

## Peer Review File

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### Reviewer A

**Comment 1:** *This is an interesting piece of study with proper methodologies to answer the research question. The findings disclosed that during the COVID-19 outbreak, the number of illness outbreaks decreased but the cases reported in each illness did not significantly change. My major question I have about this finding is— are the decrease in “the number of outbreaks” associated with “the decrease of dine-out activities” and/or “the increase rate of food delivery”? By controlling for these effects, the question whether “COVID-19-specific risk mitigation strategies have had a potential effect on foodborne enteric illness outbreaks” could be answered in a more rigorous way.*

**Reply 1:** The authors thank the reviewer for this suggestion. It would have been interesting to explore this aspect. However, the authors were not able to identify any published literature or reliable data that indicated or calculated an association between “the number of outbreaks” and “the decrease of dine-out activities” and/or “the increase rate of food delivery”. Specifically, the NORS database does not provide this type of information and a literature search did not reveal any relevant studies. However, numerous studies cite a marked decline in foodborne illness outbreaks and attribute these decreases with COVID-19 public health measures and restrictions; information regarding the possible causative pathways for a reduction in foodborne illness outbreaks are discussed in Lines 339 to 362. Further, this consideration and the following text has been added to our limitations section (Lines 449-452):

*Additionally, given the available data there was no way to control for the potential effects of reduced restaurant dining activity that may have occurred following the onset of the COVID-19 pandemic, potentially limiting the ability to conclude that COVID-19 risk mitigation strategies effected foodborne illness spread.*

If additional data were to become available, this would be an area for future research.

**Comment 2:** *In addition, more information should be provided to identify the research gap(s). Specifically, what is the current literature on strict infection prevention strategies and foodborne illness? Are there any existing studies that have tested their relationship by using different methodologies? What makes this study necessary and valuable. What important knowledge have you added to what specific area—in other words, what are your contributions that really matter to the industry and to the theory?*

*Right now, this article to me is more like a superficial research note that describe the results generated from data, rather than an academic paper. I believe this article will be much more solid and meaningful by answering the questions above.*

**Reply 2:** The authors thank the reviewer for making this suggestion. Information on recent literature and research gaps can be found in the introduction on Lines 104 through 141. Additionally, literature on the current infection prevention strategies for foodborne illnesses was added and can be found on lines 106 through 114.

## **Reviewer B**

**Comment 1:** *The proposed manuscript presents an analysis of epidemiological data on foodborne pathogens in the United States. The objective is for the authors to determine if the year 2020 (after the start of the SARS-CoV2 epidemic) is different from the previous 20 years.*

*The role of FOODNET data is unclear. The "Method" section seems to announce the use of data from this surveillance system. However, the result section only focuses on data from NORS. Thus, it is not clear why the authors focus on the 9 pathogens of FOODNET to analyze the NORS data. The analysis of the data related to norovirus would have been particularly valuable.*

**Reply 1:** The authors thank the reviewer for this comment and agree that the language regarding FoodNet is confusing throughout the manuscript. Clarifications regarding the use of FoodNet were made throughout the abstract, introduction, and methods, and the following text was added to the Methods section following the introduction to FoodNet (Lines 184-188):

*“Although data was not utilized from FoodNet due to the limited information regarding the setting in which causative exposure resulting foodborne illness occurred, the pathogens monitored in FoodNet were utilized to define the pathogens explored in this study as they are among some of the most common foodborne illness causing pathogens.”*

Additionally, the authors thank the reviewer for this suggestion, and agree that it would have been interesting to explore norovirus in greater detail and we feel this is an important topic for further research as our study focused on the general topic of food-borne illness and not specific etiological origins. We do note this as a limitation of our study (Lines 442-450).

**Comment 2:** *The term "severity" used to account for the number of cases is questionable. It is often reserved in this field for defining hospitalizations or mortality of foodborne pathogen-associated illnesses (see, e.g., Belanger et al. 2015).*

**Reply 2:** The authors thank the reviewer for this comment. We agree that the use of “severity” is not proper use of the word in the context and have updated the manuscript to use the word “density” in its place. Further, we have added the following text to clarify why we have not included information on deaths and hospitalizations (Lines 246-248):

*“The number of hospitalizations and mortality associated with each outbreak was not assessed as the NORS database noted data gaps associated with the available data.”*

**Comment 3:** *The statistical analysis comparing the two time periods for the number of cases focuses on all pathogens. An analysis by categories of pathogens (those suspected to be most affected by HACCP principles).*

**Reply 3:** The authors thank the reviewer for this suggestion. While it would have been interesting to explore this aspect of foodborne illnesses, the authors feel this analysis is outside the scope of the study objective. The aim of this study was to assess and understand the impact COVID-19 had on foodborne illness in its totality. Assessing specific pathogens is an excellent opportunity for further research to better understand which pathogens were most affected by COVID-19 mitigation strategies and the HACCP Principals.

**Comment 4:** Statistical analysis of the season effect could be improved by using time series models.

**Reply 4:** The authors thank the reviewer for this comment, while a time series model may have provided additional information regarding the forecasting of future foodborne illness outbreaks, the authors feel this analysis is outside the scope of the current analysis given the timely nature and specific COVID-19 restrictions and mitigation strategies experienced in 2020. The development of a time series model to explore the long-term effects of COVID-19 is an excellent area for future research.

**Comment 5:** *Line 70 STEC (not just O157).*

**Reply 5:** The authors thank the reviewer for this comment; however, the article referenced ([Burden of Foodborne Illness: Findings | Estimates of Foodborne Illness | CDC](#)) specifically notes that one of the top five pathogens contributing to domestically acquired foodborne illness resulting in hospitalization is “*E. coli* (STEC) O157.”

**Comment 6:** *Line 78 the word "strain" is not appropriate.*

**Reply 6:** The authors agree that the use of strain is not appropriate and have removed it from the text.

**Comment 7:** *Line 159 It is necessary to mention unselected pathogens.*

**Reply 7:** The authors thank the reviewer for this comment; however, the authors do not feel it is appropriate to list out the unselected etiologies as there are over 100 listed in the NORS database.

**Comment 8:** *Figures 2 & 3 could be grouped together (and even deleted as the data is redundant with the Table.*

**Reply 8:** The authors thank the reviewer for this comment and agree the information presented in Figure 2 and 3 is redundant with the information presented in Table 1, and thus, have both been removed; all Figure numbers were updated throughout the manuscript.

## Editorial Comments:

**Comment 1:** *The authors could consider adding the year spans “2000-2019” and “2020” in the Title. For example, “Restaurant-associated Foodborne Illness Outbreaks in the United States: An Epidemiological Assessment Comparing Outbreak Occurrence and Severity Before (2000-2019) and During (2020) the COVID-19 Pandemic”.*

**Reply 1:** The authors agree with this suggestion and have updated the title accordingly (Line 4).

**Comment 2:** *It is suggested that the type of study be highlighted in the abstract, including whether it was designed as a cohort, case-control, or cross-sectional study and whether it was retrospective or prospective. This information should be provided beyond the STROBE reporting checklist.*

**Reply 2:** The authors agree with this suggestion and have updated the abstract accordingly with retrospective cross-sectional/observational study (Line 26).

**Comment 3:** *Lines 42-44, “There was a statistically significant decrease in the occurrence of outbreaks per year” and “there was no statistically significant difference in foodborne outbreak severity”. The statements are not clear and specific enough. Please present the key results with precise data and their precisions in the abstract.*

**Reply 3:** The authors thank the reviewer for this comment and have updated the Results section of the Abstract with the following text (Lines 42-49):

**Results:** *Approximately 45% of 4,637 foodborne outbreaks were associated with exposure at a restaurant between 2000 and 2020. Overall, there was a 49% decrease in the average number of outbreaks per year in 2020 compared to 2000 through 2019 and a statistically significant decrease in the occurrence of restaurant-associated outbreaks per year in 2020 compared to the 20 years prior was observed ( $P < 0.001$ ). However, there was no statistically significant difference in the density, or number of illnesses per restaurant-associated foodborne illness outbreak, between 2000 and 2019 when compared to 2020 ( $P = 0.439$ ).*

**Comment 4:** *The hazard control and risk mitigation strategies discussed in the introduction should be organized in greater detail, beyond the single sentence provided in lines 79-82.*

**Reply 4:** The authors agree with this suggestion and have added more information and examples in the introduction (Lines 88-114).

**Comment 5:** *As for one of the sections of Highlight Box “What is known and what is new”, the authors repeated the key findings again. It’s recommended that the authors distill the point of view of the previous articles and integrate the information for “What is known”. And “what is new”*

*means what does this manuscript adds. The knowledge gap or the main purpose could be summarized here.*

**Reply 5:** The authors thank the reviewer for this comment and have updated the Highlight box with the following text (See Highlight Box):

*High rates of foodborne illness have persisted throughout history and prevention practices have plateaued. Findings from this study indicate that methods used by restaurants to enhance protection against COVID-19 transmission may not be the most effective in reducing foodborne illness outbreaks; however, application of the chain of infection to the hierarchy of controls bot COVID-19 and foodborne illnesses can be better mitigated.*

**Comment 6:** *Please add “COVID-19”, and “Foodborne illnesses” as keywords. Please also note 3-5 keywords are requested according to the authors guideline.*

**Reply 6:** The authors agree with this suggestion and have updated the keywords to include: “COVID-19”, “Foodborne illnesses”, “HACCP”, and “NORS.”

**Comment 7:** *Lines 144-145, “FoodNet only surveils eight states and specific counties in three additional states”. Please add the specific information concerning the states and counties.*

**Reply 7:** The authors agree with this suggestion and have updated the text to include the specific states that are surveilled by FoodNet, as well as the states that where specific counties were surveilled.

**Comment 8:** *The variables “Number of Outbreaks”, “Restaurant-Associated Outbreaks” and “Cases” should be defined clearly in the Method to ensure they are understandable to readers.*

**Reply 8:** The authors thank the reviewer for this comment and have added a section to the Methods section (section 2.2) that outlines the definition of an “outbreak” and “cases” (Lines 204-207); further, additional information was added to section 2.6 to clarify the definition of “Number of Outbreaks” (Line 237 ). The definition of a “Restaurant-associated Outbreak” was previously defined in Line 215-218 but has also been clarified.

**Comment 9:** *Lines 148-149, “A statistically significant decrease was observed in the number of foodborne illness outbreaks ( $P < 0.001$ ) and cases ( $P < 0.001$ ) associated with a restaurant exposure”, similar to comment 3, please report the specific data and the 95%CI. The same applies to lines 253-254 and lines 263-265.*

**Reply 9:** The authors thank the reviewer for this comment and have added the relevant 95% confidence intervals and additional specifical data details. Specifically, the Results text has been updated with the following text (Lines 299-322):

*3.4 Comparison of restaurant-associated outbreaks prior to and during the COVID-19 pandemic*

*A statistically significant decrease was observed in the number of foodborne illness outbreaks ( $P < 0.001$ ; 95% CI: 84.31 to Inf) and cases ( $P = 0.00173$ ; 95% CI: 1809.17 to Inf) associated with a restaurant exposure between the years leading up the COVID-19 pandemic (2000-2019) and the onset year of the COVID-19 pandemic (2020). Overall, there was a 49% decrease in outbreaks in 2020 (49.00 outbreaks) compared to the average number of outbreaks per year from 2000 to 2019 (95.55 outbreaks), but only a 21% decrease in the total average infections per year between the two time periods (2020: 1,698.00 illnesses; 2000-2019: 2,159.80 illnesses). In contrast, there was not a statistically significant difference in the density of the outbreaks (number of foodborne illnesses per outbreak) in 2020 when compared to years prior to the COVID-19 pandemic (2000 to 2019) ( $P = 0.59879$ , 95% CI: -2.000037 to 1.000068). Specifically, there was an average of 34.65 restaurant-associated illnesses per outbreak in 2020 and an average of 23.06 illnesses per outbreak between 2000 and 2019.*

*While it appears there were a greater number of illnesses per restaurant-associated outbreak observed in 2020 than nearly every other year since 2000, excluding 2002 and 2010 (Table 4), there was one single multistate Salmonella outbreak that occurred in June 2020 which resulted in 1,132 foodborne illness cases. If this single datapoint is removed as a potential outlier, the average number of restaurant-associated foodborne illness cases per outbreak is reduced to 11.8. However, even when this potential outlier is removed, there remains no statistically significant difference between the density of outbreaks prior to (2000-2019) and during the COVID-19 pandemic (2020) ( $P = 0.4386439$ ; 95% CI: -2.0000187 to 0.9999179).*

**Comment 10:** *Line 195, “Given the nature of the data” is not enough and concrete. It could be stated the statistical analysis methods was determined by the normality of the variables. Additionally, the authors should also state the categorical variables were presented with frequency and percentage.*

**Reply 10:** The authors thank the reviewer for this comment and have updated the text to indicate the normality of the data, as well as that the frequency and percentage of the categorical variables were calculated. Specifically, the Methods text has been updated with the following text (Lines 237-246):

#### *2.6 Summary statistics*

*The data was summarized by total number of outbreaks for each month and year, and by etiology and exposure setting. Specifically, the frequency of each exposure setting and nine etiologies for all outbreaks from 2000 to 2020 was determined. Additionally, the average number of cases per outbreak each year, the number of hospitalizations, and the number of deaths each year was summarized. Given the non-normality of the data, a Wilcoxon Rank Sum test was utilized to assess if there were statistically significant differences in the number of restaurant-associated foodborne illness cases per outbreak (i.e., density) when comparing the years prior to the COVID-19 pandemic (2000 to 2019) and the number of cases per outbreak observed in 2020.*

**Comment 11:** *Line 197, the authors consider “the number of restaurant-associated foodborne illness cases per outbreak” as the severity. Why is the number of cases? Why not using the number of hospitalizations or deaths?*

**Reply 11:** The authors thank the reviewer for this comment. The number of cases were used as there are a great deal of data gaps associated with the hospitalizations and deaths presented in the NORS database and thus, the authors did not feel this was a reliable way to present that data. However, as discussed in a response above (Reviewer B: Comment 2), the term “severity” has been replaced with “density.”

**Comment 12:** *Is the data from FoodNet database only used for analyzing the Foodborne illness etiology? The findings regarding the two main purposes were concluded from the NORS database? Please indicate the source of database of the findings in the Results section.*

**Reply 12:** The authors thank the reviewer for this comment. Clarifications to further outline the utility of FoodNet in this study have been added to the abstract, introduction, and methods section as outlined above (Reviewer B: Comment #1). The authors feel that the clarifications made in these sections address the question of the source of the database in the Results section.

**Comment 13:** *The authors should ensure that Figure 5 is cited in the main text of the article.*

**Reply 13:** The authors thank the reviewer for this comment, Figure 5 (now Figure 3) is cited in the main body of the manuscript and can be found in Line 631.

**Comment 14:** *Reporting of P values:*

*The description of the P value should be in uppercase italic format, i.e., "P".*

*If P value < 0.001, report "P < 0.001" to avoid reporting unnecessarily excessive precision.*

*If  $0.001 \leq P$  value < 0.01, report the specific P value to 3 decimal places, e.g., "P=0.001" "P=0.009".*

*If P value  $\geq 0.01$ , report the specific P value to 2 decimal places, e.g., "P=0.01" "P=0.06" "P=0.10" "P=0.90".*

*If the P value is >0.99, report "P>0.99".*

*Do not round P values, do not report "not significant" simply because the data is greater than an arbitrary value, and do not report only vague bounds such as  $P < 0.05$ , as described above, but report the exact P value.*

**Reply 14:** The authors thank the reviewer for pointing this out, the P values have been updated throughout the manuscript accordingly.