

Exploring relationship between some environmental factors and skin cancer rate

Abstract

Introduction: Skin cancer rate has been associated to UV exposure. According international literature, No report on specific environmental influence on skin cancer in Cuba has been presented.

Goal: To search some possible moderator factors, epidemiologically significant, of skin cancer in Cuba.

Methods: Information gathered for Cuba was assessed using GIS and least square modelling. Raw Skin cancer rate at municipal scale, possible function of Insolation data obtained from national Network records, demographic, biologic and urbanizing variables was intended to be modelled for the Cuban territory. So, possible linkage between raw skin cancer rate and geophysical, demographic and urbanistic variables were tested.

Results: Raw Skin cancer rate did not show a synchronous spatial connection to average skin insolation during time lapse studied, but it was pointed out that proportions of white individuals, elderly and urbanization degree presented moderate strength relationship in Cuba at a municipal level basis, 2000 – 2011.

Conclusions: It is possible that some individual and environmental factors may influence disease features in Cuban population, according empirical epidemiological relationships modelled.

Volume 9 Issue 6 - 2020

Yamile González Sánchez,¹ Carlos Barceló Pérez,² Alina Rivero Valencia A,³ Yahima Galán C,⁴ Bultó P⁵

¹Master in Sciences, Second Degree Specialist in Hygiene and Epidemiology, National Institute of Hygiene, Epidemiology and Microbiology, Cuba

²Doctor in Physical Sciences, Master in Environmental Health, National Institute of Hygiene, Epidemiology and Microbiology, Cuba

³Master of Science, Institute of Meteorology, Cuba

⁴Doctor in medicine, National Institute of Oncology and Radiobiology, Cuba

⁵Doctor of Science, Institute of Meteorology, Cuba

Correspondence: Carlos Barcelo perez, Doctor in Physical Sciences, Master in Environmental Health, National Institute of Hygiene, Epidemiology and Microbiology, Havana, Cuba, Tel 53580527-136, Email barclo@inhem.sld.cu

Received: February 26, 2020 | **Published:** November 24, 2020

Introduction

Actinic Keratoses is result of a mild to moderate impact of electromagnetic radiation (mainly UV) exposure over skin. Cancer disease is the abnormal growth of cells¹ at epidermis tissue Risk factors mentioned are UV exposure, skin sensitivity, hair, eyes color, heritage, and older ages. There are different kinds of skin cancer such as squamous and melanoma.² UV radiation exposure has been etiologically connected to skin cancer.³⁻⁵ Unrepaired DNA damages that triggers mutations could produce this disease. Low exposure to UV radiation could enhance health condition through D Vitamin production and certain beneficial action on the immune system could be observed, but higher seems to be harmful conducting to skin burns and more complex health effects^{6,7} UV comes from artificial source such as sunbeds⁸ looking for tanning and also from a natural source, such as electromagnetic radiation that arrives from the sun and atmosphere. UV received by humans mainly arrives from our star. Then, severe exposure to UV radiation could damage DNA and could cause genetic mutations⁹⁻¹¹ Former research reported some associations of skin cancer to different environmental factors such as radiation dose, skin lability, personal or family background,¹² In spite of epidemiological convenience of finding factors which could define modulation items in our geographic location and environment related to this illness kind it is intended to examine some specific variables of geophysical, ethnic, age, among others possible factors that could be related to skin cancer rate based on municipal scale and a chosen time lapse in the main island of the Cuban archipelago. Considering interest of enhancing knowledge to provide criteria on associated factors to this illness, which could eventually contribute to disease prevention and health promotion policies (reducing morbidity and mortality) on behalf of improving population health maintenance and then, identifying strategies associated to variables connected to this

disease. Then, it would be necessary to face problem of identification of association of factors in the country at municipal basis. Study of insolation through the Cuban territory was presented in a former report¹³ Because UV is part of insolation 100 – 380 nm), we chose insolation as proxy of UV atmospheric concentration. So, goal of this research is explore possible association between some personal and environmental factors and disease presence in population clinically diagnosed.

Methods

Monthly time series of insolation from 53 different locations during period 1981-2013 in Cuba were compiled on a daily basis. Cancer Case information at diagnosis time was obtained, collected, and kept on regard filled patient registration forms that were stratified by Cuban Municipalities, folder managed by the National Cancer Record by the National Institute of Oncology and Radiobiology. Some geophysical & social-related variables were obtained from the National Survey of population and Housing (2000 - 2013) and from the Institute of Meteorology. Uncertainties of individual skin cancer classification remain under 5 %. Using GIS it was plotted a territorial insolation distribution considering some areal lineal interpolation in regions without enough data coverage, overlapping cumulative skin cancer incidence at municipal level too. Then, it was checked Gaussian distribution hypothesis of the dependent variable (raw incidence of skin cancer rate) in a direct way or looking for Normalizing transformation applied to fix moderate lack of symmetry defining association strength. A GIS tool and several least square models were applied considering Gaussian distribution of direct or transformed Dependent variable. So, it was analyzed synchronous possible association functions of some independent variables with cumulative raw cancer rate, that should contribute to support epidemiological description of disease incidence.

Results and discussion

Insolation time series show a whole first order persistence and annual periodicity overlapped in its frequency structure without trends, so time insolation dependence appears relative steady state. The physiography of the territory was associated to average insolation related to several landscapes. So, shores and inland plains exhibit the highest insolation values, but gradients are rather weak across the country. Swamps and plains showed greater insolation than mountainous regions. It is possible hypothesize that geography of

Cuba as country, pose orientation that seems to be an strip to parallels of the Earth (not a Earth meridian orientation) and, that could explain relative uniformity of insolation. Extreme range of monthly average insolation across country was three hours 21 minutes; this fact could explain perhaps relative uniformity of insolation. Insolation depends on cos (earth latitude) Extreme range of insolation distribution along country was three hours 21 minutes. No skin cancer incidence trend was identified, same as insolation. Average insolation and skin cancer incidence along Cuban territory, presented graphically in Figure 1 show no close connection.

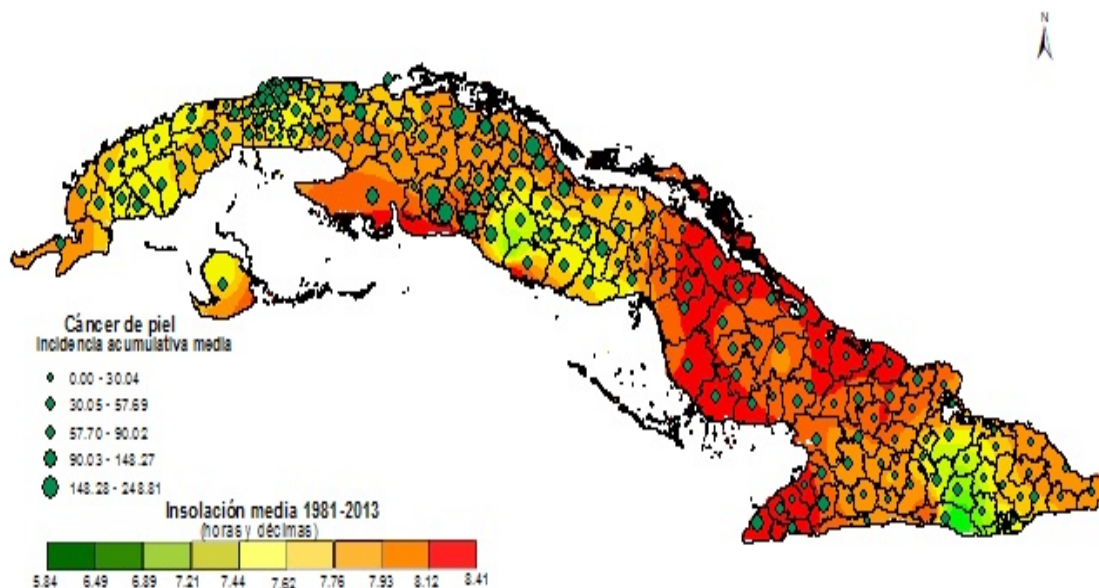


Figure 1 Synchronous presentation of average insolation and skin cancer incidence in the main island territory of the Cuban archipelago.

We found that women were 1,24 times more ill than men. It was watched that older persons become ill more often than younger. Empirical statistical relationship function of raw skin cancer incidence rate and some geophysical, social and urban variates in Cuba, allow a modelling analysis which explains partially variance of the dependent variable. Connection of raw cancer rate with insolation, obtained by GIS, fails of finding strength relationship but moderate strength was found with proportions of white, elderly population & urbanization degree using a non-lineal Least Square approach.

$$\text{Log tasa incidencia} = 1,844 + 1,332 p_b^2 + 22,404 p_v^2 + 0,006 p_u; \\ r^2: 0,65$$

Where, white population (p_b) means 65% of patients, elderly greater than 60 years old (p_v) achieves 20% and, urbanizing degree was 77%. Under this conditions skin cancer cumulative rate¹³ estimated was about 14590 identified cases. Considering the average monthly illness rate, estimated just real rate remains inside the safety range of the function. Former model explains something more than 60% of variance. This is a contribution profile of some environmental factors to disease raw rate.¹⁴

Conclusion

Insolation did not show a synchronous connection to skin cancer rate -studied by GIS-, but proportions of white individuals, elderly and urbanization degree studied by Least Square Modulation presented moderate relationship strength in Cuba, 2000 - 2011. Social and environmental variables could contribute to disease explanation. New

research must try to identify more independent explanation variables (independent) and propose some preventive measures.

Funding

None.

Acknowledgments

None.

Conflicts of interest

The authors declare that there was no conflict of interest.

References

1. US Department of Health and Human Services. Skin Cancer as a major public health problem. 2014.
2. Centers for disease control and prevention. Basic information about skin cancer. 2020.
3. Virginia oncology associates. Types of skin cancer.
4. American cancer society. Ultraviolet (UV) Radiation. 2019.
5. Rigel DS. Cutaneous ultraviolet exposure and its relationship to the development of skin cancer. *Journal of the American Academy of Dermatology*. 2008;58(5):S129–S132.
6. Cancer research uk. How does the sun and UV cause cancer?. 2019.

7. Gruijl FR. Skin cancer and solar UV radiation. *European Journal of Cancer*. 1999;35(14):2003–2009.
8. World health organization. Sunbeds. 2003.
9. World health organization. Radiation: Ultraviolet (UV) radiation and skin cancer. 2017.
10. Centers for disease control and prevention. What Is Skin Cancer?. 2020.
11. Narayanan D, Saladi RN, Fox JL. Ultraviolet radiation and skin cancer. *Int J Dermatol*. 2010;49(9):978–986.
12. Centers for disease control and prevention. What Are the Risk Factors for Skin Cancer?. 2020.
13. Barceló Pérez C. Physiographic, geographic and seasonal behavior of insolation in Cuba, 1981 - 2013. *Revista Cubana Higiene y Epidemiología*. 2017;55(2).
14. E-commerce worldwide. Urbanization from 2009 to 2019. 2019.