Reviewer: 1  
  
Comments to the Author  
Overall, this was a very interesting read. I have one question (which the authors may be able to answer in response to reviewers only): Could not physical illness, including the effects of work related accidents have affected both the risk of losing one's job and the risk of suicide (due to lowered quality of life) or a drug overdose (additionally because whatever illness someone is suffering from could produce pain that could lead to a prescription of opioids. If the authors decide to comment on this in the manuscript, they may do so in much the same way that they commented on depression.

The Reviewer is correct that physical illness, including the effects of injury, work-related or not, may have affected both the risk of losing one's job and the risk of suicide or a drug overdose. This is illustrated in the DAG, which we have revised to include injury and drug abuse along with depression, and moved from the Appendix into the main text. We also identify these unmeasured confounders as a limitation in the Discussion.

Minor typo (I think):  
P. 3, line 27: "with as drug overdoses" - should just be "with drug overdoses", right?  
  
Correct. Fixed.   
  
Reviewer: 2  
  
Comments to the Author  
General comments  
The premise of the paper is a link between a rise in suicide rates among working age US males with a ‘coincident’ decline in the manufacturing industry. The authors outlines an increase in mortality among middle aged adults (1998 onward, perhaps particularly since the year 2000). Cited literature details a rise in all-cause mortality greatest but not exclusively observed among those with low education, noting an increase in poisoning, suicide and chronic liver disease among those aged 45-54. Authors describe a coincident decline in the manufacturing industry, particularly since 2000 following the entry of China to the WTO and 2009 due to the GFC.   
The study is enabled but also complicated by the use of existing data from the UAW-GM cohort study, which were collected for different purposes. Complications arise from the periods of data available, and the nature of data available (i.e., administrative data on employment and outcomes mean that information on confounding factors such as suicide classification, date of termination of employment (potentially not aligned with date of death), voluntary/involuntary exit and subsequent employment, and no employment records beyond 1994).

A key limitation of the work is that employment data spans 1970-1994 from three car manufacturing plants which closed after 2010-2014. Thus, employment records cease 15-19 years before plant closure and the period of observation does not overlap well with the described period trends related to suicide and manufacturing decline (which emphasise the post-2000 period). This is not discussed in the manuscript.

The Reviewer is correct that this study is both enabled – and complicated – by the use of existing data from a study conducted for a different objective. It is true that we struggled to define the primary objective and analysis of the present study within the constraints of the data. Although we do not directly observe the plant closures during follow-up, our study question was about leaving work and suicide, and we capture plenty of individuals who terminated employment prior to 1994. We have edited the last sentence of Background section of the Abstract to remove mention of plant closures. We now say “Erosion of the Michigan automobile industry provides a striking case study.”

The authors propose to investigate 1) the risk of suicide 1970-2015 among male workers employed at three GM manufacturing plants for 3+ years 1967-1983 (primary analysis model) and 2) whether this risk differed by age (secondary analysis model). The authors present models for two outcomes (suicide and suicide+OD) and sensitivity analyses (one related to IV classification for the primary analyses and another to DV classification in the secondary analyses) to explore the impact of some of these limitations.

The cohort includes subjects employed for at least one day after 1.1.1970. From Table 1, 1967 is the median hire date (1956 is the 25th percentile), but employment dates span 1938 (the minimum hire date) to 1994. The minimum date is mentioned in the section on Study Population (p5).   
  
Method   
Age and voluntary exit: Age models are premised on people exiting employment after 55 were ‘likely to have exited employment voluntarily’ (or at least reduced financial hardship) as they became eligible for full or partial pensions. However, authors state that age and 10-year employment tenure were minimum criteria for partial pension eligibility, no effort to apply the tenure criteria. If older workers are automatically considered to have left employment voluntarily, and involuntary unemployment was indeed a risk factor for suicide and overdose, this categorisation risks understating the risks associated with ‘worker exit’ by age. Describing the proportion of persons aged 55+ who met criteria for full and/or partial pensions would be useful in understanding the conditions under which these adults left employment.

Of those with complete work records, 43.8% left at age 55 or older. Almost all (97.8%) of those who left older than 55, had worked more than 10 years. This has been added to the Results section, just before Table 1, p 9.

Important confounding factors: The DAG provided facilitates the discussion of the proposed model and its limitations (unmeasured confounding factors). The model indicates a direct relationship between worker exit and suicide, acknowledging authors acknowledge depression as a time-varying factor influenced by plant closure and displaying a reciprocal relationship with work exit. Important factors such as financial stress, reasons for exit, and subsequent employment are equally meaningful but unmeasured confounders in these pathways, and their discussion may be facilitated by inclusion in the DAG.

We are pleased the reviewer appreciates that the DAG facilitates discussion about the more complex mechanisms by which worker exit may be on the pathway to suicide or overdose. We agree that financial stress, subsequent employment and reason for leaving are all important unmeasured factors. We have expanded the DAG to include drug abuse and injury as possible reasons for leaving work, because they may be unmeasured time-varying confounders that may contribute both to the risk of worker exit as well as to the outcomes.   
  
Analytic plan  
The manuscript would be strengthened by a clearly stated analysis plan. A rationale for the results presented in Figures 1 and 2 (Suicide/Suicide+OD rate by calendar year for full and partial cohort) would help the reader understand their significance. They are the only figures presented in the main manuscript and do not directly relate to the primary or secondary analyses nor are mentioned in the analytic plan. While these may help to understand the biases introduced with the loss of IV data from 1994 onward and impact of excluding/including OD in the outcome, they do not convey results of either the primary or secondary analysis models related to the study’s premise.    
Similarly, a rationale for the remaining reported analyses would be useful (i.e., why outcomes of suicide and suicide+OD were explored, the impact of restricting outcomes occurring within 5 years of exit, and reclassification deaths within 1 week of work exit as occurring while employed were/were not explored for the primary and secondary analyses). Specifically, the combined suicide and suicide+OD outcome models are presented for the secondary but not the primary analysis model, and the sensitivity analyses are each only reported in relation to one model.

The reviewer raises several good points. We agree that the logical flow of the analysis should be more explicit. We have edited the Analytic Method sub-section in Methods to provide a roadmap for the analysis. Here we describe the DAG. We also moved the DAG into the main text and added motivation for contrasting suicide alone with the combined outcomes (p 7). We also revised the Sensitivity sub-section to indicate which model (primary or secondary) was examined in each sensitivity analysis.   
  
Results  
Table and figure captions reiterate a partial description of the cohort and inclusion criteria ‘…the UAW-GM Cohort restricted to men employed in or after 1970’ but may more usefully describe the data/analyses conveyed in that table/image. Footers indicating the some but not all criteria by which cohort members were excluded (i.e., that data exclude women) could be omitted.

Again, the Reviewer makes a good point. We have revised Table titles and footnotes to be more useful, consistent, and complete.

Table 1 title, column headings or footer may helpfully indicate why the full and subset are described i.e., right-hand column describes subset of workers who exited work prior to 1995 utilised in the secondary analyses of risk by age. It would be useful if these cohorts were labelled consistently across the figures and tables (i.e., ‘full cohort’ and ‘subset with complete records’ vs. ‘all records’ and ‘complete work records’).

Done.

Table 2 headings ‘Recorded worker exit date’ and ‘Fuzzy worker exit date’ are unclear and do not correspond to how these groups are discussed and defined in the text. Recoded worker exit date and 6 cases who were indicated as having suicided within a week of work exit are reclassified as having suicided while employed.

We have relabeled the Table to correspond to the description on the text.   
  
Discussion  
A third of results are dedicated to describing the rate of outcomes (suicide and suicide+OD) for workers by calendar year 1970-2015 [depicted in Figure 1a/b (page 9 line 46-page 10 line 6) and Figure 2a/b (discussed page 11, lines 46-Page12, line 17)]. These analyses provide some insight into the impact of restricting cases to those who left employment before 1995 (the ‘complete records’ subset used in secondary analysis). According to text, Figures indicate that when all cases were included (primary analysis sample) the suicide-alone rate remained stable over time and increased for suicide+OD rate, however the rates for both suicide and suicide+OD outcomes declined after 1995 when restricted to cases who left employment before 1995 (secondary analysis sample). This likely reflects the concentration of suicide and suicide+OD deaths within 5 years of leaving employment (Figure e3). Given the substantial space dedicated to presenting these results, their significance for interpretation of the primary and secondary analyses should be foreshowed in the analytic plan (any control for worker age etc.) and discussed – the implication of these findings is not currently mentioned.

The Reviewer correctly interpreted the implications of the subtle differences between the crude rates for the full cohort and the subset with complete work records. We agreed we had given too much space to presenting these results and have deleted the figures for the subset with complete work records.

Minor comments.  
Title: Authors could consider omitting overdose from title. Models for suicide and a combined suicide+unintentional fatal OD outcome are presented due to the potential for suicide by OD to be misclassified as unintentional fatal OD. No models are presented indicating the hazard of work exit on fatal OD alone and thus this may be misleading for readers searching for such research.

We have considered removing overdose from the title and prefer to leave it as is.

Abstract: Meaningful limitations of the data and analyses could be clarified such as the data available for the primary IV (e.g., the IV observation period ‘ …using employment records 1967-1994 and mortality follow-up 1970-2015’) and that hazards associated with overdose are presented.

We have added this additional information to the abstract.

Page 3 line 27: ‘with as drug overdoses…’ should be ‘with drug overdoses…’?

Corrected.

Page 3 line 29: could the authors clarify whether ‘Reversing decades of steady decline’ refers to decades of steady decline in rates of all-cause mortality, suicide and/or overdose and provide a suitable reference?

We have revised this to clarify that we are speaking about all-cause mortality, with a reference added.

Footer of Table 1, line 42, need space between ‘December’ and ‘31’

We have added a space.