ASSESSING THE RISKS OF WATER CONTAMINATION AND HOTSPOTS OF DIARRHEA IN SOUTHERN INDIA USING GIS

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Background and Aims: Recent studies in southern India show that 'treated' drinking water is contaminated with fecal coliforms and storage practices increase contaminations.This study aims to identify potential points of contamination of drinking water supply, assess the water quality, and examine associations with diarrhea in children in rural and urban areas of Vellore District, India.

Methods: The rates of diarrhea were assessed using 6-month surveillance in a cohort of 240 children (<5y.o.) in two rural (32%) and two urban (68%) areas in Vellore (12°55'60N, 79°7'60E). Water supply systems, drainage and sewage networks, households, points of potential water contamination were mapped and identified; physical characteristics of 147 public water taps were determined; 42 water samples from the public distribution system, water from households and overhead storage tanks were collected and analysed. Hotspots of diarrhoea were detected using Cluster/Outlier Analysis (Anselin Local Moran's I).

Results: 377 points of potential contamination (urban: 91%) were detected; 57 drinking water taps (38.8%) were at serious risk of contamination with sewage. All water tap samples had excessive nitrites and no free residual chlorine; 81% of water tap samples and 70% of household water samples had faecal coliforms. The incidence of diarrhea was higher in urban areas compared to rural: 2.07/1000 vs 1.66/1000 person-days, OR=1.26(95%CI:0.76,2.09). Statistically significant hotspots of diarrhea were detected in one rural village and two urban areas, where 87.5% of families used water taps at serious risk of contamination within 85 meters from their homes.

Conclusions: Widespread contamination of 'treated' drinking water exists in both rural and urban areas at source and point of use. Hotspot clustering of diarrhoea is more prevalent in urban households proximal to taps at risk of contamination. Public water distribution systems are difficult to monitor: GIS can be used to predict potential contamination and guide targeted intervention.

References: Brick T, Primrose B, Chandrasekhar R, Roy S, Muliyil J, Kang G (2004). Water contamination in urban south India: household storage practices and their implications for water safety and enteric infections. International Journal of Hygiene and Environmental Health; 207(5):473-480.