Reviewer's report

Title: Snowbirds and infection—new phenomena in pneumonia and influenza hospitalizations from winter migration of older adults: A spatiotemporal analysis

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Reviewer: Lin Yang

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Snowbirds and infection—new phenomena in pneumonia and influenza hospitalizations from winter migration of older adults: A spatiotemporal analysis

The authors conducted an interesting study by analyzing an enormous amount of hospitalization data from Medicaid and Medicare to reveal the spatial and temporal variation in out-of-state P&I hospitalization. They concluded the seasonal variation in nonresident hospitalization may be due to seasonal immigration of elders. However, in this study there are some fundamental problems needed to be solved:

- P&I hospitalization can be caused by numerous pathogens other than influenza. It is necessary for the authors to show how P&I hospitalization is correlated with other indicators of flu activity such as flu virology data or ILI rates, if they want to demonstrate a flu effect here. Have the authors also considered using excess P&I hospitalization attributable to influenza instead of crude rates?

- The authors concluded seasonal variation in nonresident hospitalization was due to seasonal migration of the elderly. However, there is no data to show the correlation of migration rates to P&I hospitalization, and there is no data to show Florida has the most extensive seasonal migration of elderly adults either. It is difficult to know how many people did travel to south only in flu season. As the authors also admitted, they did not know how long these nonresident elders live in Florida. It is likely that these migrant adults were more fragile than general elderly population and they travel to Florida or stay there because warm weather is good for their preexisting health problems. Under such circumstance, seasonal influenza is not the only reason to increase nonresident P&I hospitalization in the elderly in winter.

- The authors defined flu season as October 1st through March 31st, and non flu season as April 1st through September 30th. In fact, it is more common to use Oct-May as flu season in other studies. There were still some flu activities in April according to USCDC surveillance data.

- Harmonic analysis: The authors did not describe how they chose the best fitted model to the data of each state. It seems that they only used one pair of harmonic terms to capture the seasonal pattern in hospitalization counts. But two or more harmonic terms may be needed to fully capture the seasonal pattern in some cases.
2. Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

- P4, 1st paragraph. It is pneumonia and influenza, not influenza alone was one of the top ten causes of deaths.

- P4, 2nd paragraph. What do the authors mean by saying “each year influenza follows distinct geographical patterns across the U.S. and the globe”? I also disagree with the sentence “The timing of the seasonal peak in influenza changes annually”. The winter peaks of influenza were rather fixed and did not change much, at least in temperate regions.

- P5, 2nd paragraph. I think young people are far more likely to travel or migrate for work or leisure than the elderly.

3. Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)

- P7, para1, ln(Non-Floridian/Floridian) is not clearly defined here.

- Figure 1. The authors may consider using integer cutoff points for their color scheme of hospitalization rates.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.