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Drinking Water Quality Assessment at Underserved Farms: Relationships Among Water Quality Parameters and Survey Questions in Virginia's Coastal Plain

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Abstract Text:

Well water samples were collected from 22 counties in Coastal Plain of Virginia specifically targeting underserved households. Among the water parameters tested in the waters, survey responses showed that total coliforms (TC), fecal coliforms (FC), nitrate (NO₃), fluoride (FI), and iron (Fe) were identified to be of greater concern. When data was looked at by demography, TC counts were the highest in water samples taken from African-American homeowners than other groups. However, there was no significant difference in TC counts when compared by income levels. Comparison by education level showed that samples from households with high school education had the worse contamination of TC. The type of plumbing used in houses had significant effect on TC counts, whereby plastic piping was more conducive to TC than either copper, galvanized metal or lead piping. Even though 22 samples showed fecal coliforms count beyond the USEPA guideline, these values were not discernable when compared by demography, income level, education or the type of plumbing used. However, among the 185 water samples collected from the Coastal Plain region, 71, 22, and 12 samples exceeded the EPA limits for Total coliform, fecal coliform, and E. coli, respectively. Survey results also indicated that well age, well depth, well type, and well casing affected NO₃, FI, and Fe concentrations. Nitrate level was predominantly higher in shallow wells (50 feet depth) than deeper (>100feet). However, variations in FI and Fe levels were not too different regardless of depth. Well age showed variability in NO₃ levels, whereby wells drilled between 1970 and 1990 indicating high NO₃ content in water samples followed by older wells (1950 – 1970) and the more recently drilled wells (1990-2000). Interestingly enough, hand dug wells showed less NO₃ contamination compared with drilled wells. Well casing had greatly reduced NO₃ contamination in water samples. The same is true for FI and Fe contents.

Impact Statement:

The current study indicated that drinking water quality at underserved households in Virginia's Coastal Plain is in danger of contamination from various sources. Results from the study were provided to the homeowners and steps were taken to advice those households where coliform contamination exceeded drinking water standards. General water quality education and wellhead protection was provided to well owners through the Master Well-Owner Network (MWON) program. Water quality education materials are being prepared for distribution to individual underserved homes and communities.