PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Excess burden of non-communicable disease years of life lost from heat in rural Burkina Faso: a time-series analysis of the years 2000-2010
AUTHORS	Bunker, A.; Sewe, Maquins; Sie, Ali; Rocklov, Joachim; Sauerborn, Rainer

VERSION 1 – REVIEW

REVIEWER	Zhiwei Xu Queensland University of Technology, Australia
REVIEW RETURNED	06-Jul-2017

GENERAL COMMENTS	This study assessed the non-communicable diseases years of life lost due to heat in rural Burkina Faso. I agree that it is of great importance to look at how non-optimal temperature affect the health and well-being of African people as they are socioeconomically disadvantaged. Several main issues need to be carefully clarified/addressed prior to this paper being considered for publication. 1. The climatic data were collected from a station that is 53 km away from the study site. This may cause substantial bias. I understand that there are not many temperature monitoring sites in certain regions of Africa (mentioned in the Limitation section), but 53 km is way too far. At least you need to supply evidence saying that the spatial variability of temperature is not very big in these regions; 2. As mentioned in the paper, people in Burkina Faso are mainly affected by infectious diseases. I wonder why the authors did not look at how heat affect infectious diseases (e.g., diarrhea etc.). This may need to be better clarified (or at least mentioned) in the rationale section of this paper; 3. The choice of lag period (4 days and 14 days) seemed quite arbitrary, and the reasons behind this need to be clarified ; 4. Air pollution should be considered when assessing the effect of heat on YLLs. Ozone concentration may be higher in hot days. If collecting data on air pollutants is hard in Africa, you need to mention this in the Limitation.

REVIEWER	Małgorzata Pikala Medical University of Lodz, Poland
REVIEW RETURNED	04-Aug-2017

GENERAL COMMENTS	The problem of the correlation between temperature rise and mortality due to chronic noncommunicable diseases, in the face of global climate changing, is current and very important issue. The intensity of this problem is especially evident in African countries, becoming at risk group of both factors: high temperatures and increased mortality from chronic noncommunicable diseases. In my opinion, worth emphasizing is the methodology applied by the authors of the article. Many world epidemiological studies have shown that years of life lost are better indicators of premature mortality than commonly used death rates, as they show much better social and economic outcomes of the phenomenon. Certain doubts may arise from the choice of the life expectancy tables used for YLL calculations. In Global Burden of Disease 2010 Study, WHO experts recommend the use of the SEYLL indicator (Standard Expected Years of Life Lost Index), which is calculated by the use of the life expectancy tables based on the lowest observed death rate for each age group in countries with more than 5 million people. However, the authors of this manuscript do not attempt to compare the situation of the analyzed population with other countries in the world, but they want to pay attention to the need of the implementation adequate strategies reducing the scale of the phenomenon under investigation. Due to this fact, I agree with the authors that the choice of the local life expectancy tables to assess the actual number of years of life lost in Burkina Faso is more justified than referring to the tables developed for the countries where people live the longest in the world. I recommend the article to be published without any changes.

VERSION 1 – AUTHOR RESPONSE

Detailed responses to Reviewer 1

Reviewer Name: Zhiwei Xu Institution and Country: Queensland University of Technology, Australia Competing Interests: None declared This study assessed the non-communicable diseases years of life lost due to heat in rural Burkina Faso. I agree that it is of great importance to look at how non-optimal temperature affect the health and well-being of African people as they are socioeconomically disadvantaged. Several main issues need to be carefully clarified/addressed prior to this paper being considered for publication.

Comments:
1. The climatic data were collected from a station that is 53 km away from the study site. This may cause substantial bias. I understand that there are not many temperature monitoring sites in certain regions of Africa (mentioned in the Limitation section), but 53 km is way too far. At least you need to supply evidence saying that the spatial variability of temperature is not very big in these regions;

Response: Thank you for your suggestion. We obtained maximum temperature data from the local Nouna weather station (located at coordinates 12.73° N, 3.86° W) to compare with maximum temperature from the Dédougou weather station used in our analysis between 1 January 2000 to 31 December 2010 (4071 days).

We conducted a Pearson's correlation analysis to compare the spatial variability of maximum temperature data between the Nouna and Dédougou weather station. We obtained a correlation of 0.929 (95% CI 0.923 to 0.935), p-value < 2.2e-16. The strong correlation indicates that the maximum temperature profile of Dédougou is similar to that of Nouna. The availability of only 2432 out of 4071 days of maximum temperature (59%) was deemed insufficient for use in the final analysis of temperature and NCD in this paper.

We have added the following text into the manuscript (pg7/8):
Pearson's correlation analysis was performed to compare maximum temperature between a local Nouna weather station (coordinates 12.73° N, 3.86° W) and the Dédougou weather station (located 53 km from Nouna). Of a total 4071 days, 2432 days (59%) of maximum temperature from Nouna were available for comparison. The very strong correlation coefficient of 0.93 (95% CI 0.92 to 0.94), p-value < 2.2e-16 indicated there is little variability between the two sites, validating our use of Dédougou maximum temperature.

2. As mentioned in the paper, people in Burkina Faso are mainly affected by infectious diseases. I wonder why the authors did not look at how heat affect infectious diseases (e.g., diarrhea etc.). This may need to be better clarified (or at least mentioned) in the rationale section of this paper;

Response: The focus of this paper was to investigate the impact of temperature on non-communicable disease (NCD) because although NCD is rising rapidly in Africa, there is no research assessing this relationship. The impact of temperature on cause-specific infectious disease in Nouna will be the subject of another paper. We have added the following text into the manuscript to clarify this point.

We have added the following text into the manuscript (pg5):
This paper addresses Africa's dual challenge of coping with rising temperatures from climate change and increasing prevalence of NCD. The association between temperature and other health outcomes in Nouna, including infectious disease will be investigated in another body of work.

3. The choice of lag period (4 days and 14 days) seemed quite arbitrary, and the reasons behind this need to be clarified；

Response: We were guided by choice of lag days in previous studies1 and plotted the individual-day lagged effects of temperature on NCD YLL in Figure 3 to guide choice of cumulative lag structures. The immediate, statistically significant heat effects on NCD YLL lasted up to four days, therefore we used lag 0-4. Our approach was to combine all NCD outcomes. Because some chronic illnesses such as diabetes and genitourinary outcomes can take longer to manifest2, we extended the lagged effects to 14 days, and then 24 days in the sensitivity analysis to see if the elevated effects persisted. Individual day lagged effects to 14 days were also considered to identify any mortality displacement trends with longer lag days. We comment on this finding in the discussion.

We have added the following text into the manuscript (pg8):
The lag structure of 0-4 days was used to identify immediate health effects1, which were expanded to 14 days to verify if the effects persisted or were concentrated in earlier days. Single day lagged effects from 0-14 days were also considered to identify mortality displacement trends with longer lags.

4. Air pollution should be considered when assessing the effect of heat on YLLs. Ozone concentration may be higher in hot days. If collecting data on air pollutants is hard in Africa, you need to mention this in the Limitation.
Response: Thank you for raising this important point. Unfortunately, air pollution data were unavailable for use in our analysis. We have acknowledged this in the limitation section.

We have added the following text into the manuscript (pg14):
Air pollution data were unavailable to assess potential confounding effects of the exposure-response relationship.

Reviewer: 2 Reviewer Name: Małgorzata Pikala
Comment:
Institution and Country: Medical University of Lodz, Poland Competing Interests: None declared
The problem of the correlation between temperature rise and mortality due to chronic noncommunicable diseases, in the face of global climate changing, is current and very important issue. The intensity of this problem is especially evident in African countries, becoming at risk group of both factors: high temperatures and increased mortality from chronic noncommunicable diseases. In my opinion, worth emphasizing is the methodology applied by the authors of the article. Many world epidemiological studies have shown that years of life lost are better indicators of premature mortality than commonly used death rates, as they show much better social and economic outcomes of the phenomenon. Certain doubts may arise from the choice of the life expectancy tables used for YLL calculations. In Global Burden of Disease 2010 Study, WHO experts recommend the use of the SEYLL indicator (Standard Expected Years of Life Lost Index), which is calculated by the use of the life expectancy tables based on the lowest observed death rate for each age group in countries with more than 5 million people. However, the authors of this manuscript do not attempt to compare the situation of the analyzed population with other countries in the world, but they want to pay attention to the need of the implementation adequate strategies reducing the scale of the phenomenon under investigation. Due to this fact, I agree with the authors that the choice of the local life expectancy tables to assess the actual number of years of life lost in Burkina Faso is more justified than referring to the tables developed for the countries where people live the longest in the world. I recommend the article to be published without any changes.

Response: Thank you for your feedback and for supporting the publication of our research. We have emphasised the methodology in the introduction as you recommend.

We have added the following text into the manuscript (pg6):
For the GBD 2010 study, a reference standard of 86 years at birth was used for both males and females and YLL were calculated using a life table based on the lowest observed death rate in each age group in countries with more than five million inhabitant3.

References:

1 Basu R, Malig B. High ambient temperature and mortality in California: exploring the roles of age, disease, and mortality displacement. Environmental Research 2011; 111: 1286–92.
2 Pudpong N, Hajat S. High temperature effects on out-patient visits and hospital admissions in Chiang Mai, Thailand. Sci Total Environ 2011; 409: 5260–7.
3 Murray CJL, Ezzati M, Flaxman AD, et al. GBD 2010: design, definitions, and metrics. Lancet 2012; 380: 2063–6.

VERSION 2 – REVIEW

REVIEWER	Zhiwei Xu Queensland University of Technology
REVIEW RETURNED	19-Sep-2017

GENERAL COMMENTS	The authors have well addressed my comments, and I do not have any further concerns.