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Estimating Arsenic Affected Water by Adaptive Sampling Procedure

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ABSTRACT

Water quality issues and Arsenic contamination are a fundamental source of concern for agencies involved in the provision of water supplies throughout the world. Bangladesh and West-Bengal have faced a major problem regarding to above issue. Since the alarm was first raised in Bangladesh about excessive arsenic concentrations in groundwater in the mid 1990's there have been a number of arsenic surveys in Bangladesh. These issues motivate us to estimate total arsenic affected areas in any particular zone. Department of Public Health Engineering (DPHE) with UNICEF assistance carried out a massive screening program of wells for arsenic across the whole of Bangladesh. DPHE staff randomly tested some 23,000 wells. But it was time consuming and cost-ineffective. Arsenic affected wells may not be included in large number in the surveys.

In our proposed method to estimate total arsenic in a particular village of Bangladesh, we select a number of samples (wells) by any general unequal probability-sampling scheme. The depth of the well is the size measure variable for selecting wells. Finally, in order to capture more wells beyond the initial samples accommodating the rare commodities namely the "arsenic affected wells" we employ the technique of Adaptive sampling defining appropriate (1) 'neighborhood' and (2) 'networks' using Thompson and Seber's method (1996). A simulation study has been carried out to demonstrate an improvement over the existing method.