Association between Air Stagnation and Melanoma Incidence in Washington and a Perspective on Racial Disparity in Melanoma Care

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Hypothesis: Regional difference in melanoma incidence in WA state may be explained by difference in the degree of air stagnation.

In recent years, there has been rising skin cancer cases in Washington, making it the seventh highest state with melanoma incidence across the nation. Interestingly, there is a notable regional difference in the melanoma incidence within the state of Washington with the highest incidence rate found in the Puget Sound area and the lowest incidence rate found in the Southeastern part of WA. The purpose of the study was to explore whether air stagnation is linked to such regional differences in the melanoma incidence found in the WA state.

It is known that the risk of melanoma increases with the higher degree of exposure to UV irradiation.(Jhappan, Noonan, & Merlino, 2003) While atmospheric pollution by ozone depleting chemicals disrupts the ozone layer thereby overall increasing the exposure to UV,(Zhang, Wei, & Fang, 2019) air stagnation (a meteorological situation in which there is a major buildup of air pollution in the atmosphere) may absorb and scatter UV rays, thus reducing the UV radiation.(Barnard & Wenny, 2010) The southeastern part of the WA state has the highest concentration of the facilities with a Risk Management Plan (RMP) (Figure 1). The RMP was established by the Environmental Protection Agency to monitor facilities that use highly toxic substances that could potentially endanger the atmosphere in the nearby communities (See Figures 2-3: Melanoma incidence rate map and air stagnation map).

Figure 2.

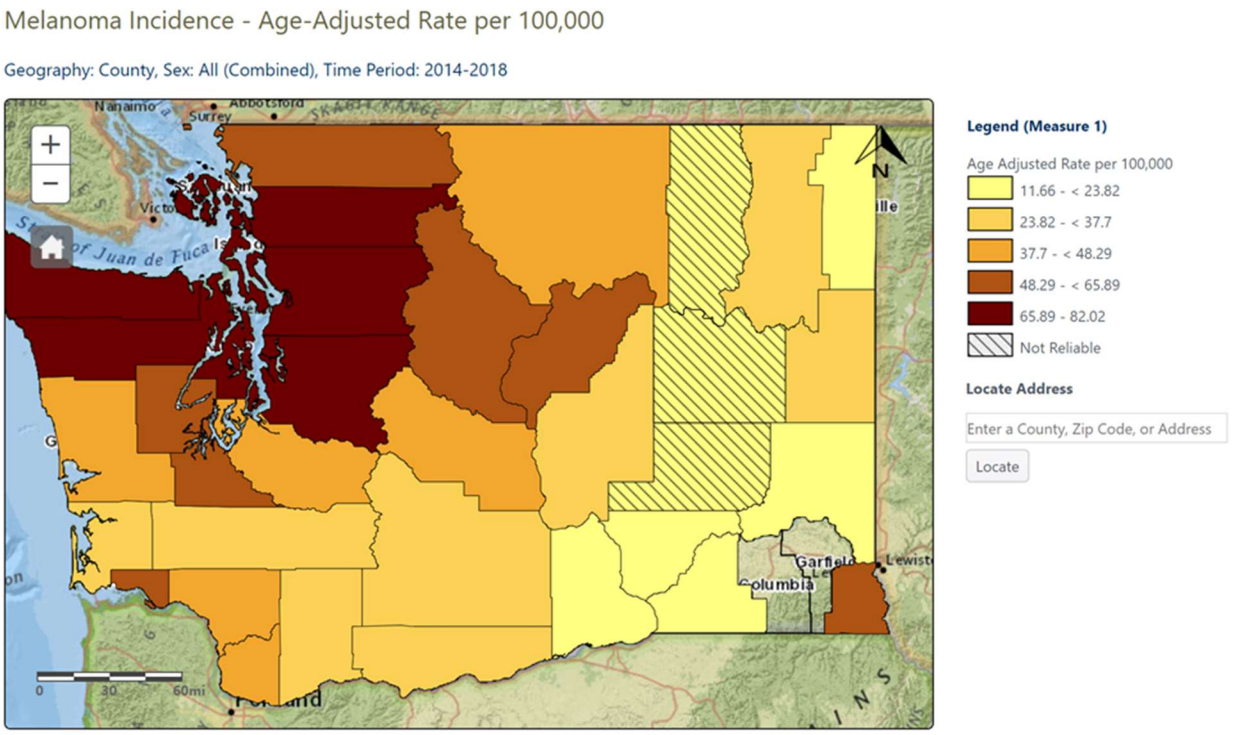
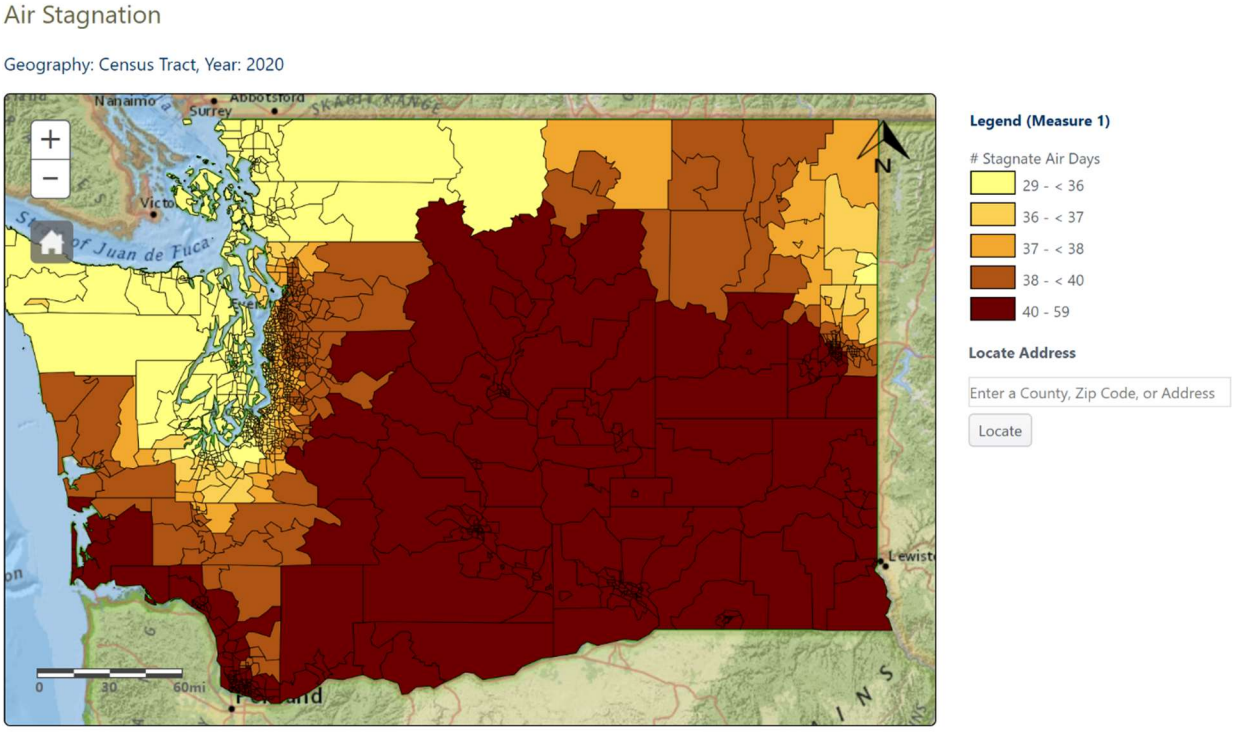


Figure 3.

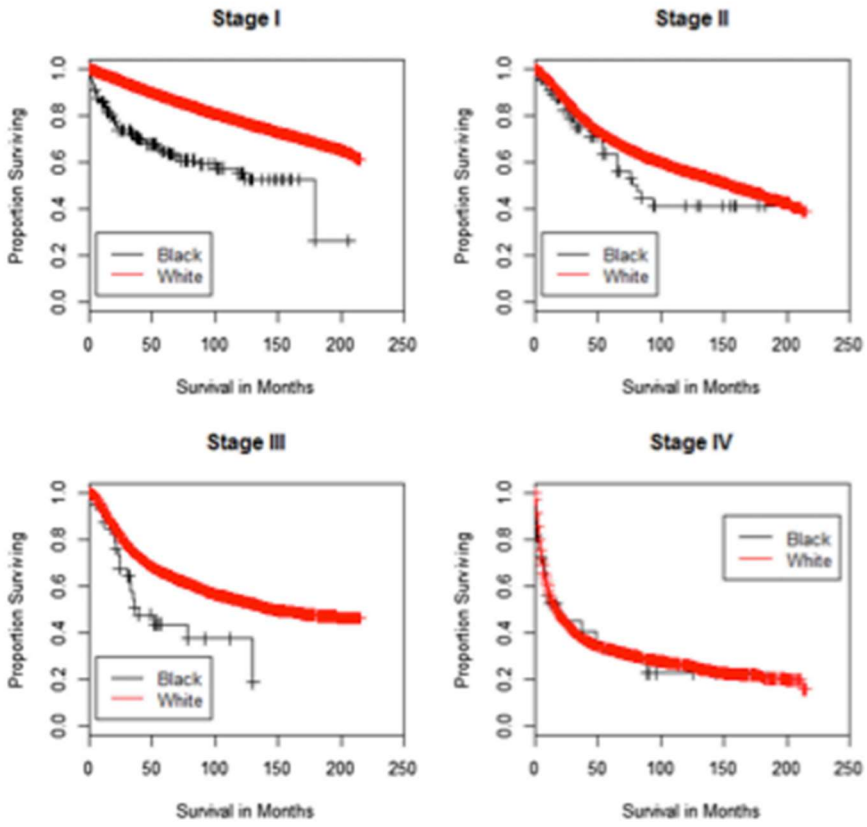


Simple juxtaposition of the melanoma incidence rate map on the air stagnation map from WTN seems to support this hypothesis. Another consideration should be given to the possible confounding of the regional difference in racial composition. Since Caucasians are at a much higher risk of melanoma compared to other races and the proportion of Caucasians in the Southeastern region of WA is high, one would posit that the melanoma incidence would be higher in this area. However, given that melanoma incidence rate is actually lower in this region, this suggests that there is no confounding by race on the association between air stagnation and melanoma incidence. While there is theoretical benefit of air stagnation in lowering UV radiation, thus lowering the risk of melanoma, whether air stagnation is truly associated with the melanoma incidence is uncertain as not all confounders may have been accounted for. Further research is necessary to determine the causal association and understand the mechanism of the protective effect of air stagnation on melanoma incidence.

Perspective: Racial disparity in melanoma care exists in WA state.

This investigation prompts further discussion about the racial difference and disparity in detection and treatment of melanoma in WA. It is well accepted that Caucasians are more susceptible to melanoma due to the amount of melanin in their skin.(Wu et al., 2011) UV radiation causes DNA damage to melanocytes that produce the pigment of skin, known as melanin. As melanin is a protective pigment, the more melanin, the less DNA is damaged from harmful UV radiation. Since Caucasians have less pigment in skin, Caucasians are at higher risk of melanoma incidence.

However, there was no correlation between the proportion of Caucasians and melanoma incidence by county based on the published WTN data (i.e., Counties with a higher proportion of Caucasians do not have a higher melanoma incidence). Further research outside of WTN data, shows that African Americans have higher melanoma mortality rates compared to Caucasians despite the lower incidence.(Dawes, Tsai, Gittleman, Barnholtz-Sloan, & Bordeaux, 2016) A study found that the survival rate of melanoma was the highest in Caucasian and lowest in African American.(Wu et al., 2011) This may be explained by the fact that the proportion of later stage melanoma (stages II-IV) diagnosis is greater in blacks compared with Caucasians. Despite the higher incidence of melanoma in Caucasian due to the melanin in their skin, overall survival, and outcomes for each stage for melanoma in African American were worse (Figure 4).



Studies have shown that there is a racial disparity in health screening.(Esnaola & Ford, 2012) For example, in a study based on cancer screening, Caucasians received the most skin examinations, mammograms, digital rectal examinations, and prostate specific antigen tests. This disparity in cancer screening makes early detection of melanoma less likely for African American populations. This results in a higher rate of melanoma diagnosis at more advanced stages in African American populations, which confers a higher likelihood of metastasis and higher rates of mortality. This inequity in healthcare cancer screening needs to be highlighted and addressed. With more racially diverse populations projected to grow over the next few years, it is important that awareness about melanoma improves for equitable and accessible cancer screening for all ethnicities and races in minority populations, not only in the United States, but across the globe.

References

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