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The uranium and radon gas concentration and impact on human health: A case from abondoned gold mine tailings in the West Rand area, Krugersdorp, South Africa

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The occurrence of radon gas in most residential areas is a major concern in many countries and it is accounted to be the second largest cause of lung cancer after smoking. Numerous deaths due to radon exposure are continuously reported worldwide. Consequently, due to critical radiological effects associated with radon, several countries adopted monitoring with intentions to minimize exposure levels and protect the public. However, in South Africa although a large number of the population is living in regions which are susceptible to the exposure of radon and still unaware of the health risks involved, very little attention has been given to this issue.

This is the case of the West Rand area, which is selected as the most appropriate site for the study of the impact of radon gas on health as it comprises large quantities of waste products from gold-uranium mines, which enhance the amount of radon-222 released in the air. In addition, a large number of population is living in close proximity to mine tailings, such as the Kagiso township, which could significantly be affected. There are always concerns raised in the West Rand area that most communities nearby mine wastes suffer from respiratory related diseases. However, there is no detailed study to ascertain this theory. Therefore the purpose of the present study is to investigate on the possible link between radon gas, which could be released from uranium-bearing geological formations and health issues such as lung cancer in the area.

In this study sampling of rocks, tailings and water was carried out for chemical analysis in order to help in identifying the predominant source of harmful radioisotopes in the area. The results show that mine tailings in the area have high concentrations of U, Th and Pb which exceptionally exceeds the concentration found in rocks. Uranium which is the primitive source of radon varies significantly in tailings between 7.38 to 74.3 ppm; therefore elevated radon levels could be expected. Subsequently, to characterize radon distribution in the area, 30 radon monitors have been placed in indoor and outdoor areas according to distribution of tailings and geological background. These results will be integrated with health data so that any correlation with the occurrence of lung cancer will be established. Therefore the targeted outcome will be of great importance in the management of radioactive waste materials. In addition it will contribute to the improvement on the public knowledge related to health effects associated with radon exposure.