Author's response to reviews

Title: Missed Opportunities: Racial and Neighborhood Socioeconomic Disparities in Emergency Colorectal Cancer Diagnosis and Surgery

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Author's response to reviews: see over
Dear Dr. Solera:

We appreciate the opportunity to revise and resubmit our manuscript. The reviewer’s comments were helpful, and we have responded to each of them in turn. We believe our revised manuscript is significantly improved as a result. A point-by-point description of our revisions follows. We have submitted a revised version of our manuscript which uses track changes to highlight our revisions. We look forward to your decision.

Reviewer #1:
Major Compulsory Revisions
1. …the exact nature of this study’s Inclusion Criteria is not as defined…..an emergency inpatient admission may be directly related to other comorbidities or factors such as trauma….It is unclear whether the authors accounted for these cases. If not, this would be a significant limitation of the study. Due to the variation in what is considered an ‘emergency diagnosis’, the emphasis of the study should be on ‘emergency surgeries’ instead. Given that ‘emergency surgeries’ will have fewer potential variables to acknowledge.
Response: The reviewer brings up concerns related to what s/he perceives as a more ambiguous definition of emergency diagnoses, as compared to emergency surgeries. We have several responses. First, we do measure and control for clinical confounders such as comorbidity, prior hospitalization, and preventable hospitalizations. Second, we felt it was important to describe the prevalence and correlates of emergency diagnosis because many patients diagnosed emergently have advanced disease or poor prognosis, which could postpone or preclude curative resection, particularly African Americans and those of low SES who often present with more advanced disease.[14] In other words, if we had focused on surgery alone, we would have neglected an important population of patients with emergency diagnoses who were not eligible for surgery. Third, we found that the two variables (emergency diagnosis and emergency surgery) were closely related, suggesting that diagnoses identified as emergent were very likely related to the CRC. Of patients diagnosed emergently and undergoing surgery, 84.0% had emergency surgery. Of patients undergoing emergency surgery, nearly all (94.0%) were also classified as having an emergency diagnosis. Last, we note that our primary
results regarding neighborhood socioeconomic status and African American race are virtually identical across both outcomes. Moreover, results were identical in our reported sensitivity analyses wherein we examined the use of different indicators of emergent status (some more specific than others). For these reasons, we have confidence in our analysis of emergency diagnosis as well as emergency surgery.

2: Living in an area with higher poverty rates does not directly indicate what SES a specific patient is from.
Response: We agree. Notably, our purpose was to describe neighborhood SES disparities in two outcomes, as indicated in our title and throughout our purpose statement. Neighborhood SES is a validated measure that is frequently used across multiple research fields. We have now provided additional information and multiple references supporting our use of neighborhood SES in the methods on Page 7.

3: The authors should define how the census tracts are determined within the methods.
Response: We have now clarified that census tracts are determined by the SEER registries on Page 6.

4: The statistical analysis is quite difficult to understand in its entirety and needs further explanation. The empty model does not make sense….In my understanding of the ‘empty model’, there are no independent variables analyzed. If this is the case, then the variance and median odds ratio are incorrectly labeled and/or are not relevant to this ‘empty model’.
Response: The reviewer is correct that there are no independent variables included in an empty model. However, variance and median odds ratios are not measures of independent variables, but rather measures of the census tract-level variance, and thus, are appropriate measures obtained from an empty model. To improve reader understanding, we now have revised the text to be explicit in describing what an empty model is and what its purpose is as follows: “Empty models include no predictor variables, but include a hierarchical structure, and are fit for the purpose of quantifying variation at the census tract level.”

Minor Essential Revisions
1. There are several grammatical errors and language error that should be revised.
Response: We have reviewed the manuscript in its entirety and corrected any errors.

Reviewer #2:
Major Compulsory Revisions
A) General comments

1. The manuscript, at times, suffers from poor sentence structures and grammatical errors.
   Response: We have reviewed the manuscript in its entirety and corrected any errors.

B) Introduction

1. The authors need to note about the study population for references #6 and #7, using data from which sources?
   Response: We have now modified the introduction to describe the sources of the data for both of these references.

2. Better organize the introduction section so that each paragraph communicates one complete idea.
   Response: We have reviewed the introduction and have split some paragraphs to ensure each paragraph communicates one complete idea.

3. The study objectives at the end of page 4 are not clear and the evidence supporting the study hypothesis should be referenced.
   Response: Thank you for this suggestion. As suggested, we have now included numerous references into the text where we describe our hypotheses. Please note that the findings from these references were previously described in detail elsewhere in the Introduction.

C) Methods

1. It is unclear what the authors mean on p.6 that they excluded patients without year 2000 census tract, are information for these Census Tracts missing in the US Census data?
   Response: We have now clarified this statement to describe that we excluded patients in the SEER-Medicare database without this data (i.e. data were missing from SEER-Medicare not the U.S. Census).

4. The sentence describing about potentially preventable hospitalizations on page 8 is unclear, what do the authors mean by ‘compared to those with one or more to those with no preventable hospitalizations.”
   Response: We have revised this sentence to improve clarity.

5. Consider calling unadjusted model instead of ‘empty model’
   Response: An unadjusted model is different from an empty model. We now have revised the text to be explicit in describing what an empty model is and what its
purpose is, which is different from an unadjusted model as follows: “Empty models include no predictor variables, but include a hierarchical structure, and are fit for the purpose of quantifying variation at the census tract level.”

6. It is not clear if the authors retained the main effects of race and neighborhood in the interaction model, they should have retained.
Response: Thank you for this question. Yes, the main effects of race and neighborhood SES were retained in the interaction model. We have now clarified this in the Methods on Page 9 and in a note to Table 3.

C) Discussion
The discussion and conclusion sections will need to include discussion about the direct practical and policy implications for the study within the current health care context, reporting racial and geographic disparities in access to care is not novel. Also, the data years the authors have used are relatively old (1991-2005) and study findings might not be generalizable within the current health care context (the economic downturn of 2007-2009, health care reform initiatives, etc.). The authors will need to discuss how study findings might still be applicable within the current context and highlight better how this study is in particular different than the other studies they have referenced.
Response: Thank you for these reflections about the results of our study in light of policy and economic changes. We have now included some text in the discussion in response on Page 17. Regarding the comment about the novelty of our study, we maintain that while documentation of race and SES disparities is not novel; we present the first documentation of such disparities in a novel outcome (CRC emergencies). Furthermore, we also present the first documentation of neighborhood variation in these outcomes. Therefore, for this reason as well as many others, this study is different from the other studies we have referenced.

Discretionary revisions
Most studies suggest retaining tumor characteristics variables (such as stage and grade) even though these might not be significant in the bivariate analyses, because these variables are most likely associated with outcomes (despite the nonsignificant bivariate analyses).
Response: We agree. Indeed, the tumor characteristics of both stage and grade were included in the adjusted models, as described in the footnotes of Table 2 and Table 3. The criteria for inclusion in the model was a statistically significant ($p<.05$) association in bivariate analysis. As shown in Table 1, both stage and grade met this criteria and thus were included in the adjusted models. However, to ensure clarity, we now discuss which covariates were included in the adjusted models in the Results on Page 10.
Reviewer #3:
No revisions were requested.