Author's response to reviews

Title: Individualized and institutionalized residential place-based discrimination and self-rated health: a cross-sectional study of the working-age general population in Osaka city, Japan

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Author's response to reviews: see over
Reviewer: Naoki Kondo

Reviewer's report:
This study investigated individual and area-level perceived place-based discriminations (PBD), and area-level deprivation as potential determinants of individual self-rated health. The topic is important for public health. The manuscript is very well-written. I have several comments on its argument.

Major Compulsory Revisions
#1 The authors wanted to evaluate “institutionalized” PBD and measured it by aggregating individual responses on PBD by area and called it “area-level PBD”. I understand the authors’ this intention but I think there is still substantial distance between the concept of institutionalized PBD and area-level aggregate of individual PBD. It is good that the authors clearly defined these terms in the main text but in abstract it is confusing. Please clarify. Potential alternative interpretations of measured area-level PBD and SRH should be discussed more (perhaps in limitation section?). In addition, when using the term institutionalized PBD, it should be defined clearly at the first place it used (Currently the definition came first at methods section).

Our response: We have added a description of the concept of institutionalized PBD in the abstract and background as follows. Related to comment #12 of referee 2, we have added a description in the limitations section as follows.

[page 2 in the abstract] An area-level PBD indicator was created by aggregating individual-level PBD responses in each tract, representing a proxy for institutionalized PBD, i.e., the concept that living in a stigmatized neighborhood affects neighborhood health. 100 tracts were divided into quartiles in order.

[page 5 in the background section] PBD may not be merely the actions and prejudices of individuals against individuals; institutionalized PBD may be perpetuated by organizations and represent processes built into social entities, in a similar way to institutionalized racism [19]. Thus, even if residents do not recognize the existence of interpersonal PBD, they may suffer inherent institutionalized PBD and, in turn, their health may be compromised; i.e., the concept that living in a stigmatized neighborhood affects neighborhood health.

[page 16 in the limitation section] Furthermore, there may be a common tendency when respondents rated their experience of discrimination and subjective health, which may lead to overestimation of the association [43]. On the other hand, peer comparison, in
which lower SES respondents may compare themselves to their relatively unhealthy peers, may lead to relative health "optimism" among lower SES individuals and cause an underestimation of the association [43].

#2 It is misleading to evaluate the strengths of associations based on statistical significance or the width of credible intervals. I think it should be done mainly by the magnitude of point estimates. I recommend to modify the interpretations of the results based on this.

Our response: We have changed the description according to the magnitude of point estimates as follows.

[page 10-11 in the results] Tables 4 and 5 show the results of the multilevel logistic analyses. All analyzed individual-level factors showed significant associations with poor SRH in the age, sex, PBD and SES-adjusted model (model 4). For example, ORs (95%CI) were 1.89 (1.33, 2.81), 2.28 (1.50, 3.42) and 1.83 (1.45, 2.30) for perceived PBD, unemployment and not-home-owner, respectively (Table 4). Regarding associations between area-level indicators and poor SRH (Table 5), only area-level indicators were included in model 1. The ORs for the third and highest quartiles of ALPBD, ALNHA and ALNHC, third quartile of area-level unemployment by aggregated responses (ALUEA), and highest quartile of ALDI were statistically significant compared with the lowest quartile: for example, ORs for the highest quartiles of ALPBD, ALNHA, ALNHC and ALDI were 1.84 (1.35, 2.52), 1.57 (1.14, 2.20), 1.65 (1.18, 2.33) and 1.78 (1.30, 2.44), respectively. Results from an age and sex-adjusted model (model 2) did not vary compared with those from model 1. After adjustment for age, sex and a corresponding individual-level factor (model 3), the ORs for highest quartile of ALPBD, ALNHC and ALDI were attenuated, but remained statistically significant: i.e., 1.57 (1.13, 2.18), 1.53 (1.11, 2.12) and 1.66 (1.20, 2.28), respectively. In the further social relationship-adjusted model (model 5), the ORs for the highest quartile of ALPBD, ALNHA, ALNHC and ALDI were attenuated to 1.28, 1.10, 1.25 and 1.13, respectively, and all were non-significant, although the ORs for the third quartile of ALUEC were 0.74 and marginally significant. ORs for the third quartile of ALUEA retained significance throughout all models: i.e., 0.65 (0.46, 0.93) for model 1,
0.64 (0.45, 0.90) for model 2, 0.60 (0.42, 0.85) for model 3, 0.65 (0.46, 0.92) for model 4 and 0.67 (0.47, 0.95) for model 5.

#3 The comparisons of the magnitude of area-level PBD and deprivation should be careful as the ranges of these measurements should be different. As this is conducted in Japan where I think severe poverty issue and areal segregations based on living standards are not highly likely, the range of areal deprivation may be narrower than those in other places with wider social disparities (such as downtown areas in the US). Please mention about these in discussion.

Our response: We have added a description in the discussion section as follows.
[page 12-13 in the discussion] Thus, the magnitude of area-level indicators should be compared carefully as the ranges of these measurements should be different. As this is conducted in Japan where severe poverty and areal segregation based on living standards are not highly likely, the range of areal deprivation may be narrower than those in other places with wider social disparities such as the USA.

#4 Bring some of explanations on “buraku” and “nishinari” from supplement to the main text, as they are important concepts in this paper’s argument. Especially it seems to me very important to understand “the fifth pathway” on discrimination/health associations.

Our response: We moved and changed the description from supplement to the main text as follows.
[page 4 in the background] In Japan, the Buraku people are a minority group that continues to face discrimination because their predecessors, the eta and hinin, were considered outcasts during the Japanese Edo period (1600-1868) when they were employed socially unacceptable jobs (such as slaughtering animals or treating leather). In present day Japan this discrimination occurs in many aspects of life, including employment, housing and education. Further, discrimination against Buraku district residents, which is based on the place itself regardless of residents' ancestry, continues [14]. At the same time, a new type of discrimination against residents of the Nishinari ward in Osaka city, which includes the largest Buraku district, so-called Nishinari discrimination has emerged [14, 15]. This refers to the stigmatization of the ward for reasons of slums, poverty, crime, dilapidated dwellings and insanitary conditions. These two forms of discrimination, Buraku and Nishinari, could be categorized as PBD, which
may affect the health of individuals who live in the specified area [16].

#5 Concepts for the authors hierarchical modeling approach is not clear. What is the key model to evaluate the association between area-level PBD on SRH? What is additional models to evaluate those potential pathways? For example, I agree to the authors on the point that social relationships may possibly be the mediator on the association between area-level PBD and health. So what is the role of the fully adjusted models in the authors’ data evaluation? These consideration may better be shown in methods section, when introducing their modeling approach.

Our response: We changed the description in the methods section as follows. We also removed the results of model 5 into supplementary results. [page 8-9 in the methods section] Firstly, unadjusted and age and sex-adjusted odds ratios (ORs) and 95% credible intervals (CIs) for poor SRH were calculated (model 1 and 2, respectively). To distinguish the individual-level compositional impact and area-level contextual impact of PBD (or SES) on outcome, a corresponding individual-level PBD (or SES) variable was added into model 3. To compare six area-level indicators after adjustment of the same covariates including individual-level PBD and SES, adjustments for all individual-level PBD and SES (working status, housing tenure and educational attainment) in addition to age and sex were conducted as a key model (model 4). As social relationships might possibly mediate the association between area-level PBD and health, further adjustments for social relationships were applied to evaluate those potential pathways (model 5, see supplementary data).

#6 Page 12, the discussion on institutionalized discrimination is somehow difficult to follow. What are the authors mean by “small measures”?

Our response: We changed the description in the discussion section as follows. [page 14 in the discussion] When only a small number of individual social factors are adjusted, neighborhood indicators may be more likely to act as proxies for unmeasured individual-level information. In general, studies adjusting for more individual level SES factors found the extent of the association between area-level SES and health was smaller [38].

#7 Page 14: Drawing policy makers’ attitude: this part may exceed the scope of
this paper.

Our response: We deleted the description in the discussion section.

Minor Essential Revisions

#8 better to explain the definitions of area-level measures using different data sources in each tables, making them self-explanatory. (it is difficult to understand the meanings of “aggregated” and “census” in the current status.

Our response: We added the explanation in the Tables as follows.

[page 23-26] The term "aggregated" means area-level aggregates (%) of survey positive responses for individual-level place-based discrimination, unemployment or not-home-owner within each tract.
The term "census" means that area-level indicators were created from the information from Japanese census 2005.

#9 minor point: model 4 in table 4: CI is incomplete for individual PBD.

Our response: We corrected the data expressions in the Tables.

Reviewer:Ayako Hiyoshi
Reviewer’s report:
Major comments
Thank you for the opportunity to read the manuscript. The authors addressed an important public health issue. Data were collected with care, and the paper would make a useful contribution to the literature. However, a revision is needed to clarity a number of points.

1. In Background, literature review leading to this work appeared not to be sufficient. Importance of this work was not fully understood from the current manuscript. What are the findings from relevant studies? Also, please clarify ‘although relatively little attention has been paid to the entire spectrum of population’.

Our response: We changed the description in the background section as follows. We also deleted the description of " although relatively little attention has been paid to the entire
spectrum of population”.

[page 4 in the background section] The concept of an association between place and discrimination such as racial/ethnic residential segregation is also one of the most investigated research fields in the USA [10, 11]. Residential segregation based on race is associated with poor health outcomes among African Americans in the USA. Economic segregation and poverty concentrations are closely linked with such residential segregation [10]. However, studies based on this concept outside the USA are scarce, especially in Asian countries.

2. In 2nd paragraph in Background section, I consider that some of the information about Buraku and Nishinari in supplement should be included in the main text. Buraku and Nishinari have been mentioned a couple of times in the manuscript, but never been explained.

Our response: We added the description in the background section as follows.

[page 4 in the background section] In Japan, the Buraku people are a minority group that continues to face discrimination because their predecessors, the eta and hinin, were considered outcasts during the Japanese Edo period (1600-1868) when they were employed socially unacceptable jobs (such as slaughtering animals or treating leather). In present day Japan this discrimination occurs in many aspects of life, including employment, housing and education. Further, discrimination against Buraku district residents, which is based on the place itself regardless of residents' ancestry, continues [14]. At the same time, a new type of discrimination against residents of the Nishinari ward in Osaka city, which includes the largest Buraku district, so-called Nishinari discrimination has emerged [14, 15]. This refers to the stigmatization of the ward for reasons of slums, poverty, crime, dilapidated dwellings and insanitary conditions. These two forms of discrimination, Buraku and Nishinari, could be categorized as PBD, which may affect the health of individuals who live in the specified area [16].

3. It was still unclear whether the aim of this paper was to examine mechanisms (pathways) of institutionalised PBD, and if so, how was this supposed to be examined. Institutionalised PBD and institutionalised pathways were not clearly explained. Were individualized and institutionalised pathways tested in the analyses?

Our response: Because the term of "pathway" in the abstract was confusing, we deleted
the term and changed the description in the abstract and introduction section as follows.

[page 2 in the abstract section] However, studies exploring the association between institutionalized PBD and health are scarce, especially in Asian countries including Japan.

[page 5 in the background section] Our objective was to examine the association of both individualized and institutionalized PBD with health, using the self-rated health (SRH) index, in Osaka city. This city has a wide ranging population from the very poor to the affluent of Japan and includes some stigmatized areas, identified from a priori knowledge of Buraku and Nishinari discrimination [supple3, supple6]. We focused on area-level contextual impact on health, comparing the health impact of institutionalized PBD with that of other area-level indicators relating to socioeconomic status (SES), after adjusting for individual-level factors including perceived PBD and SES.

4. In 2nd paragraph in Background (and Discussion), I wonder what does ‘a range of individuals from the whole Osaka city’ mean? What variation does this imply? More detailed account of the study area would be useful to understand the settings of the study.

Our response: We changed the description in the background section as follows.

[page 5 in the background section] in Osaka city. This city has a wide ranging population from the very poor to the affluent of Japan and includes some stigmatized areas, identified from a priori knowledge of Buraku and Nishinari discrimination [9, 14].

5. Regarding the sampling framework, it was unclear how authors identified the residents and the reliability of the source (the level of completeness).

Our response: We added the description in the methods section as follows.

[page 6 in the methods section] We randomly selected 100 of the 1,759 census enumeration tracts (each tract has average of 1,500 inhabitants) of the city, and randomly sampled 63 adults in each tract from the governmental Basic Resident Register database, which included all Japanese residents who had address in the area [21].

6. In 1st paragraph in Individual-level PBD, what dimension of life does ‘social life’ in the question of ‘how often have you suffered discrimination based on
geographical place of residence in your social life’ mean? Does this mean primarily interpersonal relationships or marriage, or include aspects such as employment opportunity, admission to schools, receiving services or crime investigation? I wonder whether the reference for the information about the validity and reliability of the question is available.

Our response: Because we used just the term of "personal or social life" in our questionnaire, we did not know whether participants interpret that this includes interpersonal relationships, employment opportunity, receiving services, crime investigation or anything. However, since we asked the frequency of the discrimination by the terms of "frequently, sometimes or never", participants might answer supposing their relatively recent events.

We added the description about the validity of the discrimination scale in the discussion section as follows.

There is no consensus on an optimal scale of perceived discrimination [34], and various patterns of questions have been used to assess self-reported racial/ethnic discrimination. A single item scale for self-reported discrimination has often been used, but may be unreliable and may understate the extent of discrimination [35], although these problems tend to bias associations between self-reported discrimination and health toward the null (i.e., type II error) [19]. In our results, the distribution of ALPBD was consistent with our a priori knowledge of PBD in areas such as Buraku or Nishinari. Although our single question about perceived discrimination has not been validated, the fact that our results matched with a priori knowledge may imply an acceptable validity of the scale used for perceived PBD in the study.

7. In 2nd paragraph in Results section, what does ‘except for the second quartile of ALPBD’ mean? The table 2 appeared to be correlation using continuous scale of each variable.

Our response: We changed the description in the results section as follows.

The distribution of ALPBD was consistent with our a priori knowledge of PBD in areas such as Buraku or Nishinari except for the low ALPBD areas where only one or two subjects answered "yes" to PBD (data not shown) [16].
8. Regarding Table 4, I am not familiar with the common style of reporting multilevel analysis, but some explanation about factors listed under ‘random effects’ would be useful for readers.

Our response: We added the description in the table as follows.

[Table 4] e: Area-level variance means the extent of variability between areas after fixed effects adjustments.
f: Deviance information criterion was used to compare the goodness-of-fit of each model. Generally, lower estimates means good fit.

9. While authors reported significance in chi-square test in Table 1, it would be still of interest to see bivariate analyses for each covariate. p-values do not tell the direction of association.

Our response: As we understood bivariate analyses you suggested as univariate logistic regression model for positive place-based discrimination and poor self-rated health, we added the results in the supplementary table S2.

[Page 2 in the supplementary results] Results of the univariate-adjusted multilevel logistic regression for individual-level place-based discrimination (PBD) and poor self-rated health according to basic characteristics are shown in Table S2.

10. Why multiple indicators were used for area level unemployment and home ownership? How the discrepancies in results should be understood?

Our response: Because two area-level indicators of place-based discrimination (key factor in the study) and deprivation were derived from different data sources of the survey and census 2005, respectively, we were afraid that there was merely a difference of data source in these results. We compared the results from the two data sources for area-level unemployment and not-home-owner, because these measures were available in both the survey and census 2005. As the results of multilevel logistic regression (Table 5), discrepancies in results between survey aggregates and census-based indicators were small for area-level not-home-owner, and were relatively small in adjusted model 4 (key model) for area-level unemployment. Therefore, we considered that there might be possible comparability between six area-level indicators derived from the survey aggregates or census 2005.
11. In Statistical analyses, authors mentioned ‘Each area-level characteristic was tested in a separate model because of potential multicollinearity between the area-level indicators’. In the Table 2, apart from the two correlations that authors mentioned, correlation coefficients in relation to ALPBD appeared not to be too high. Were these variables supposed to be included in the analyses using PBD if multicollinearity was not a problem? Why authors mentioned as ‘potential’ but did not examine whether it was really a problem in their analyses if it was what they wished to do.

Our response: We changed the description in the methods section as follows.

[page 8 in the methods section] Each area-level characteristic was tested in a separate model because we started from a simple comparison between the area-level indicators and consider multiple area-level adjustment an issue for future research.

12. The outcome is subjective measure of health which may be under- or overestimated, depending on how respondents rated their health compared to their objective health. Also, there may be a common tendency when respondents rated on their experience of discrimination and subjective health, which may lead to overestimation of the association (for example, please see Dowd 2012 SSM). The interpretation of the results needs caution, and such possible bias should be discussed.

Our response: We added the description in the limitation section as follows.

[page 16 in the limitation section] Furthermore, there may be a common tendency when respondents rated their experience of discrimination and subjective health, which may lead to overestimation of the association [43]. On the other hand, peer comparison, in which lower SES respondents may compare themselves to their relatively unhealthy peers, may lead to relative health "optimism" among lower SES individuals and cause an underestimation of the association [43].

13. 1st paragraph in Discussion section was difficult to understand why this is the new evidence and how education and ethnicity were related to the argument. Also, since the inclusion of SES variables in model 4 attenuated the association of area level PBD to non-significant level in the conventional threshold, it would be misleading to express it as ‘independently’.

Our response: We added the description in the limitation section as follows.

[page 16 in the limitation section] Furthermore, there may be a common tendency when respondents rated their experience of discrimination and subjective health, which may lead to overestimation of the association [43]. On the other hand, peer comparison, in which lower SES respondents may compare themselves to their relatively unhealthy peers, may lead to relative health "optimism" among lower SES individuals and cause an underestimation of the association [43].
Our response: We changed the description focusing the individual-level PBD as follows. In our previous study, the association between individual-level PBD and poor mental health was observed after adjustment for SES such as education, employment, housing tenure and education, and stronger among the highly educated than among the less educated [16], although low education levels were positively associated with poor health in general [28]. In a study in New Zealand, health differences between ethnic minorities and majorities were considerably attenuated after adjustment for perceived discrimination in addition to SES [31]. These two results indicated that individual-level discrimination may affect health independently of SES, consistent with the results in the current study.

14. There was no mentioning about non-respondents which were about half of approached samples. I wonder whether there were any characteristics which may be relevant to the interpretation of the study results.

Our response: There might be a relevant impact on the prevalence estimates for place-based discrimination and poor self-rated health if differences between responders and non-responders were large. We could not collect critical information on the factors related to non-response. Our unpublished data for non-response indicated that older and female people were more likely to respond than young and male people, being consistent with previous studies [Eaker S, Am J Epidemiol 1998, Volken T. BMC public health 2013]. However, we do not know whether this difference in sex and age made a biased result in the association between ALPBD and health. Furthermore, according to Table S1, there were no large differences of non-response rate between highest and lowest discrimination rate (ALPBD) quartiles: average number of respondents in a tract was 27.4 among highest quartile of ALPBD, and 30.0 among lowest quartile. Therefore, we could not determine the direction of the response bias on the association between PBD and health.

15. Is the study sample 3244-263-12-7=2962?

Our response: Because one had missing in both mobility and PBD, the analyzed sample size was 2963 (not 2962).

16. Please check the estimation of Model 3 area-level PBD 3rd category, some CIs in Tables 4 and 5.
Our response: We have corrected the estimates in the tables.

Minor points
1. 1st paragraph in Area (tract)-level indicators in Method section, what does ‘(according to both method)’ refer to?

Our response: We have changed the description in the methods section as follows. [page 7 in the methods section] according to both aggregates and census-based methods

2. For the Table 5, it is easier if variables used for adjustment were provided in footnote. ‘additional’ was difficult to understand to which model it was ‘additional’.

Our response: We have changed the description in the tables. [Table 4 and 5] Model 3: Age, Sex and Corresponding Individual-level Factor-adjusted Model

3. In 1st paragraph in Institutionalized discrimination, what ‘small measures of individual social determinants’ means? small number of? Also, please clarify the sentence 'In general, studies adjusting for more individual level measures of SES found smaller measures of association between area-level SES and health’.

Our response: We have changed the description in the discussion section as follows. [page 14 in the discussion section] When only a small number of individual social factors are adjusted, neighborhood indicators may be more likely to act as proxies for unmeasured individual-level information. In general, studies adjusting for more individual level SES factors found the extent of the association between area-level SES and health was smaller [38].

4. In 1st paragraph in Drawing policy.. section, it would be more informative if the aims of the policies were stated, and please revise the sentence: ‘Place-based policies making such as the Special Nishinari Project and the Reform of governmental organized wards in Osaka are now in progress’.
Our response: We deleted the description in the discussion section according to the comment #7 from referee 1.

**Discretionary Revisions**

1. In 1st paragraph in Area(tract)-level indicators in Method section, is there an agreement that housing and unemployment are the representative of social determinants of health? References the authors provided appeared not to be sufficient to support such a statement.

   Our response: We have added a description and references in the methods section as follows.
   [page 7 in the methods section] because these factors were available in the 2005 census and considered as representative social determinants of health [6, 27-29].

2. 1st paragraph in Individual-level covariates in Method section, it would be useful to provide the number of years of education for “high school” and “college or more”.

   Our response: We have added a description in the methods section as follows.
   [page 7 in the methods section] Education attainment was dichotomized as “high school (12 years education or less)” or “college or more (more than 12 years education)”.

**Quality of written English:** Not suitable for publication unless extensively edited

   Our response: English was corrected again thoroughly by native English editor.