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Influence of seasonal variation on water quality in tropical water distribution system: is the disease burden significant?



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ABSTRACT

Recent evidence shows that water distribution system (WDS) is a major risk factor in piped water supply system and the degree of contamination of water in WDS is usually influenced by seasonal variation. Risk assessment studies eliminate the effect of seasonality whenever annualized estimate of concentration of contaminants in water is used to determine the risk to health. In tropical climate where strong seasonal variation prevails, the excess risk during dry and hot season, above the annualized risk can be significant. This study investigates what impact seasonal adjustment may have on health improvement targets for WDS. Water quality data of two Nigerian water supply schemes were used to estimate the impact of WDS on water quality. Seasonal deviation from the annualized impact was quantified as the latent risk in disability-adjusted life years (DALYs). The hazards identified in both WDSs were cadmium and lead, and the estimated 95th-percentile risk of the metals, over the course of dry season was about 31–38%, and 1–3% higher than the estimated yearly average risk, respectively. Wilcoxon signed-rank test showed that the risk distributions during the dry season was significantly higher ($p < 0.05$) than the yearly average. The median latent risks (5th, 95th-percentiles), for both WDS were 0.014 (7.6×10^{-3} , 0.023) and 4.8×10^{-3} ($-, 7.6 \times 10^{-3}$) DALYs/person/year for cadmium and 0.87×10^{-3} ($0, 0.1 \times 10^{-3}$) and 0.16×10^{-3} ($0, 0.031 \times 10^{-3}$) DALYs/person/year, respectively, for lead. These risks are substantially higher than the WHO limit (1×10^{-6} DALYs/person/year). Therefore, to achieve effective health improvement target, mitigation measures should be planned and executed by season.

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