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## **Health Impacts of the Pilanesberg Complex and the Rustenburg Layered Suite on communities in the Mabeskraal-Mabaalstad areas in the North West Province, South Africa**

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Medical geology in Africa, particularly in South Africa is a fairly new discipline and because of this few data are available on health problems that are related to the geological hazards. With the exposure of knowledge of such problems elsewhere in the world and a few initiatives (e.g. publication of Davies (2010) and the 1st International Symposium on Medical Geology in Africa at the University of Johannesburg in 2014), thorough studies of these problems in South Africa are now urgent. Past geological problems in Africa include the well-known asbestosis, silicosis, thyroid disorder including goitre development, as well as dental and skeletal fluorosis. Several natural geological problems that affect the health of the environment and its inhabitants are also observed in South Africa. In the semi-arid area immediately west of the Pilanesberg Complex, located approximately 210 km west of the city of Johannesburg, an investigation was conducted in 11 villages. Nearly all communities here heavily depend on groundwater for domestic use. The alkaline Pilanesberg Complex (PC) and the mafic Rustenburg Layered Suite (RLS) contaminate the groundwater here. The PC contains high concentrations of zirconium, fluoride (F), sodium (Na), uranium (U), thorium, hafnium, niobium, and tantalum. The RLS is the world's largest mafic intrusion and hosts the largest reserves of platinum-group elements, chromium and vanadium, but also contains rocks rich in calcium (Ca) and magnesium (Mg). Lack of water from the municipality and also the recent 2015/2016 drought has compelled villagers to bore wells in their own yards instead of relying in municipal communal taps. Groundwater from these self-drilled boreholes is often untested for harmful trace elements. Water here is hard and dominated by  $\text{HCO}_3^-$ ,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , F, U, Na, and total dissolved solids, consistent with the chemical composition of surrounding rocks. The concentrations of these elements are higher than the allowable safe limits of World Health Organisation (WHO) and the South African Department of Water Affairs (DWA). Some concentrations are about 10 times greater than the allowable limits.

Radioactivity emitted by U from the PC is low but it is the long-term effects from ingestion and inhalation that are of concern. Dental and skeletal fluorosis cases are common in Southern Africa [3] even at fluoride concentrations deemed to be safe. Recent fieldwork also indicated a significant amount of hypertension, cardiac failures, diarrhoea, irregular menstrual cycle disorders, mental illnesses and musculoskeletal problems. This is partly in line with the NW Province mortality profile report by Bradshaw et al. [1]. In many cases, patients with hypertension also had one of the following disorders:

musculoskeletal diseases, diabetes, psychosis, stomach ulcers, and other mental illness problems. Aggression is a noticeable problem in some villages.

*References:*

[1] Bradshaw D, Nannan N, Laubscher R, Groenewald P, Joubert J, Nojilana B, Norman R, Pieterse D, and Schneider M (2006) South African Burden of Disease Research Unit.

[2] DWA (2013) Dept. Wat. Affrs.

[3] Thole, B. (2013) doi: 10.5772/54985

