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Title	Using Ontario Health Insurance Plan physician billing claims to ascertain individual influenza immunization status: an updated validation study
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Reviewer 1	Dr. M.M. Leeflang
Institution	University of Amsterdam, Clinical Epidemiology, Biostatistics and Bioinformatics, Amsterdam, Netherlands
General comments (author response in bold)	To be able to evaluate immunisation programs, a comprehensive registry is needed to indicate who has been immunized and who was not. Such a registry is absent, so the aim of the paper is to evaluate an alternative. In a previous study they have evaluated billing claims and in this study they will do the same, but this time combined with extra information. In general the paper is thorough and I found no mistakes in the analyses, not in the interpretation. The limitations have been addressed. But to make it a worthwhile piece of work, I think some more work is needed and perhaps even a different approach. 1. First of all I would like to know how this manuscript really differs from the previous study. Is it just the addition of Tables 2 and 3? What is then the additional value of Tables 2 and 3? If the doctor of a 50-year old female from a city has billed an immunisation, would you then believe this information or not? **Thank you for this comment. The major differences are the use of more recent data, the substantially increased sample size, and the examination of a broader range of risk factors for serious influenza infections. With the additional power we were able to stratify the results by age and comorbidities to get subgroup-specific performance measures, which will be useful for vaccine effectiveness studies in these populations in the future.** 2. Why did the authors decide on this design? Just calculating sensitivity and specificity for each subgroup may not be very informative. If you take my previous comment into account, I would have found a prediction model much more informative (because then you will be able to indicate what the chances are that that 50-year old female from a city with a bill indeed had an immunisation). **We are intrigued by this suggestion and are interested in pursuing a prediction model approach, but we feel that would be an entirely different study. We appreciate the utility of such a model for evaluating the validity of individual billing practices or location. However, we hope you will agree that this validation analysis (calculating performance measures) is useful in itself for the reasons outlined in the Interpretation section. Our hope is to publish this study and work on a prediction model in the future.** 3. I did not understand the part in which the results from an immunisation study were corrected. The authors state that they used a SAS macro for that and refer to the citation for that macro and although I trust that macro and checked the citation they refer to, I would like to have some more explanation about what they actually did and what the assumption are for this model. And were they able to include also the information on the individuals in this study (e.g. did they use a different sensitivity and specificity for males than for females)? Or did they just use the average sensitivity and specificity? I think the authors should also provide some more information about the study they corrected: how many people, how many improved and how many did not improve; was there misclassification in the outcome measurement as well? **The Methods and Results sections describing this aspect of the study have been modified to provide more clarity. We used the input from Table 3 line 7 (>65 years) as inputs for the macro. We adjusted only the primary analysis in the referenced paper by Kwong et al (i.e., vaccine effectiveness in individuals aged >65 years). We assumed those values to be precise (i.e., no variability in the estimate) for the purposes of illustrating the utility of these results. We did not adjust for outcome misclassification, as we did not have data on this and we expected it to be minimal with studies using the test-negative case-control design.** 4. Please explain the Figure. What is the difference between "adjusted" versus " accounted for"? What do the percentages mean? How should I interpret this figure? **We apologize that this figure was unclear. We have modified the text describing this figure (Methods) as well as the headings in the figure to improve interpretation.** 5. MINOR COMMENT - Page 6 (as stated in right corner): "Data from more recent

	cycles of CCHS were not yet available in linked format at ICES as of January 2016.". What does this mean? And how should I judge this comment knowing that the manuscript was submitted (or at least sent to me) in the beginning of January 2016? **At the time of submission of this manuscript (on January 12, 2016), the files containing the linkable records from the 2011 and 2012 (and later) cycles of the CCHS were not yet available for analysis at ICES. The files containing non-linkable records for the 2011 and 2012 survey cycles were available at ICES but they would not be useful for this study because those records cannot be linked to other ICES data holdings.**
Reviewer 2	Ms. Sukirtha Tharmalingam
Institution	Canada Health Infoway, Toronto, Ont.
General comments (author response in bold)	An interesting article serving to help researchers that might be looking to ascertain immunization status particularly in the 65+ age group. Clearly written, methodology easy to follow. An excellent follow up to the previous publication. **Thank you for your review and your kind words.**
Reviewer 3	Judy MacDonald BSc MD MCM FRCPC
Institution	Medical Officer of Health, Alberta Health Services, Calgary Zone Clinical Assistant Professor, Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Alta.
General comments (author response in bold)	This is a well-written and interesting update to a similar study previously carried out that looks at the validity of using an administrative database (physician billing claims) to capture annual influenza immunization in a population with a universal influenza immunization program. Not surprisingly, this database has its limitations, which the authors do address. 1. Though the authors illustrate how the associated misclassification bias can be used to correct the vaccine effectiveness estimate, are there other applications of this information? For example, it would be helpful to explain a bit more about the implications to determining vaccine coverage overall or by risk group, especially in those less than 65 years of age. How might that inform efforts to improve vaccine uptake in those risk groups with low coverage? **Thank you for this comment. Certainly, the performance measures reported in this study can be used for a variety of applications besides correcting for misclassification bias for vaccine effectiveness studies. For example, the results can also be used to correct for underascertainment at the aggregate level if using physician billing claims to measure vaccine coverage. We have expanded our discussion on this in the Interpretation section (page 11).** 2. The authors do not make any comments about the fact that Ontario has no immunization registry; given the limitations to using the physician billing claims database, it seems reasonable to mention at least in passing the pros and cons of establishing such a registry, especially when other provinces may be moving to capture all doses administered. **Reference to Ontario's lack of an immunization registry was made in the final paragraph of the Interpretation section. We have added further text to emphasize our preference for an immunization registry.** Minor comments: 1. Page 12, line 42 - I believe that a semicolon is required before "therefore" rather than just a comma. **We have made this change as requested.** 2. Page 15, line 15 - physician is misspelled. Also is the journal name Copd and not COPD? **We have corrected these errors.** 3. Page 16, Table 1 - consider mentioning that in the Risk factors for serious influenza section, the percentages add up to more than 100% because individuals may have more than one risk factor. **We have added that footnote to Table 1.** 4. Page 20, Figure - should this be called Figure 1, even though there is only one figure? Also, it would be useful to include a bit more detail about the vaccine effectiveness estimate - for example, for what influenza season was this estimate made? **This figure has now been labeled Figure 1, and we have provided additional information about the vaccine effectiveness estimate in both the figure title and the text.**