Climate Variability and Its Effects on School Attendance in Selected Public Senior Secondary Schools in Urban Areas of Ibadan, Nigeria

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

Good classrooms, adequate security, school location, incessant strikes have been found to significantly influence school attendance and are baseline factors in determining student success. However, little is known about the influence of climate variability on school attendance in Nigeria. Thus, the focus of this study was to examine the effects of climate variability on school attendance in urban areas of Ibadan, Nigeria. Both primary and secondary data were used. A total of 450 students were sampled randomly from five public senior secondary schools in urban areas of Ibadan. The study revealed that the awareness of climate variability was high and not significantly different among students (x^2= 20.465; p>0.05). Rainfall explained 38.9% and had a significant negative correlation with school attendance (r= -0.609; p<0.05), and this was largely due to the perceived threats that come along with high rainfall in the form of violent wind. The reality of climate variability has made students to devise means of coping with its adverse effects such as; sleeping naked and frequent drinking of water. The study concluded that there should be adequate enlightenment on effective environmental interaction to mitigate the adverse effects of climate variability.

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1. INTRODUCTION

Regular school attendance has been identified as a baseline factor in determining student success, and different factors affecting school attendance have been identified in the literature. Students were found to be regular in schools with good classrooms, laboratories and with sporting facilities [1,2,3]. A possible deduction from the above stated, is that schools with good physical environment encourage high school attendance. Students' turnout was also found to be high in schools and communities that provide adequate security [4]. Furthermore, school discipline, family background and school location are also variables determining school attendance [5].

Hunt [6] asserts that children without any form of mobility to school, unsupportive parents and lack of professional model in the community are barriers to school attendance. Osuu [7] in his analysis of school attendance in Uganda found that household work, lack of interest in education, hunger at school, sexual harassment, loss of parents or close relatives, peer influence and harsh punishment at school were causes of declining school attendance or absenteeism. Vidyakala and Priya [8] reports that home location of the students, family income and transportation problems affect school attendance in one way or the other. In addition, the value a community attaches to education and students' perception of education were identified as key factors affecting school attendance in selected schools in Jamaica [9].

Beyond the above-stated factors affecting school attendance, climate variability has also been pivotal. Climate variability refers to the differences from long-term climate over short periods such as a month or a year [10]. This is as a result of human activities and sometimes natural occurrence such as volcanic eruptions. Large volcanic eruptions can lead to the release of sulphate particles which spreads through the atmosphere with a detrimental effect [10]. The emission of greenhouse gases, especially carbon dioxide has also risen in recent times largely due to the combustion of fossil fuels for energy production [11]. These greenhouse gases trap energy that should have escaped into space leading to the increase in the amount of energy in the climate system. These activities can lead to extreme weather conditions. For example, 2017 had the most extreme weather conditions due to natural and human activities [12]. The effects of climate variations on human and human activities have been widely documented [13,14,15,16,17]

Thus, the reality and negative consequences of extreme weather conditions have attracted studies on the relationship between climate variability and school attendance. Consequently, Shah and Steinberg [18] found out that in rural India when rainfall is higher, children switched out of school enrollment into productive work. The evidence of climate variability on school attendance was also provided by De Janvry et al. [19] in Mexico, Colmer [20] in Ethiopia, Datar [21] in China and Villalobos [22] in Costa Rica. In a study carried out by Zivin [23] in the United States of America, a negative correlation was found between high temperature and school attendance. This is because with extreme temperatures, the human body finds it difficult to perform tasks. In Zimbabwe, drought had adverse effects on school attendance, as students who were malnourished did not find going to school interesting [24]. Climate variability adversely affected existing environmental health issues in some schools in United States of America, with the occurrence of worsened childhood asthma, cognitive and learning issues leading to absenteeism [25]. In Laguna province of Philippines, flood led to the cancellation of classes and the physical damage of schools resulting in poor motivation and loss of concentration of students in class [26]. Likewise in England, children living 3 km from their schools were excused from going to school due to high snow fall [27].

From the foregoing discussion, little is known about the effects of climate variability on school attendance in Nigeria. Most studies on climate variability have been largely linked with agriculture, health, migration, economy, water resources, among others [28,29,30,31]. As stated concisely by Adejuwon [32], "the problems associated with climate variability on school attendance include education retardation, dropout and child labour". These will obviously have negative consequences on school enrolment and academic performance of students. As a result, achieving quality education which is one of the Sustainable Development Goals would be greatly hampered.

With respect to the aforementioned, this study intends to examine how the changing climatic conditions have affected school attendance in Nigeria. It is believed that this research will help educational policy makers to have an understanding of the challenges posed by climate variability on students, and the need to come up with appropriate policies in order to achieve quality education in line with the United Nations Sustainable Development Goals. In order to achieve the central focus of this study, the following research questions were addressed:

1. Are students aware of climate variability?
2. How do students determine climate variability?
3. Does climate variability influence school attendance?
4. In what ways does climate variability influence school attendance?
5. How do students cope with the effects of climate variability?

2. STUDY AREA

To this end, Ibadan metropolis was selected for this study, due to the high concentration of educational institutions and the amalgam of different microclimates that are dominant and mostly modified by the influence of built up areas, auto mobile and industrial emissions in urban areas [33]. Ibadan, the capital of Oyo State, is located in South-western Nigeria and it lies between latitude 7°3'N to 7°4'N of the Equator and longitude 3°8'E to 3°9'E of the Greenwich [34]. It comprises eleven local government areas. Out of the eleven local government areas, five are urban while six are semi urban. The urban local government areas include; Ibadan North, Ibadan Northeast, Ibadan Northwest, Ibadan Southeast and Ibadan Southwest. On the other hand, Akinyele, Egbeda, Ido, Lagelu, Ona Ara and Oluyole make up the semi urban local government areas. With a population of about 306,795 [35], it is regarded as one of the most populous black African cities and one of the oldest in Africa [36].

The Yorubas' are the dominant ethnic group, however, it has a mix of other ethnic groups such as the Hausas, Igbos, Ijaws, Nupes, among others. Both the government and private individuals provide educational services. Notably, among these educational institutions are; The University of Ibadan, The Polytechnic of Ibadan, Lead City University, Loyola College, Government College Ibadan, etc. The area falls within the tropical wet and dry climate. The wet season runs from March through October with a double maxima rainfall in June and September while the dry season runs through November to February. The mean maximum and minimum temperature are 26.46°C and 21.42°C respectively. It also has a relative humidity of about 74.55%.

3. THE METHODS

This study made use of survey research design as the focus was to examine the effects of climate variability on school attendance. The study covered five public senior secondary schools selected randomly from the five urban local government areas of Ibadan. The schools include; Ijokodo High School in Ibadan North, Loyola College in Ibadan North East, Eleyele High School in Ibadan North West, Adelagun Memorial Grammar School in Ibadan South East and Adifase High School in Ibadan South West. Senior secondary school students formed the study population and were sampled based on the assumption that they would be better informed about climatic condition as a result of their age, being older than junior secondary school students and the possibility of longer duration of stay in Ibadan. A total of 450 students were randomly selected from the aforementioned schools, that is; 105 students from Loyola College, 100 from Eleyele High School, 85 from Adelagun Memorial Grammar School, 80 from Adifase High School and 80 from Ijokodo High School.

Both primary and secondary data were used. Data on school attendance was obtained from students' class register for 2017. The year 2017 was selected for this study because it had the most extreme weather conditions in the last three decades [12]. School attendance record was limited to second, third and first term. This is against the usual sequence of first, second and third term. This is to capture school attendance in 2017 only, as secondary schools in Nigeria run an academic session that spans between two years. School attendance was measured as average number of students present in school for the three terms. This was arrived at by dividing the total monthly attendance with the total number of day's school opened for academic activities. Climate data (rainfall and temperature) for 2017 were obtained from the records of the Nigerian Meteorological Agency. The primary data was obtained through a structured

questionnaire administered to the students based on their consent and that of the principals of the schools. The first section elicited information about the socio economic characteristics of the students such as their age and duration of stay in Ibadan, while the second section obtained information on students' awareness of climate variability; its effects on their school attendance and their coping strategies.

Both descriptive and inferential statistical techniques were adopted to address the research questions of this study. Binary logistic regression was used to determine the influence of students' socio economic characteristics $(X_{1...}X_n)$ on climate variability awareness (Y). Bivariate correlation was used to examine the relationship between school attendance (Y) and climate variability (that is, temperature and rainfall elements) $(X_{1...}X_n)$. Afterwards, the linear regression model ascertained the individual effects of temperature and rainfall on school attendance while chi square was used to determine: students' perception of climate variability, effects of climate variability on school attendance and the strategies of coping with the effects of climate variability. Graphs and tables were also used to present the findings of this study.

4. RESULTS AND DISCUSSION

4.1 Students' Socio-economic Characteristics and Awareness of Climate Variability in Urban Areas of Ibadan

Two key socio economic variables were used to assess the awareness of students about climate variability. These variables are age and the duration of stay in Ibadan. These variables are important as they helped in conceptualizing the study. Majority (51.3%) of the respondents were between 14-16 years while majority (92.8%) had lived in Ibadan for more than 14 years (Table 1). Based on the total number of respondents sampled, the study revealed that majority (95.3%) were aware of climate variability while just 4.7% were not aware of climate variability (Table 2). A further breakdown shows that majority (97.7%) of the respondents, 17 years and above were better informed of climate variability when compared to 93.1% of the respondents of age range 14-16 years (Table 2). A possible deduction from the aforementioned is that, awareness of climate variability increases with age. The statistical analysis shows that age

significantly determines the awareness of climate variability (odd value 3.65; p<0.05). Furthermore, majority (98.8%) of those who had lived in Ibadan for more than 14 years had a better understanding of its climatic conditions compared to those (50%) that had lived in Ibadan for less than 5 years. The statistical analysis showed that duration of stay in Ibadan significantly influences the awareness of climate variability among students (odd value 4.56; p<0.05) (Table 3). On the whole, the statistical analysis showed that there was no significant difference in the awareness of climate variability among the students (x^2 =20.465; p>0.05) (Table 3).

Table 1. Students' socio-economic characteristics in urban areas of Ibadan

Variables	Frequency	Percentage
Age:		
14-16 year	231	51.3
17 years and above	219	48.6
Duration of stay in Ibadan:		
14 years and above	418	92.8
Less than 5 years	32	7.1

Source: Field survey, (2018).

4.2 Students' Perception of Climate Variability in Urban Areas of Ibadan in 2018

Although there are scientific methodologies in measuring climate variability, students' perceptions were used in determining climate variability for this study. Six indicators of climate variability were identified by the students, and they are; flooding, high temperature, violent wind, severe erosion, excessive rainfall and intense harmattan (Fig. 1). A larger percentage of the respondents, about 40.4% identified climate variability through excessive rainfall. Furthermore, high temperature representing 25% of the total distribution was the second major indicator of changing climate and weather. It was reported by the respondents that the level and intensity of temperature had increased at an abnormal rate over the years. This is felt in the burning effect of the sun on their skin and the increased heat at night.

Flooding was identified by 19% of the respondents, and this could be due to the link that exists between excessive rainfall and flooding. Harmattan was also noticed to have

been severe in recent times, as this was indicated by 9.6% of the respondents. Its impact is felt in reduced visibility in the morning, intense cold and the fast rate at which washed clothes dry up. Severe erosion in the form of washing away of the top spoil was identified by 4% of the respondents while violent wind that accompanies the onset of rainfall was indicated by 2% of the respondents. The result revealed an unequal distribution in the indicators of climate variability among students. The statistical analysis confirms that there was significant difference in students' perception of climate variability (x^2 =18.346; $p<0.05$) (Table 4).

Table 2. Awareness of climate variability based on socio-economic characteristics of students in urban areas of Ibadan

Variables	Frequency	Aware of climate variability	Not aware of climate variability
Awareness of climate variability	450	429 (95.3%)	21 (4.7%)
Age:			
14-16 years	231	215 (93.1%)	16 (6.9%)
17 years and above	219	214 (97.7%)	5 (2.3%)
Duration of stay in Ibadan:			
14 years and above	418	413 (98.8%)	5 (1.2%)
Less than 5 years	32	16 (50%)	16 (50%)

Source: Field survey, (2018)

Table 3. Results of binary logistic regression model and chi square analysis

Binary logistic regression model			
Awareness of climate variability	**Df**	**Sig**	**Odd value**
Age	1	0.014*	3.65
Duration of stay in Ibadan	1	0.009*	4.65
Chi square analysis			
Awareness of climate variability	**Df**	**Sig**	**X^2**
	1	1.076	20.465

*Note: significant at 0.05**
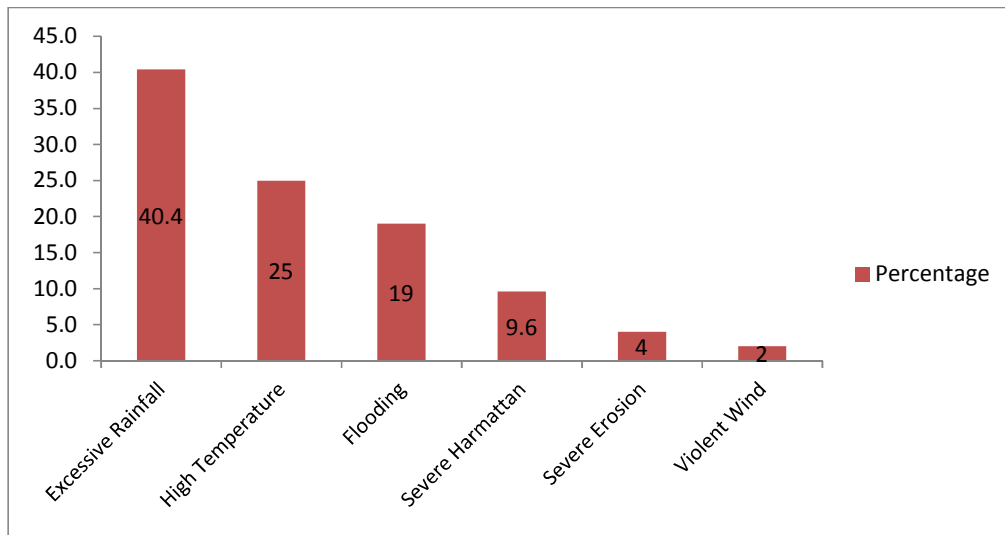*Source: Field survey, (2018)*

Fig. 1. Students' perception of climate variability in urban areas of Ibadan in 2018
Source: Field survey, (2018)

Table 4. Results of chi square analysis

	Students' perception of climate variability
X^2	18.346*
Df	5
Sig	0.025

Note: significant at 0.05*
Source: Field survey, (2018)

4.3 Effects of Climate Variability on School Attendance

Fig. 2 shows the average monthly temperature and rainfall distribution in Ibadan in 2017. There was a noticeable variation in temperature and rainfall distribution from January to December. The highest rainfall of about 190 mm was experienced in June, while March was the hottest with a temperature of 28.6°C. Similarly, there was a significant variation in school attendance in the study area, with the highest attendance (2250) reported in December while the lowest attendance (1840) was in September (Table 5). The result of bivariate correlation analysis shows that rainfall had a significant negative relationship with school attendance (r= -0.609; p<0.05). In other words, an increase in rainfall led to a decrease in school attendance. On the other hand, temperature had a positive but no significant effect on school attendance (r= 0.482; p>0.05) (Table 6). In exploring the effect of rainfall on school attendance, a simple linear regression model was estimated. The regression model for rainfall explained nearly 38.9% of school attendance with F value of 5.719 at p value of 0.040 (Table 6).

Table 5. Summary of students' school attendance at the surveyed schools in urban areas of Ibadan in 2017

Months	School attendance
January	2246
February	2104
March	2249
April	2200
May	2124
June	1998
July	2000
August	2204
September	1840
October	2161
November	2141
December	2250

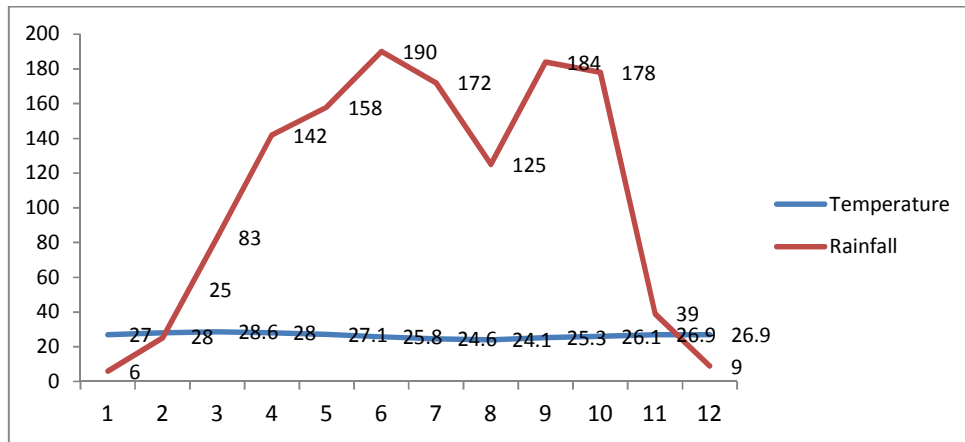*Source: Students' class register, (2017)*

Fig. 2. Average temperature (°C) and rainfall (mm) distribution in Ibadan in 2017
Source: Nigerian Meteorological Agency, (2018)

Table 6. Results of correlational and linear regression analysis

Correlational analysis		
	Rainfall and school attendance	Temperature and school attendance
	-0.609*	0.482
Linear regression analysis		
R. Square	**F**	**Sig.**
0.389	5.719	0.040*

Note: significant at 0.05*
Source: Field survey, 2018

Having empirically established that there is a relationship between climate variability and school attendance, the researcher went further to understand this relationship from the perspective of the students. Climate variability was found to influence school attendance as this was reported by majority (95.3%) of the respondents. The effects of climate variability on school attendance are presented in Table 7. Excessive rainfall was found to lead to 'fear' among 47.6% of the respondents as they reported an unpleasant emotion caused by the perceived danger or threat that comes along with heavy rainfall in the form of violent wind. According to some of the respondents, winds that accompany rainfall in recent times have been violent; falling down electric poles, removing the roofs of their classes and felling down tress. This can become even more dangerous when the violent wind that accompanies rainfall occurs in the morning. In such a situation, it becomes very difficult going to school and the cost of getting to school more than doubles. This situation is further made worse by poor mobility conditions.

High temperature led to the inability to sleep and rest at night, as this was indicated by 35.9% of the respondents. In addition, it has also reduced drastically the number of sleeping hours for some students. The high heat level was also compounded by erratic power supply which makes coping with high temperature difficult. This has resulted in most students sleeping in the morning at the expense of going to school. Some students have also decided not to attend school due to the possibility of sleeping in class and the loss of concentration. This is because high temperature creates a scenario whereby the brain is constantly reminding the body to do something about the condition. Due to the constant interruption, it is difficult for students to stay focused. Corroborating the findings of this study, Zivin and Neidell [37] asserts that high temperature cause discomfort, fatigue and even cognitive impairment which leads to absenteeism among students. Similarly, Somanathan et al. [38] argues that productivity and attendance to work decrease with high temperature.

Flooding which is a possible resultant effect of excessive rainfall was also found to affect school attendance among 16.5% of the respondents. Some students whose homes were once flooded, reported that they had to stay awake all night trying to reduce the possible damage that may be caused by the flood. This leaves them stressed out and not wanting to go to school the next day. Furthermore, some students decided to cut off schooling due to flooded roads which lead to their schools. They claimed going to school would be suicidal as they could drown in water.

Some of the respondents absented themselves from school due to minor injury on their physical health as a result of flooding. Non-fatal injuries such as cuts and minor fracture were sustained. Flooding has also exposed them to toxic materials carried by floodwater leading to skin infections. The statistical analysis confirms that there was significant difference in the effects of climate variability on school attendance among students (x^2 =19.563, p<0.05) (Table 7).

4.4 Strategies of Coping with the Effects of Climate Variability among Students in Urban Areas of Ibadan in 2018

In coping with the effects of climate variability, various measures have been adopted by students which include; a change in the time of study, putting on light clothing, sleeping naked, frequent drinking of water, bathing at least twice in a day, the use of electric fan powered by generator and sleeping on the floor (Table 8). The study revealed that majority of the respondents (31.2%) adopted a change in their time of study as a way of coping with the effects of climate variability. According to the respondents, they had to change their period of study to a time that is more conducive in terms of less heat to fast track their level of assimilation. For those who initially studied in the afternoon, there has been a shift to evening which they claimed is cooler when compared to afternoon which is now extremely hot unlike in time past. This is buttressed by the radiation and insolation concept, of which there is great heating in the day and cooling at night.

Putting on light clothing accounted for 23.1% of the coping strategies. Based on the responses, it is no longer convenient wearing thick clothes in time of intensive heat. It is believed that this will only worsen the situation leading to more perspiration, a situation which makes them very uncomfortable. Also, 18.6% of the respondents sleep naked in order to adjust to the effects of climate variability. The respondents asserted that it makes no sense sleeping with their clothes on during extreme heat condition. In addition, it was found that the water intake level of the students had greatly increased. Some of the respondents

Table 7. Effects of climate variability on school attendance

Climate variability indicators	Effects on respondents	Decision on school attendance	Frequency
Excessive Rainfall	Perceived danger or threat that comes along with heavy rainfall in the form of violent wind.	I do not go to school.	204: (47.6%)
High Temperature	Inability to sleep and rest at night	I do not go to school.	154: (35.9%)
Flooding	Non-fatal injuries such as cuts, minor fracture and Stress.	I do not go to school.	71: (16.5%)
			429: (100%)
Results of chi square analysis			
Df		**Sig**	**X^2**
2		0.031	19.563*

Source: Field survey, (2018)
Note: significant at 0.05*

Table 8. Strategies of coping with the effects of climate variability among students in urban areas of Ibadan in 2018

Coping strategies	Frequency	Percentage
Change in the time of study	134	31.2
Putting on light clothing	99	23.1
Sleeping naked	80	18.6
Frequent drinking of water	67	15.6
Bathing at least twice in a day	36	8.4
Use of electric fan powered by generator	7	1.6
Sleeping on bare floor	6	1.4
Results of chi square analysis		
Df	**Sig**	**X^2**
6	0.012	21.365*

Note: significant at 0.05*
Source: Field survey, (2018)

(15.6%) now drink between 5-10 glasses of water per day as against the initial average of 5 glasses of water per day.

The rate of bathing was also found to be more frequent in the face of climate variability. About 8.4% of the respondents reported bathing at least twice in a day in order to keep themselves cooler and more refreshed. Another coping strategy was the use of electric fan powered by generator which was adopted by 1.6% of the respondents. According to the respondents, the impact of heat would have been minimal if there had been constant electricity supply to power their fans. Since this is not the situation, they had to persuade their parents to buy a generator. Finally, 1.4% of the respondents slept on bare floor which they claim is cooler and can help mitigate the adverse effects of climate variability. On the whole, the coping strategies with the effects of climate variability were largely determined by the increase in temperature. It can be reasonably concluded that extreme weather conditions such as high rainfall and flooding are beyond the control of students. The statistical analysis shows that there was a significant difference in the strategies of coping with climate variability among respondents (x^2 =21.365, p<0.05) (Table 8).

5. CONCLUSION

The study identified the effects of climate variability on school attendance among students, the awareness of climate variability, students' perception of climate variability and the coping strategies adopted by the students. Based on the findings, a number of conclusions were arrived at. First, the awareness of climate variability was high and largely determined by age and duration of stay in the study area. Second, high temperature, severe erosion, excessive rainfall, flooding, severe harmattan and violent wind were key indicators of climate variability. Third, an increase in rainfall led to a decrease in school attendance. Thus, it poses a great danger to the achievement of quality education for sustainable development. Finally, a change in the time of

study, wearing light clothing, sleeping naked, frequent drinking of water, bathing at least twice in a day, the use of electric fan powered by generator and sleeping on the floor were some of the coping strategies with the adverse effects of climate variability adopted by students. Based on the aforementioned findings, educational policy makers and the government need to come up with appropriate policies to ameliorate the negative consequences of climate variability in the form of; intensive awareness on the causes and consequences of climate variability and the need for optima environmental interaction. Furthermore, the government should embark on the renovation of schools and reconstruction of roads damaged by violent wind and flood respectively to improve school attendance. Despite the key findings of this study, urban areas of Ibadan may not be an adequate representation of most urban areas in Nigeria due to the variations in climatic conditions, especially between the north and south of Nigeria. Finally, the effect of climate variability on the academic performance of students is an area for further research.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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