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Title	Trends in medical and non-medical immunization exemptions to measles-containing vaccine in Ontario: Annual cross-sectional assessment of students over eleven school years (2002-03 to 2012-13).
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Reviewer 1	Dr. Conar O'Neil
Institution	University of Manitoba, Department of Medicine
General comments (author response in bold)	<p>Page 5, line 77-78: provide example of geographic areas in Ontario that have been previously linked to specific VPD outbreaks Response: Two examples of VPD outbreaks in Ontario have been added (lines 80-81). The new added sentence reads "...including a pertussis outbreak in 2011 and a rubella outbreak in 2005 that occurred in under-immunized religious communities in southwestern Ontario."</p> <p>Page 6, line 116: explain what it means to document exemptions by measles antigen Response: Until 2009-10 school year, IRIS reported exemptions for the combined MMR vaccine. This meant that exemption numbers for measles, mumps and rubella were identical, as the three antigens were not distinguishable from the IRIS reports. From 2010-11 and onwards, IRIS reports for the combined MMR vaccine were separated into antigen-specific reports, giving a separate report for each of measles, mumps, and rubella antigens. This allowed us to report exemptions specifically for measles antigen starting in 2010-11. The lines 167-169 have been revised to better clarify this: "Since 2010, data from the Immunization Records Information System have been reported at the level of antigen (measles), rather than vaccine (MMR). Prior to this data were extracted by vaccine."</p> <p>Results: are you able to unpack results by geographic distribution of PHUs? You refer to the large geographic variability in non-medical exemptions. Are there particular geographic regions in Ontario that have higher rates of non-medical exemption? In the discussion, can you link these geographic areas with high non-medical exemption rates with known demographic data on religious beliefs or other factors. This may help tie into the "targeted interventions" you discuss in your conclusions. Do the geographic areas with high exemption rates identified in this study correspond to previously identified VPD outbreaks? Response: We thank Dr O'Neil for his suggestion. Ontario's 36 Public Health Units can be grouped into seven public health regions, based on their geographic locations. As part of this work, we have investigated how exemptions among 7-year-old students differ across the 7 health regions and found that the geographic variability in exemptions is markedly reduced when aggregated up to this level. We were not surprised to observe this as the variability in exemptions tends to be most remarkable when smaller areas (e.g., communities or schools) are compared. Furthermore, within the Ontario context we believe it is the local, or community, level that is the level at which interventions would most likely be targeted as the organization of public health service delivery in Ontario is at the level of individual public health unit. With the transition to a new immunization information system in Ontario which is currently underway, we anticipate that we will have the capacity to conduct analyses which focus on variability within public health units (rather than simply between public health units) in the near future. Therefore, we have not included a new figure which presents the data by health region but instead have emphasized the need to conduct future analyses within public health units to assist in the targeting of interventions. The revised text is as follows (lines 399-400): "Future analyses to examine patterns of exemptions within public health units are needed and would support these efforts."</p> <p>Figure 1: in column 5 and 6 there is a dark blue line indicating some proportion of children with prior immunity though in the provided data it is listed at 0.0 for both. Response: Thank you for this comment. This was due to rounding down of numbers to one decimal place. Figure 1 has been updated to report the proportions using two decimal places.</p>
Reviewer 2	Timothy Cordon
Institution	Children's Hospital of Wisconsin, Pediatric Critical Care
General comments (author response in bold)	I enjoyed reading your paper "Trends in medical and non-medical immunization exemptions ...". I found the shift from medical exemptions to C/RB reasons interesting; left me wondering if the shift simply represents families taking the path of least resistance as the medical profession became better informed about the indicators for medical exemptions and families became more aware of the C/RB option. As you indicated, this may be part of the reason the exemption rate has remained relatively

constant even as the exemption classification shifted. Perhaps the most valuable portion of the study is the geographic distribution of the exemptions. I agree this finding offers the potential for targeted education of both the general public in those areas, and the medical community regarding their role in explaining the benefits of immunizations. Decreasing herd immunity in areas with the higher exemption rates truly represents a public health hazard. I am sure many clinicians have had the unfortunate task of caring for a child with a VPD or during an outbreak caring for many such children, sad and all preventable. Your results lead to further questions as to what will be the most productive approach to reducing the exemption rates, especially in the higher frequency areas. As you pointed out, more stringent processes for exemptions may help; use of stories of VPD in the community and motivational interviewing techniques may also resonate with families seeking exemptions.

[No author response.]