

Abstract

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Relationship between low ultraviolet B irradiance and higher breast cancer risk in 107 countries.

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BACKGROUND: Epidemiological data show an inverse relationship between vitamin D levels and breast cancer incidence. This study investigates the relationship of modeled and measured serum 25-hydroxyvitamin D [25(OH)D] levels with age-standardized incidence rates of breast cancer in 107 countries.

OBJECTIVE AND METHODS: The hypothesis being tested is that breast cancer incidence is inversely related to geographically-dependent cutaneous sunlight exposure. A multiple regression approach was used to examine the contributions of ultraviolet B (UVB) irradiance to age-standardized incidence rates of breast cancer in the 107 countries with data on these covariates: total column ozone thickness, per capita intake of alcohol and energy from animal and vegetable sources, cigarettes, proportion of female population overweight, and total fertility.

RESULTS: Age-standardized incidence rates were substantially higher at latitudes distant from the equator ($R^2 = 0.43$, $p < 0.0001$). The dose-response gradient between modeled serum 25(OH)D levels and incidence rates of breast cancer followed a standard inverse dose-response curve. Increasing increments in serum 25(OH)D in the range above 22 ng/mL were associated with incrementally lower incidence rates of breast cancer. According to multiple regression, UVB irradiance adjusted for cloud cover was inversely associated with incidence rates ($p = 0.04$) after controlling for covariates. Intake of energy from animal sources was also positively associated with incidence rates ($p < 0.01$). The overall coefficient of determination, R^2 , was 0.81 ($p < 0.0001$).

CONCLUSIONS: There was a protective effect of UVB irradiance on risk of breast cancer that was independent of fertility rate, proportion of the population overweight, alcohol intake, animal energy intake, and other covariates.

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