

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	The impact of the COVID-19 pandemic on vaccine coverage for early childhood vaccines in Alberta, Canada: A population-based retrospective cohort study
AUTHORS	MacDonald, Shannon; Paudel, Yuba Raj; Kiely, Marilou; Rafferty, Ellen; Sadarangani, Manish; Robinson, Joan; Driedger, S. Michelle; Svenson, Lawrence

VERSION 1 – REVIEW

REVIEWER	Lee, Bee Natl Univ Hlth Syst
REVIEW RETURNED	11-Sep-2021

GENERAL COMMENTS	<p>This study assesses the impact of the COVID-19 pandemic on early childhood vaccination coverage in Alberta, Canada, a relatively high income community, and found that coverage dropped particularly during 2 time periods – March-April 2020, and September-October 2020, corresponding to tighter physical distancing measures implemented. Measles-containing vaccine had the largest different in coverage at the end of the follow-up. These findings add value to the current body of literature on this subject.</p> <p>Comments:</p> <ol style="list-style-type: none">1. The main finding was the lower cumulative coverage for measles-containing vaccines. This is of major public health significance, as measles is highly infectious and recent drops in vaccine coverage in high income countries has led to outbreaks. The impact of lowered coverage of measles containing vaccines could be briefly elaborated in the discussion and consider following references: "Patel M, Lee AD, Redd SB, Clemmons NS, McNall RJ, Cohn AC, Gastañaduy PA. Increase in Measles Cases — United States, January 1–April 26, 2019. <i>MMWR Morb Mortal Wkly Rep</i> 2019;68(17):402–4. https://doi.org/10.15585/mmwr.mm6817e1." "Zhong, Y., et al. (2020). "Childhood vaccinations: hidden impact of COVID-19 on children in Singapore." <i>Vaccine</i>. https://doi.org/10.1016/j.vaccine.2020.12.054"2. Page 5 line 8 – The reference (1) used by authors is more applicable to lower income countries. It would be more appropriate to refer to publications relating to high income countries, as the reasons for drop in routine childhood vaccinations during a pandemic differ substantially between lower and high income countries.
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	<p>3. Page 14 Line 47 – “community health centres instituted various public health measures for vaccination appointments”. Could authors briefly describe these measures?</p> <p>4. Page 15 line 29 – “For some of the vaccine doses given at older ages, 2020 coverage rates were substantially lower than for younger children.” Are there any known factors would result in the older children missing out on vaccination compared to those in the first year?</p> <p>5. Page 16 line 40 – The data that shows 5-year vaccine coverage was stable / increasing could be move to the Methods section, and references made to appendices A5 to A7 in the Results section. It justifies the use of 2019 as the comparator (by examining past 5 years vaccine coverage pattern). The increasing trend of vaccine coverage also explains the higher coverage of measles-containing vaccines in Jan and Feb 2020.</p>
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REVIEWER	Lu, Chun-Yi National Taiwan University Hospital, Department of Pediatrics
REVIEW RETURNED	24-Sep-2021

GENERAL COMMENTS	<p>In the manuscript entitled “The impact of the COVID-19 pandemic on vaccine coverage for early childhood vaccines in Alberta, Canada: A population-based retrospective cohort study,” the authors retrospectively compared coverage rates of 3 childhood vaccines (pertussis-containing, measles-containing, and rotavirus) in 2020 and 2019 in Alberta, Canada. Their results showed that vaccine coverage rates temporarily declined during Apr. 2020. The cumulative coverage rates of measles-containing vaccines remained lower in the 2020 cohort when compared with the 2019 cohort. The authors concluded catch-up vaccination for measles-containing vaccines should be considered for specific cohorts. The manuscript is well written with convincing data. It is mainly descriptive, and its impact is limited as similar reports have been available from different parts of the world. However, it provides very good insights for local vaccination policymakers.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer 1: Dr. Bee Lee, Natl Univ Hlth Syst

This study assesses the impact of the COVID-19 pandemic on early childhood vaccination coverage in Alberta, Canada, a relatively high income community, and found that coverage dropped particularly during 2 time periods – March-April 2020, and September-October 2020, corresponding to tighter physical distancing measures implemented. Measles-containing vaccine had the largest different in coverage at the end of the follow-up. These findings add value to the current body of literature on this subject.

1. The main finding was the lower cumulative coverage for measles-containing vaccines. This is of major public health significance, as measles is highly infectious and recent drops in vaccine coverage in high income countries has led to outbreaks. The impact of lowered coverage of measles containing vaccines could be briefly elaborated in the discussion and consider following references: “Patel M, Lee AD, Redd SB, Clemmons NS, McNall RJ, Cohn AC, Gastañaduy PA. Increase in

Measles Cases — United States, January 1–April 26, 2019. *MMWR Morb Mortal Wkly Rep* 2019;68(17):402–4. <https://doi.org/10.15585/mmwr.mm6817e1>.” “ Zhong, Y., et al. (2020). "Childhood vaccinations: hidden impact of COVID-19 on children in Singapore." *Vaccine*. <https://doi.org/10.1016/j.vaccine.2020.12.054>”

Response: This is a useful addition. The recommended citations and following text have been added to the last paragraph of the Discussion: “Accumulation of unimmunized and under immunized children can lead to a corresponding increased risk of disease outbreaks. In a 2019 outbreak of 704 measles cases in the USA, 89% of cases were in unvaccinated individuals or those with unknown vaccination status. In a 2013 measles outbreak in Alberta, Canada, linked to a religious community from southern Alberta, of the 42 confirmed cases, all were unimmunized for measles. In light of the evidence of reduced measles vaccine coverage in our study, catch-up programs to reach unimmunized/under immunized children are critical.”

2. Page 5 line 8 – The reference (1) used by authors is more applicable to lower income countries. It would be more appropriate to refer to publications relating to high income countries, as the reasons for drop in routine childhood vaccinations during a pandemic differ substantially between lower and high income countries.

Response: We agree with the reviewer’s comment and have replaced two of the references with more appropriate references to studies in high-income settings.

3. Page 14 Line 47 – “community health centres instituted various public health measures for vaccination appointments”. Could authors briefly describe these measures?

Response: The measures instituted by community health centers have been explained. Specifically, we have added the statement: “Community health centres instituted various public health measures for vaccination appointments such as shorter appointments for infant immunizations, implementation of public health restrictions (i.e. wearing personal protective equipment and screening for COVID), and temporary suspension of school immunizations.”

4. Page 15 line 29 – “For some of the vaccine doses given at older ages, 2020 coverage rates were substantially lower than for younger children.” Are there any known factors would result in the older children missing out on vaccination compared to those in the first year?

Response: We have added the following information about the possible reason: “One of the reasons for less impact of the pandemic on doses given to infants compared to toddlers may be due to higher priority given to primary immunization series for infants.

5. Page 16 line 40 – The data that shows 5-year vaccine coverage was stable / increasing could be move to the Methods section, and references made to appendices A5 to A7 in the Results section. It justifies the use of 2019 as the comparator (by examining past 5 years vaccine coverage pattern). The increasing trend of vaccine coverage also explains the higher coverage of measles-containing vaccines in Jan and Feb 2020.

Response: We have moved the relevant methodologic text to the “Statistical Analysis” section of Methods, and the findings from the five-year comparison are mentioned in the “Results” section with reference to Appendices A5 to A7, as recommended by the reviewer.

Reviewer 2: Dr. Chun-Yi Lu, National Taiwan University Hospital

In the manuscript entitled “The impact of the COVID-19 pandemic on vaccine coverage for early childhood vaccines in Alberta, Canada: A population-based retrospective cohort study,” the authors retrospectively compared coverage rates of 3 childhood vaccines (pertussis-containing, measles-containing, and rotavirus) in 2020 and 2019 in Alberta, Canada. Their results showed that vaccine coverage rates temporarily declined during Apr. 2020. The cumulative coverage rates of measles-containing vaccines remained lower in the 2020 cohort when compared with the 2019 cohort. The authors concluded catch-up vaccination for measles-containing vaccines should be considered for specific cohorts.

1. The manuscript is well written with convincing data. It is mainly descriptive, and its impact is limited as similar reports have been available from different parts of the world. However, it provides very good insights for local vaccination policymakers.

Response: Thank you for your positive feedback on the manuscript. Policymakers in Canada are indeed eager to examine the impact of the pandemic on routine vaccines.

VERSION 2 – REVIEW

REVIEWER	Lee, Bee Natl Univ Hlth Syst
REVIEW RETURNED	04-Dec-2021
GENERAL COMMENTS	Thank you the revision of the manuscript. The comments from reviewer have been adequately addressed.