The Quality of Drinking Water in Migrant Farmworker Camps in Cumberland County, New Jersey

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Introduction

The camps which migrant farmworkers occupy during the harvest season have been described as "crowded, filthy, and dilapidated" by John Briscoe, et al in 1986.[i] In a study by Arbab, et al., researchers noted that "migrants presented [to physicians] more frequently with symptoms that are indices of poor sanitation and hygiene or impure drinking water."[ii] Considering these observed living conditions, this study seeks to obtain information about the purity of the drinking water used by the migrant farmworkers in their camp sites.

Studies have shown that the water quality in some camps declines during occupancy. Currently, the local Department of Health for Cumberland County examines the drinking water from migrant farmworker camp sites before issuing an occupancy permit. Samples of water are taken and analyzed for the presence of total coliforms. "The presence of any type of coliform organism in treated water suggests either inadequate treatment or contamination of the treated water. Coliform bacteria ... should not be present in significant numbers in any potable water supply."[iii] If the sample is negative for total coliforms (less than 1 colony per 100 ml of water[iv]) in the drinking water, an occupancy permit is issued. These samples are taken, however, before occupancy. An independent research group tested the water in three southern New Jersey counties in September of 1992. They found 15 of 51 camps exceeded the New Jersey Department of Health standard for potable water.[v] A study done by Ciesielski, et al. at the University of North Carolina found drinking water that tested positive for total coliforms in twelve of twenty-seven camps.[vi] The migrant workers living in labor camps from April through November do not have access to other sources of potable water. They may suffer the consequences of bacterial infections or other illnesses because of the exposure to this contaminated water.

A large aquifer, situated under southern New Jersey, provides potable water for the residents of Cumberland County. Where the camps tested are located, landowners rely on well water systems to provide potable water to the residents of their property. Contaminated well water may go unnoticed because regular testing is not mandated by law.

> Contamination of groundwater is of particular concern to the rural populations dependent upon individual drinking water wells in conjunction with septic systems, since the quality of this water is not monitored by health officials as are urban water supplies. . . Studies by the US Environmental Protection Agency (EPA) and the Center for Disease Control have confirmed a number of cases in which failed septic systems, or less-sophisticated cesspool systems, have been the source of outbreaks of serious waterborne diseases.[vii]

Contaminated water may create health hazards to those who use the water for drinking. "The most common waterborne diseases, however, result in gastrointestinal problems that may be diagnosed by family members, even doctors, as diarrhea or flu."[viii]

Goal

The goal of this study is to determine whether the water quality in large migrant camps is poorer than in small migrant camps during the months of June and July. A large migrant camp is defined as a camp whose residents number sixteen or more at the time the water sample is obtained. A small camp will have fifteen or fewer residents. The water quality will be termed "good" if the total coliform bacteria count per 100 ml of water numbers less than 1 colony; this standard is the one used by the local Department of Health prior to issuing occupancy permits. If a water sample has a count of 1 colony per 100 ml coliform or more, the quality will be termed "poor." Other parameters such as sink location, bathroom facilities, housing style, and number of months that the camp is occupied will be examined considering positive coliform results.

Little research has been done on the water quality of migrant camps. In an attempt to find possible correlates to the presence of water contamination, variables signifying more modern facilities are employed. The variables chosen to characterize the camps are used as a measurement of modernity. An indoor faucet is considered more modern than one located outdoors. Questions about outward appearance are posed. Are the proprietors of the land concerned enough to maintain indoor plumbing for the migrants, or are they relying on outdoor spigots or hoses to suffice for sources of potable water? Will these modern facilities correlate with a lower prevalence of water contamination? Will a modern kitchen with hot and cold running water, indoor faucets with aerators, and indoor flush toilets have a greater chance of producing uncontaminated water than a less modern one?

The size of the camps is characterized on a scale of fives from zero to twenty-five residents. Having visited the camps, it is clear that they were evenly divided at the fifteen person range into larger and smaller camps. Again the question of outward appearances arises. If a camp has a greater number of residents, will it show an increased prevalence in water contamination, or will the opposite be shown?

Methods

In June and July of 1995, the drinking water of Cumberland County migrant labor camps inhabited during the months of June and July was tested for the presence of total coliforms. Community Health Care, a local health services center, was contacted. Members of the migrant outreach program provided a list of camps in Cumberland County that were currently occupied by migrant farm laborers. The camps had passed pre-occupancy inspection, each testing negatively for the presence of total coliforms.

Water samples were collected from a total of thirty-two camp sites during the months of June and July 1995. Verbal consent was obtained from the inhabitants of the

camps before testing. Water samples were taken from faucets located in the camps. Aerators were removed from the taps when possible. (Only one camp was tested where an aerator could not be removed. This camp, however, tested negative for the presence of coliforms.) A flame was applied to metal taps; Isopropyl alcohol was then poured over all taps to complete the sterilization process. Cold water was allowed to run for three to five minutes before the sample was taken. Water was collected in 100 ml sterile plastic containers provided by the laboratories. Samples were labeled and placed in a cooler on ice. Samples were taken within 24 hours to local laboratories for analysis. The laboratories used were QC (Vineland, NJ) and South Jersey Testing Laboratory (Bridgeton, NJ). The water was tested using the membrane filter technique for members of the coliform group.[ix] A positive result showed the presence of more than 1 colony of coliforms per 100 ml of water.

Results

Of the thirty-two migrant labor camp sites tested, two water samples tested positive for total coliforms. Because the statistical power was so low, liberal criteria have been employed in interpreting the results of this study. The characteristics of the camps ranged in the variables collected.

Certain camp characteristics were observed. Eighteen camp sites had less than sixteen residents (56 percent), while fourteen camps had sixteen or more residents (44 percent). A positive total coliform test was found in each category. Table 1 sites the percentages of each characteristic in light of a positive coliform test. Other observations included twenty-nine out of thirty-two camps had sinks located indoors. Slightly more than one half of the camps had aerators on the spigots. Only one camp did not have hot running water. Two camps had toilets of the latrine type style; the other thirty camps had flush style toilets. Most camps were occupied from six to eight months of the year; the migrants usually arrived in April or May and stayed until October or November.

The majority of sources from which water samples were collected were indoor kitchen sinks; only two of the thirty-two samples were taken from outdoor spigots. Both outdoor water samples were uncontaminated with coliforms. One would suggest that spigots with aerators would fair better in providing coliform free water, however, the two camps that tested positive were equipped with aerators.

The two camps that did test positive for total coliforms were quite different from each other. (Table 2) The labor camps' similarities included flush-type toilets, hot and cold running water, and aerators on the spigots. Water samples were taken from indoor kitchen sinks in both cases. The population of the camps differed in size; one camp had over twenty-five residents, while the other had twelve. The smaller camp had opened in May, and the larger in April. They both were scheduled to close in November. Again, because of the small number of camps that had contaminated water, there seemed to be no outstanding characteristic that correlated with poor water quality with any statistical significance.

When the data collected in this study was compared to two other studies, there was a statistically significant difference in underlying contamination rates of migrant camp communities. (Table 3) The microbiological quality of drinking water was tested in migrant camps in North Carolina. Drinking water samples were tested for the presence of total coliforms over a two year period. Twelve of the twenty-seven camps tested positive for total coliforms in 1988. When compared to the results of this study (where only two out of thirty-two camps tested positive) there was a significantly lower contamination rate in Cumberland County than in North Carolina ($p = .0018$; Yates Corrected Test). Another water testing study was done on migrant camps during occupancy in southern New Jersey in 1992. The results of this study showed coliform contamination in fifteen of fifty-one labor camps. When compared to the results of this study, there was again a significantly lower contamination rate ($p = .02$; Yates Corrected Test).

Discussion

In this study, because of the small number of camps testing positive for contamination, the number of residents of a camp does not prove to be a good indicator of water contamination. One might hold the belief that as number of residents living in a particular camp increases the risk of water contamination increases as well. An increase of waste and excreta by large numbers of residents might overtax an older septic system, with leaching from the septic sites into wells leading to coliform presence in drinking water. However, a larger camp site may also have a septic system with a greater capacity to handle waste matter produced by the residents, and therefore result in a lower prevalence in contaminated water. The issue remains open to further study.

One might conclude that the camps with more modern facilities will show a lower prevalence of water contamination. Indoor kitchen sinks, hot and cold running water, faucets equipped with aerators, and flush toilets enclosed within buildings are considered more modern facilities than those without such conveniences. Ciesielski (1992) found there to be an increasing prevalence of coliforms in water samples as a function of time of occupancy. The variables chosen in this study do not show strong correlation with the prevalence of contamination. This lack of correlation may be explained by the low statistical power of the data; therefore, no firm conclusions can be drawn.

The results of this study show that there is a significantly lower contamination rate in Cumberland County migrant farmworker camps than in other areas, such as North Carolina. The study done in the area of southern New Jersey in 1992 includes the areas of Cumberland County, Atlantic County, and Gloucester County. Unfortunately, the data that isolated the rate of Cumberland County from the other two counties is not available in the report. In the study done in 1992, the water samples were collected in September, not in June and July, when this study was done.[x] Samples collected later in the harvest season (September or October) may show higher rates of contamination.

Drinking water standards are established to protect the general public from health risks. Water standards are based on preventing waterborne infectious diseases from being transmitted through drinking water. Coliform levels are the standard measure used to determine fecal contamination of water. "While their presence may not signify that water is a health hazard, their absence provides reasonable evidence of bacteriologically safe water."[xi] This research study shows that the outward appearance of camps is not a good indicator of the quality of drinking water available to the migrants.

As an agricultural community, Cumberland County is home to many migratory farmworkers during the months of March through November. Before occupancy, the drinking water in migrant camp sites is tested by the local Department of Health for the presence of coliforms. The drinking water is, however, not currently tested during occupancy. Even though this study showed a lower contamination rate than other areas where migrant camps are located, any contamination could have long lasting repercussions on health. One contaminated drinking water supply is one too many.

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[iv] Standard Methods for the Examination of Waste and Wastewater: American Public Health Association, American Water Works Association, Water Pollution Control Federation, 15th edition, 1981.

[v] CATA, Rural Community Assistance Program. Water Testing of Wells on Migrant Camps During Occupancy in Southern New Jersey, 1992. (unpublished report)

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[vii] Texas Rural Water Quality Project. Back to the Land: On-site Treatment of Domestic Wasterwater, 1986: p. 7.

[viii] Ibid., 6.

[ix] Standard Methods for the Examination of Waste and Wastewater: American Public Health Association, American Water Works Association, Water Pollution Control Federation, 15th edition, 1981.

[x] The study done by Ciesielski in North Carolina does not specify the months in which the data was collected.

[xi] Okun, DA. Waste and Water Disposal. In *Maxcy-Rosenau Public Health and Preventive Medicine*, edited by J. Last. East Norwalk: Appleton-Century-Crofts, East Norwalk, 1986: 815.

TABLE 1

Percent prevalence of characteristics in migrant camps

Variable	*# camps with characteristic*	*# (%) positive for coliforms*
Faucets indoors	29	2(6.9%)
Faucet outdoors	3	0 (0%)
Aerators present	19	2 (10.5%)
Aerator absent	13	0 (0%)
Flush toilet	30	2 (6.7%)
Latrine	2	0 (0%)
Hot/cold water present	31	2 (6.5%)
Hot/cold water absent	1	(0%)
Variable	*# camps with characteristic*	*# (%) positive for coliforms*
16 or more residents	14	7.1%
15 or less residents	18	5.6%

TABLE 2

Characteristics of the two migrant camps where coliforms were found in drinking water

Characteristic	*Camp 1*	*Camp 2*
Faucets indoors	yes	yes
Aerator present	yes	yes
Flush toilet	yes	yes
Hot/cold water	yes	yes
# months occupied	eight	seven
enter date	April	May
exit date	November	November
# residents	over 25	under 15

TABLE 3

Percent prevalence of contaminated drinking water in camp sites

Site of water source	*# samples collected*	*# (%) positive*
North Carolina	27	12 (44)
South New Jersey	32	2 (6)
Cumberland County	51	15 (29)

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