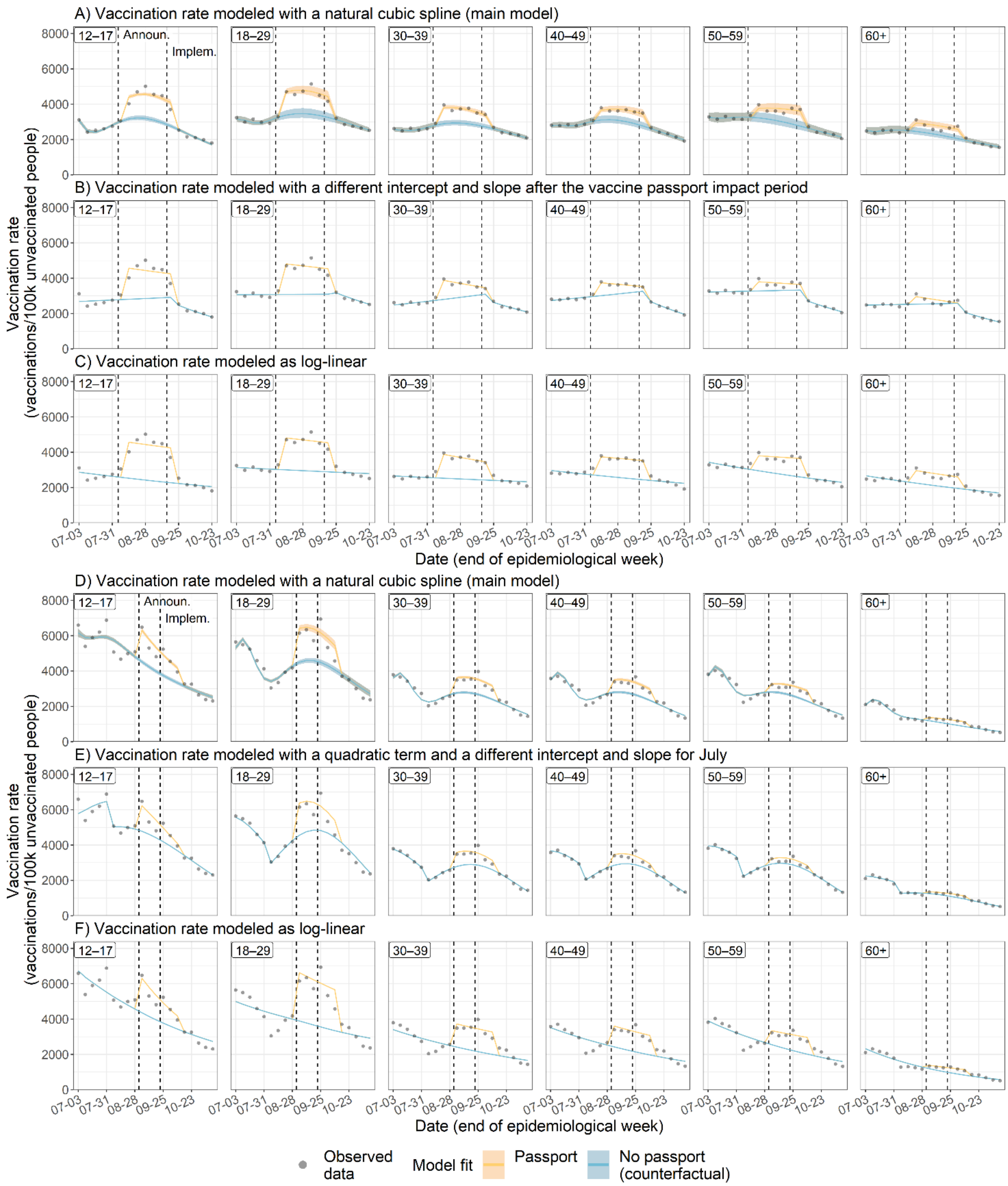
Supplementary Figure S6. Impact of changing start of timeseries on first-dose COVID-19 vaccine coverage and the estimated vaccine passport effect in Québec (A–C) and Ontario (D–F). Observed (points) and modeled (blue and yellow) vaccination rate over time are shown. Each row presents model fits from a different regression model, all of which allow the impact of the vaccine passport to vary by age group. Data for the regression models starts on July 3rd (main model; A,D), June 26th (B,E) or July 10th (C,F). Estimates and 95% confidence intervals (CIs) of the impact of the vaccine passport (observed coverage minus modeled counterfactual) are shown at the right of each panel. 95% CIs were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport; pts., points.



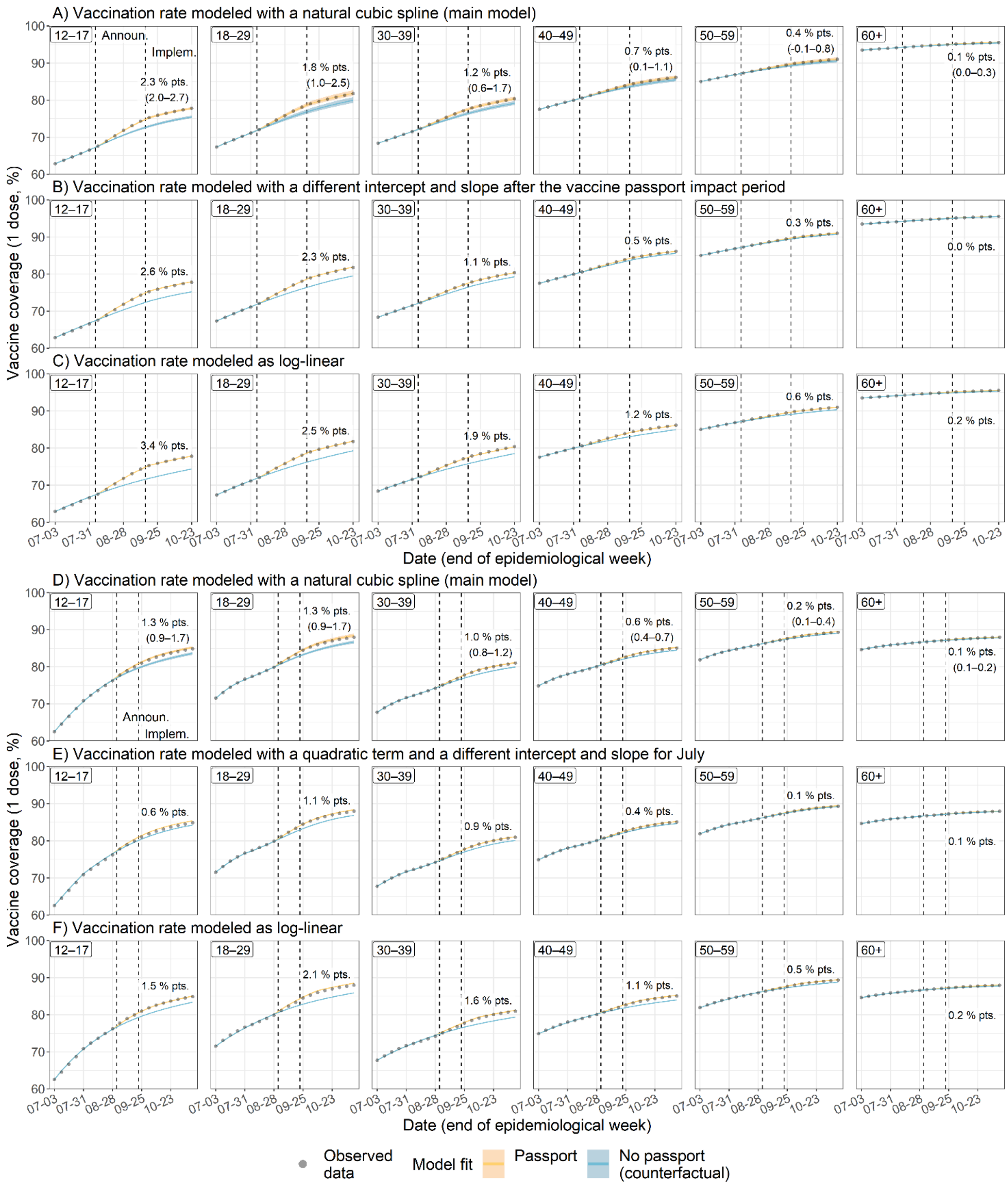
Supplementary Figure S7. Impact of changing the length of the vaccine passport impact period on the weekly vaccination rate in Québec (A–C) and Ontario (D–F). Observed (points) and modeled (blue and yellow) vaccination rates over time are shown. Each row presents model fits from a different regression model, all of which allow the impact of the vaccine passport to vary by age group. The vaccine passport was assumed to have an impact for a period of six weeks (main model; A,D), five weeks (B,E), or seven weeks (C,F). 95% confidence intervals were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport.



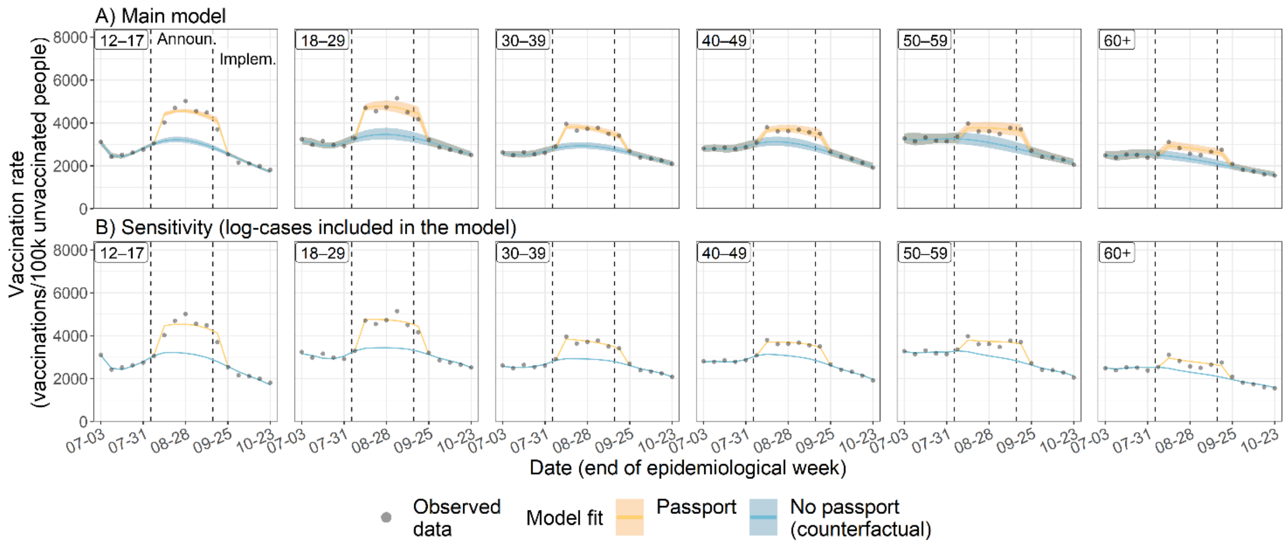
Supplementary Figure S8. Impact of changing the length of the vaccine passport impact period on first-dose COVID-19 vaccine coverage and the estimated vaccine passport effect in Québec (A–C) and Ontario (D–F). Observed (points) and modeled (blue and yellow) vaccination coverage over time are shown. Each row presents model fits from a different regression model, all of which allow the impact of the vaccine passport to vary by age group. The vaccine passport was assumed to have an impact for a period of six weeks (main model; A,D), five weeks (B,E), or seven weeks (C,F). Estimates and 95% confidence intervals (CIs) of the impact of the vaccine passport (observed coverage minus modeled counterfactual) are shown at top right of each panel. 95% CIs were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport; pts., points.



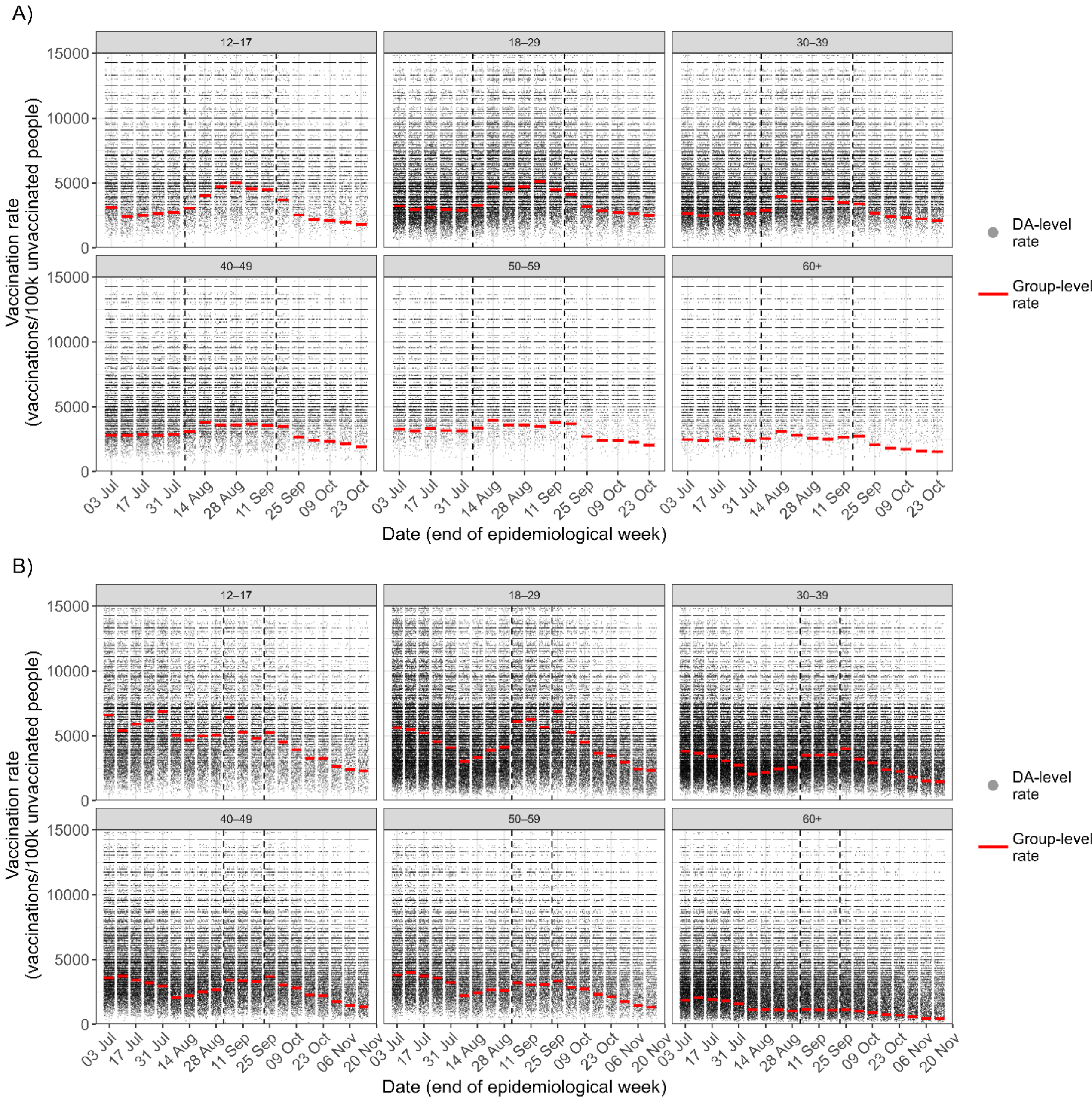
Supplementary Figure S9. Impact of changing how the temporal trend is modeled on the weekly vaccination rate in Québec (A–C) and Ontario (D–F). Observed (points) and modeled (blue and yellow) vaccination rates over time are shown. Each row presents model fits from a different regression model, all of which allow the impact of the vaccine passport to vary by age group. The vaccination rate-calendar time relationship is modeled with a natural spline (main model; A,D), a change in level and slope after the end of the vaccine passport's impact period (B), a quadratic term and a change in level and slope in July (D), or a log-linear relationship (C,F). 95% confidence intervals were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport.



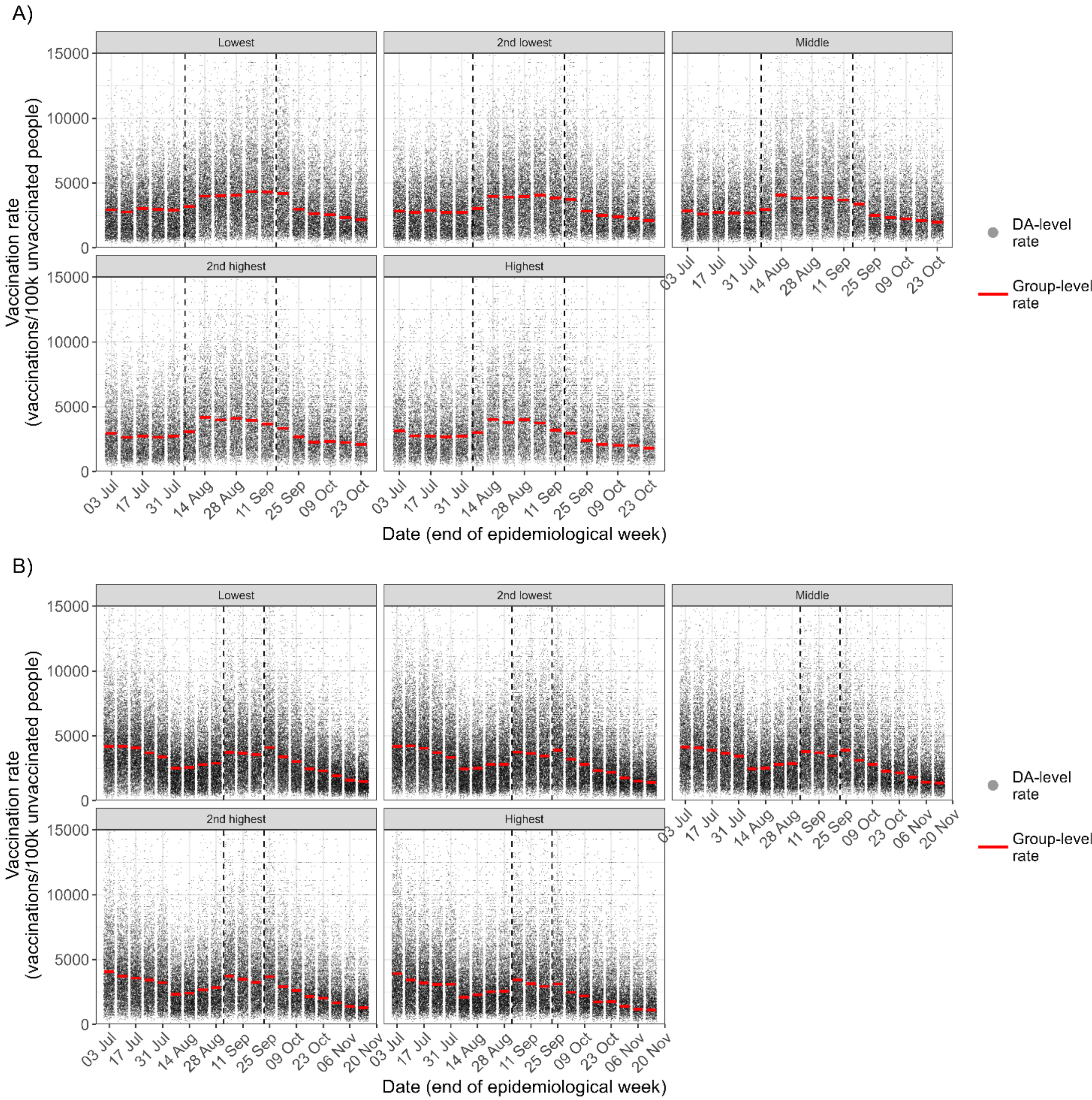
Supplementary Figure S10. Impact of changing how the temporal trend is modeled on first-dose COVID-19 vaccine coverage and the estimated vaccine passport effect in Québec (A–C) and Ontario (D–F). Observed (points) and modeled (blue and yellow) vaccination coverage over time are shown. Each row presents model fits from a different regression model, all of which allow the impact of the vaccine passport to vary by age group. The vaccination rate-calendar time relationship is modeled with a natural spline (main model; A,D), a change in level and slope after the end of the vaccine passport's impact period (B), a quadratic term and a change in level and slope in July (D), or a log-linear relationship (C,F). Estimates and 95% confidence intervals (CIs) of the impact of the vaccine passport (observed coverage minus modeled counterfactual) are shown at the right of each panel. 95% CIs were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport; pts., points.



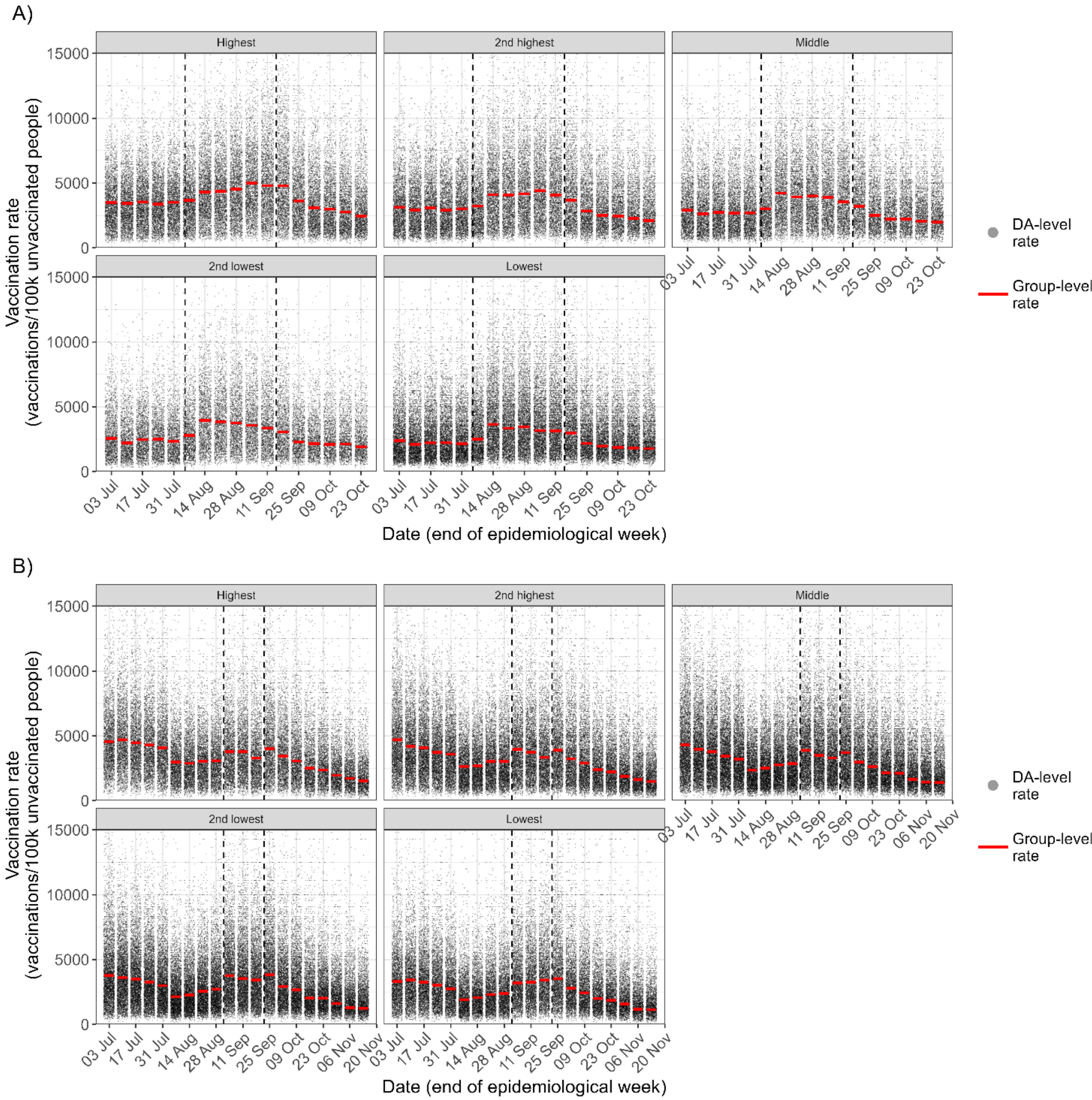
Supplementary Figure S11. Impact of including regional log-cases in the statistical model on the weekly vaccination rate in Québec. Observed (points) and modeled (blue and yellow) vaccination rates over time are shown. The model in (A) is the main age model presented in the article (see model 1 in the *Equations* section for more details). The model in (B) is the same as model 1 with an additional term for the weekly number of cases (log scale) at the *région sociosanitaire* level, Québec's administrative units for health and social services (see *Model with log cases at the région sociosanitaire level* section for details). 95% CIs were estimated via bootstrap with 1,000 replicates. Announ., announcement of the vaccine passport; Implem., implementation of the vaccine passport.



Supplementary Figure S12. Distribution of the dissemination area (DA)-level weekly vaccination rate by age group in Québec (A) and Ontario (B). Observed weekly vaccination rates over time are shown, each dot represents data from a single DA and each panel shows a different age group. DA, dissemination area.



Supplementary Figure S13. Distribution of the dissemination area (DA)-level weekly vaccination rate by income quintile in Québec (A) and Ontario (B). Observed weekly vaccination rates over time are shown, each dot represents data from a single DA and each panel shows a different income quintile. DA, dissemination area.



Supplementary Figure S14. Distribution of the dissemination area (DA)-level weekly vaccination rate by proportion racialized quintile in Québec (A) and Ontario (B). Observed weekly vaccination rates over time are shown, each dot represents data from a single DA and each panel shows a different quintile of proportion racialized. DA, dissemination area.

