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Editorial

Bone Health, Intersectionality and Climate Change

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Extreme weather patterns are becoming more common, with attendant risks for human health. As described by the World Health Organisation, climate change refers to long-term shifts in temperatures and weather patterns [1]. While weather shifts can be caused by naturally occurring phenomena, such as changes in the sun's activity or large volcanic eruptions, the main drivers of climate change over the last two centuries have been human activities, such as the burning of fossil fuels like coal, oil and gas [2]. Burning fossil fuels generates greenhouse gas emissions, including carbon dioxide and methane, that act as an insulating layer around the Earth, which traps heat from the sun and leads to higher temperatures.

The consequences of climate change include weather events such as droughts, which leads to water scarcity, and flooding, severe fires and severe storms, all of which can lead to the migration of people and animals, as well as impact food supplies. It is well recognised that the communities most affected by the consequences of climate change—such as people living in small island nations and other developing countries—are not the main contributors to climate change [3]. Further intersectionality occurs within vulnerable communities—young and older people are often disproportionately affected by health consequences, including heat exhaustion, risks from natural hazards and, in the case of young people, a recognition that mental health is often impacted by concerns about the climate change [4].

So, are these observations relevant for bone health? One example of intersectionality in climate change concerns the possible impacts of extreme weather on the Pacific archipelago of islands, Vanuatu. Home to a venting volcano, many of the islands are affected by endemic fluorosis [5]. This group of islands has, indeed, been affected by several extreme weather events in recent years, including cyclones and an observation that temperatures are rising and will continue to rise [3]. The impact of this on poverty and inequality is already recognised due to Vanuatu's remote location and lack of economic independence, but there is an additional concern for the bone health of populations exposed to very high fluoride levels. This is of particular concern in paediatric populations, as high levels of fluoride exposure can adversely impact dental and skeletal health as fluoride is incorporated into the growing skeleton, producing a dense but brittle skeleton which is vulnerable to fracture [6].

Could climate change worsen the health situation with regard to the health impacts of endemic fluorosis? Some studies, at least, suggest this is the case for a variety of reasons. At the simplest level, temperature rise may lead to the need to drink more, leading to higher quantities of fluoride being ingested from ground water. This was explored in an ecological American study that found that temperature rises make people drink more which means that more fluoride is ingested and incorporated into the skeleton [7]. Climatic events may also disrupt safe water supplies. Another study set in China highlighted the higher concentrations of fluoride commonly associated with consuming water from shallow groundwater sources; while deep sources are preferable, these are typically more expensive to access and are not available to many populations [8]. It has also been suggested that fluoride concentrations are higher in arid environments,

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as might be expected if temperatures continue to rise [9]—a meteorological drought is already predicted to occur by 2080 [3]. Finally, endemic fluorosis has also been associated with thyroid hormone disturbance [10], which can also impact peak bone mass acquisition [11].

Might there also be a particular impact on females in Vanuatu that is unrelated to fluorosis? Age at menarche is associated with bone health, with studies suggesting an association between late menarche and poorer bone health in later adulthood [12]. While the average age at menarche has been falling worldwide [12], a recent systematic review has highlighted the risk that food disruption might impact this, for example through forced migration after severe weather events or through poor food supplies following crop failure in places where there is a large dependence upon subsistence farming, such as in Vanuatu.

There is, hence, a growing appreciation of the urgency of the need to address climate change. In a series of UN reports, thousands of scientists and government reviewers agreed that limiting global temperature rise to no more than 1.5 °C would help us avoid the worst climate impacts and maintain a liveable climate [1]. Yet the policies currently in place point to a 2.8 °C temperature rise by the end of the century [1]. There are several potential impacts of climate change on skeletal health, and the specific vulnerabilities of younger people—where the acquisition of optimal peak bone mass is very important to reduce fracture risk in later life—and those who are older—at a time in their life course when fragility fracture is common—need to be considered as we develop strategies to address this. Further research to consider these impacts is now urgently required in order to mitigate these effects on the most vulnerable in our society. It seems likely that we will need to adapt to climate change, as well as try to continue to work towards net zero, and we should consider the impact of current trends in bone health, especially among the most affected groups, as part of those considerations.

Conflicts of Interest: The authors declare no conflict of interest.

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