



ALABAMA DEPARTMENT OF PUBLIC HEALTH

Community Assessment of Knowledge and Concerns About Open Sewage and Related Illnesses

Lowndes County, Alabama

May 22-24, 2018

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Introduction

Lowndes County is a rural county in east central Alabama, in an area known as the Black Belt Region.

This region, originally named because of the rich, black, fertile soils, has a unique geology that makes the ground virtually impermeable to water. This is a problem for sewage disposal because regular septic systems will not work in this environment thus necessitating more expensive, specialized systems, which many residents cannot afford. As a result, there have been reports of open sewage and waste pooling near or around homes. Open sewage near homes not only affects the desirability of that neighborhood but also causes a concern for potential health issues. Sewage can be a source of contamination and exposure to bacteria (e.g., *E. coli*, *Salmonella*, etc.), viruses (e.g., hepatitis A, norovirus, etc.), and parasites (e.g., *Giardia*, *Cryptosporidium*, etc.).¹⁻³

The Alabama Department of Public Health (ADPH) has been working with local and federal partners to address some of the issues in Lowndes County. As part of this response, ADPH conducted a community assessment. The objective of this community assessment was to gather firsthand information from the residents of affected areas in Lowndes County about their concerns and experiences with sewage disposal and potentially associated illnesses. This information would be used to guide a more targeted response based on the concerns from the community.

Methods

Sample Selection

For the community assessment, eight communities were chosen as the sampling area based on guidance from local environmentalists as to what areas had been most affected by sewage problems. Based on the number of households in these areas, assuming a 95% confidence level and 5% margin of error, a sample size of 250 surveys was set as the goal. Residential addresses were obtained for the communities from a publicly available list developed for county tax assessors. A sample of 400 addresses, to account for a 25% non-response rate and 30% invalid addresses, was randomly selected using a random number

generator. The addresses were mapped and divided into 14 clusters based on geographical location. For each cluster, a map and list of addresses was created for reference.

Survey Administration

A questionnaire was developed by ADPH with assistance from subject matter experts from the Centers for Disease Control and Prevention, in the Division of Foodborne, Waterborne, and Environmental Diseases and the Division of Parasitic Diseases and Malaria. The survey addressed potential water and sewage problems, associated illnesses, and preventative behaviors.

On May 22, 2018, the first day of the assessment, a two-hour training session took place in Lowndes County for individuals who would be conducting interviews. It covered interview techniques, safety issues, household selection, tracking methods, and confidential referrals. Ten teams of two to three people, with volunteers from the state and local health department, were assigned one or two clusters each to conduct interviews. The team members also reviewed the questionnaire and practiced administering it before going into the field. Several community members participated in the training and either went out with the teams or assisted in spreading awareness in their neighborhoods about the survey.

Interviews were conducted during May 22–24. At each household interviewed, one adult representative (18 years or older) responded for the entire household. If a resident was not present at the household when the interview team arrived, the team was asked to attempt two more times at a later hour before terminating attempts to contact those residents. Household tracking forms were used to keep track of the number of households where contact was attempted, taking into account those where interviews were successfully completed, refused, or where no one was available at the home.

Survey Analysis

Contact rate, cooperation rate, and a completion rate were calculated according to the following formulas:

$$\text{Completion rate: } \frac{\text{number of surveys completed}}{\text{goal of 250 households}}$$

$$\text{Cooperation rate: } \frac{\text{number of surveys completed}}{\text{number of households where contact was made}}$$

$$\text{Contact rate: } \frac{\text{number of surveys completed}}{\text{number of households where contact was attempted}}$$

Some houses were deemed "inaccessible" due to fences, private property warnings, dogs, etc.; contact was not attempted in such cases.

Frequencies and 95% confidence intervals (CI) were calculated for all variables using Epi Info™ 7 version 7.2.0.1 (CDC, Atlanta, Georgia). For open ended questions, answers given by respondents were categorized into relevant groups for ease of reporting frequencies. Risk ratios (RR) were also calculated for sewage exposures and risk of reporting gastrointestinal illnesses over a 6 month period.

Results

Interviews were successfully completed at 192 households in the eight communities surveyed. With 192 surveys completed out of the goal of 250, this assessment had a completion rate of 76.8%. Although there were 400 addresses available to visit, 20.3% were deemed inaccessible. Contact was attempted at 319 households and successful at 239 households. This yielded a cooperation rate of 80.3% and a contact rate of 60.2%.

Household Characteristics (Table 1)

The majority of respondents lived in a single-family home (98.4%) that they owned (90.0%) and had lived there a median of 30 years. Most households had two residents (40.8%), with most reporting residents between 18-64 years (70.7%) or greater than 65 years (51.8%).

Water and Sewage Characteristics (Table 2)

A majority of household respondents used a municipal system to obtain drinking water (57.3%), although 42.2% of respondents reported bottled water as their primary source of drinking water. Among households, a majority of respondents (57.3%) used a septic tank as their means of sewage disposal. Municipal sewage systems were used by 39.1% of respondents. Straight pipe use was reported by 2.1% of respondents. Several households (10.9%) had another form of sewage disposal before their current one, mostly septic tanks (81.0%). When asked if they thought sewage disposal and sanitation was a big issue in Lowndes County, 64.1% of respondents replied yes. More specifically, 35.0% commented on the need for a new or upgraded sewage system, 29.3% commented on how there is sewage backing up and pooling in open areas, and 17.1% spoke about the high cost and lack of funding for proper sewage disposal.

Sewage Issues and Potentially Associated Illnesses (Table 3)

Household residents were asked about their personal experiences with sewage as well. Of respondents, 17.7% had experienced sewage backing up into their home in the last year, 15.1% had off-color or foul smelling water from the faucet, and 8.3% had standing sewage or run-off near their homes. In contrast, 68.2% of respondents reported not experiencing any of these issues with their sewage. Of those that did experience an issue with their sewage in the last year, 55.9% reported that it was a recurring problem. Most respondents reported that they would either hire a professional (45.8%) to clean up any sewage backup or would do it themselves (35.4%).

In the last six months, 13.2% of respondents had experienced gastrointestinal (GI) illness one to three times in their household, 1.6% had experienced GI illness four to six times, and 4.7% had experienced GI illness more than six times. Overall, 80.5% of respondents had not experienced any gastrointestinal illness in the last six months.

In the last four weeks, 9.9% of respondents had diarrhea, 8.9% had abdominal cramps or pain, and 6.3% had eye redness and inflammation. Respondents reported not having any of the symptoms asked in 78.7% of households.

Of households with residents reporting illness in the last four weeks, 46.3% saw their family doctor and 43.9% did not seek medical care. The majority of respondents (83.3%) who did not seek medical care said it was because the symptoms were not bad enough.

Prevention and Communication Characteristics (Table 4 and 5)

Almost all household respondents reported always washing their hands before preparing food or cooking (97.4%), before eating (96.4%), before feeding children (70.3%), after cleaning or changing a diaper (64.6%), and after using the bathroom (99.0%). Feeding children and changing a diaper was not applicable in 27.1 % and 34.4% of households, respectively. In 38.5% of households, respondents reported walking outside their homes barefoot.

Trusted sources for health information included physicians (76.0%), the health department (33.3%), and family (29.7%). The main methods for getting information about health and environmental concerns reported by respondents included television (50.5%), and word of mouth (25.5%).

Main Health and General Concerns (Table 6)

When household residents were asked what their main health concern was, 40.3% reported not having any health concerns. Of those who reported a concern, cardiovascular issues such as having a heart

condition or high blood pressure (16.2%), water and sewage issues (9.7%), and diabetes (7.9%) were the most frequently reported concerns.

When residents were asked what general concerns they had other than health issues, 75.5% did not have any concerns. Water and sewage concerns (13.5%) were the most frequently reported concerns followed by the high cost for utilities (3.1%).

Risk Ratio Analysis

Respondents who reported any sewage or water issues in their homes were over 3 times more likely to report having experienced GI illness in the last 6 months (RR: 3.2, 95% CI 1.8, 5.7). If the household had sewage back-up in the last year, respondents were over 3 times as likely to report GI illness (RR: 3.1, 95% CI: 1.8, 5.4). Residents from households with standing sewage near their homes did not have a significant risk of GI illness being reported compared to households without standing sewage (RR: 1.0, 95% CI 0.3, 2.8). Finally, respondents reporting off-color or foul smelling water from their faucet, were over 2 times more likely to report GI illness in the last 6 months (RR: 2.3, 95% CI 1.3, 4.2).

Discussion

The community assessment in Lowndes County was an important step to better understand the issues and concerns of the community related to sewage disposal. Household characteristics showed that a lot of those sampled had lived in their homes for many years and that there was a large representation of elderly individuals over 65 years. Although a majority of respondents drank tap water primarily, there was a large percentage that drank bottled water as their primary source of drinking water. This might be a reflection of their thoughts on the safety or taste of their local tap water, although this was not directly asked on the survey.

Over 60 percent of households were not using a municipal sewage system, but instead had either a septic tank or a straight pipe. A majority of the community expressed that sewage disposal was a big

issue in the county and felt that new or upgraded systems were needed to reduce the amount of open sewage in certain communities. Almost a third of respondents had personally experienced some issue related to improper sewage disposal such as sewage backing up into the home or pooling around the house, many of which had this happen on a recurring basis.

A majority of respondents had not experienced gastrointestinal illness in the last 4 weeks to 6 months. Although there is no baseline of gastrointestinal illness normally experienced in a community to compare to, these reports can be used as a new baseline for future surveys regarding illness in this community, particularly after an intervention is put into place. Of those who reported illness, almost half did not have symptoms that were serious enough to seek medical care, which reduces the chance of identifying causative organisms and maintaining surveillance for increased rates of disease.

Interestingly, when comparing those who reported sewage or water issues to those who did not, there was a significantly increased risk of having had gastrointestinal illness among household residents in the last 6 months for those with sewage issues. Specifically, there was an increased risk for those with sewage back-up and off-color water. These results should be interpreted with caution, and causality should not be assumed because of other potential factors, or confounders, that were not accounted for in the analysis. For example, the survey did not collect any information on social economic status or comorbidities, which could also affect the likelihood of certain illnesses or the type of sewage system in the household.

Respondents were asked about two categories of concerns, health and general. Health concerns reported by respondents focused less on infectious causes and more on chronic conditions such as heart disease, high blood pressure, and diabetes, although almost ten percent did mention concern for the health effects from sewage and water issues. Over three-quarters of respondents did not have any general concerns and less than 15 percent were concerned about water and sewage issues. This is interesting considering a larger percentage had experienced sewage issues in the past.

Limitations

This assessment had at least three limitations. The respondents chosen for the survey were selected at random from a list of addresses; however, there could still be a bias on who agreed to take the survey since it was voluntary. One possible effect of this might be a false elevation of certain reported issues, if those more likely to be affected were more likely to respond. Another limitation might be social desirability bias, which is exhibited when respondents answer a question in the way they perceive the interviewer might like or that is socially acceptable. Respondents might report certain behaviors they perceive as expected and not report other things that they perceive as negative. Finally, because the number of completed surveys did not reach at least 80% of the target of 250 households, the results could not be weighted and generalized to the entire sampling area from which the 400 households were selected.

Recommendations

While the results of this assessment may not be generalizable to the entire sampling frame, the findings provided adequate evidence to guide the development and implementation of targeted public health activities that might prevent illness in these communities. There are four main recommendations based on this assessment.

1. Sewage and sanitation issues, barriers, and solutions should continue to be addressed. The majority of households indicated that sewage and sanitation were issues in the county, with nearly 31% of households reporting that at least one of the following was experienced in the past year: Sewage backing up into the home, off-color or foul-smelling water from faucet, and standing sewage or run-off near the home. While specific funding and technical recommendations are beyond the scope of this assessment, it is well established that exposure

to sewage and inadequate sanitation poses a public health risk and efforts should be made to reduce and minimize that risk.^{4,5}

2. Informational campaigns should be developed and implemented, using trusted information sources and targeted outreach methods. As physicians were indicated as trusted sources of health information and one-fourth of households indicated that word of mouth was their preferred way to get information, a collaboration among ADPH, local healthcare providers, and community groups should be considered. The information campaign should include these steps:
 - a. Develop situation-specific informational materials, including the following topics:
 - i. Illnesses that may be transmitted by exposure to sewage
 - ii. Ways to prevent illness (i.e., wear shoes outdoors, proper hand hygiene)
 - iii. How to safely clean up after a sewage back up inside the home
 - iv. How to identify unsafe drinking water and to whom to report issues
 - b. Disseminate materials through television, physician offices, health departments, and community groups.
3. ADPH should provide information to healthcare providers where Lowndes County residents seek medical care to consider exposure to sewage as a possible cause of illness in patients presenting with compatible symptoms. In this way, an outbreak or cluster of cases might be more easily identified and patients can receive appropriate care and information.
4. Further assessment of available resources for prevention and treatment of chronic health conditions should be considered. Although questions related to general health and chronic conditions were not specifically asked, it was a common response by households when asked about the main health concern and should be addressed as chronic health conditions may increase individual susceptibility to infectious diseases and vice versa.^{6,7}

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Appendix 1: Tables

Table 1. Self-reported housing characteristics, Lowndes County Community Assessment — May 2018

Characteristic	No. of households	% (95%CI)
Type of structure		
Single-family home	189	98.4 (95.5, 99.7)
Mobile home	3	1.6 (0.3, 4.5)
Primary Residence		
Yes	189	98.4 (95.5, 99.7)
No	3	1.6 (0.3, 4.5)
Length of Residence (years)		
Range	0.2-85	–
Median	30	–
Ownership Type		
Rent	17	9.0 (5.3, 13.9)
Own	171	90.0 (84.8, 93.9)
Other	1	0.5 (0.01, 2.9)
Refused	1	0.5 (0.01, 2.9)
Household size		
One	44	23.0 (17.3, 29.7)
Two	78	40.8 (33.8, 48.2)
Three	41	21.5 (15.9, 28.0)
Four	16	8.4 (4.9, 13.3)
Five or more	12	6.3 (3.3, 10.7)
Households with at least one member		
<2 years old	7	3.7 (1.5, 7.4)
2-17 years old	41	21.5 (15.9, 28.0)
18-64 years old	135	70.7 (63.7, 77.0)
≥ 65 years old	99	51.8 (44.5, 59.1)

Table 2. Water and sewage characteristics of households, Lowndes County Community Assessment — May 2018

Characteristic	No. of households	% (95%CI)
Primary source of drinking water		
Municipal/public	110	57.3 (50.0, 64.4)
Bottled water	81	42.2 (35.2, 49.5)
Private well	1	0.5 (0.01, 2.9)
Sewage disposal method		
Septic tank	110	57.3 (50.0, 64.4)
Municipal sewage system	75	39.1 (32.1, 46.4)
Straight pipe	4	2.1 (0.6, 5.3)
Don't know	3	1.6 (0.3, 4.5)
Previous disposal method		
Yes	21	10.9 (6.9, 16.2)
No	159	82.8 (76.7, 87.9)
Don't know	12	6.3 (3.3, 10.7)
Previous sewage disposal method		
Septic tank	17	81.0 (58.1, 94.6)
No system	1	4.8 (0.1, 23.8)
Pit	1	4.8 (0.1, 23.8)
Other	2	9.5 (1.2, 30.4)
Think that sewage disposal is a big issue in this county		
Yes	123	64.1 (56.8, 70.8)
No	48	25.0 (19.0, 31.7)
Don't know	21	10.9 (6.9, 16.2)
In what ways		
Need new sewage system or upgrade	43	35.0 (26.6, 44.1)
Sewage in open areas/backing up	36	29.3 (21.4, 38.2)
High cost and lack of funding for sewage	21	17.1 (10.9, 24.9)
Other	18	14.6 (8.9, 22.1)
Don't know	5	4.1 (1.3, 9.2)

Table 3. Sewage issues and potentially associated illnesses, Lowndes County Community Assessment — May 2018

Characteristic	No. of households	% (95%CI)
Experienced by household in the last year		
Sewage backing up into home	34	17.7 (12.6, 23.9)
Off-color or foul-smelling water from faucet	29	15.1 (10.4, 21.0)
Standing sewage or run-off near home	16	8.3 (4.8, 13.2)
None of these	131	68.2 (61.1, 74.8)
Don't know	2	1.0 (0.1, 3.7)
Is a recurring problem		
Yes	33	55.9 (42.4, 68.8)
No	26	44.1 (31.2, 57.6)
Method would use to clean up sewage backup		
Hire a professional	88	45.8 (38.6, 53.2)
Clean/sanitize area themselves	68	35.4 (28.7, 42.6)
Call family to help	10	5.2 (2.5, 9.4)
Call city/utility company	6	3.1 (1.2, 6.7)
Don't know	20	10.4 (6.5, 15.6)
Gastrointestinal illnesses in the last 6 months		
None	155	80.7 (74.4, 86.1)
1-3 times	25	13.0 (8.6, 18.6)
4-6 times	3	1.6 (0.3, 4.5)
More than 6	9	4.7 (2.2, 8.7)
Symptoms experienced in the last 4 weeks		
Diarrhea	19	9.9 (6.1, 15.0)
Abdominal cramps/pain	17	8.9 (5.2, 13.8)
Eye redness/inflammation	12	6.3 (3.3, 10.7)
Localized rash on skin	10	5.2 (2.5, 9.4)
Fever	10	5.2 (2.5, 9.4)
Vomiting	7	3.7 (1.5, 7.4)
Unexplained weight loss	6	3.1 (1.2, 6.7)
None of the above	151	78.7 (72.2, 84.2)
Sought medical care for these conditions at		
Family Doctor	19	46.3 (30.7, 62.6)
Did not seek medical care	18	43.9 (28.5, 60.3)
Emergency department	3	7.3 (1.5, 19.9)
Urgent care	2	4.9 (0.6, 16.5)
Don't know	1	2.4 (0.1, 12.9)
Reasons residents did not seek medical care		
Symptoms not bad enough	15	83.3 (58.6, 96.4)
Self-treated at home	3	16.7 (3.6, 41.4)

Table 4. Preventative handwashing practices, Lowndes County Community Assessment — May 2018

Characteristic	No. of households	% (95%CI)
Frequency of handwashing:		
Before preparing food or cooking		
Always	187	97.4 (94.0, 99.2)
Sometimes	5	2.6 (0.9, 5.6)
Rarely	0	–
Never	0	–
Don't know	0	–
Before eating		
Always	185	96.4 (92.6, 98.5)
Sometimes	6	3.1 (1.2, 6.7)
Rarely	0	–
Never	0	–
Don't know	1	0.5 (<0.1,2.9)
Before feeding children		
Always	135	70.3 (63.3, 76.7)
Sometimes	5	2.6 (0.9, 6.0)
Rarely	0	–
Never	0	–
Don't know/not applicable	52	27.1 (20.9, 34.0)
After cleaning/changing diaper		
Always	124	64.6 (57.4, 71.3)
Sometimes	1	0.5 (<0.1,2.9)
Rarely	0	–
Never	1	0.5 (<0.1,2.9)
Don't know/not applicable	66	34.4 (27.7, 41.6)
After using the bathroom		
Always	190	99.0 (96.3, 99.9)
Sometimes	1	0.5 (<0.1,2.9)
Rarely	0	–
Never	0	–
Don't know	1	0.5 (<0.1,2.9)

Table 5. Prevention and communication characteristics, Lowndes County Community Assessment — May 2018

Characteristic	No. of households	% (95%CI)
Household residents ever walk outside barefoot		
Yes	74	38.5 (31.6, 45.8)
No	117	60.9 (53.7, 67.9)
Don't know	1	0.5 (<0.1, 2.9)
Trusted sources for health information		
Physicians	146	76.0 (69.4, 81.9)
Health Department	64	33.3 (26.7, 40.5)
Family	57	29.7 (23.3, 36.7)
Internet websites	37	19.3 (14.0, 25.6)
Neighbors	33	17.2 (12.1, 23.3)
Other	19	9.9 (6.1, 15.0)
Social Media	15	7.8 (4.4, 12.6)
Community groups	14	7.3 (4.0, 11.9)
Main method of getting information about health and environmental concerns		
Television	97	50.5 (43.2, 57.8)
Word of mouth	49	25.5 (19.5, 32.3)
Other	16	8.33 (4.8, 13.2)
High-speed internet	10	5.2 (2.5, 9.4)
Print media	9	4.7 (2.2, 8.7)
Social Media-Facebook	9	4.7 (2.2, 8.7)
Phone App	1	0.5 (<0.1, 2.9)
Don't Know	1	0.5 (<0.1, 2.9)

Table 6. Main health and general concerns, Northwest Alabama CASPER — March 2018

Characteristic	No. of households	% (95%CI)
Main health concerns*		
No concerns	87	40.3 (33.7, 47.2)
Heart condition/high blood pressure	35	16.2 (11.6, 21.8)
Water/sewage concerns	21	9.7 (6.1, 14.5)
Diabetes	17	7.9 (4.7, 12.3)
Other	12	5.6 (2.9, 9.5)
Musculoskeletal issues	11	5.1 (2.6, 8.9)
Overall Health	11	5.1 (2.6, 8.9)
Respiratory issues	9	4.2 (1.9, 7.8)
Cancer	4	1.9 (0.5, 4.7)
Environmental issues	3	1.4 (0.3, 4.0)
Neurological issues	3	1.4 (0.3, 4.0)
Obesity	3	1.4 (0.3, 4.0)
General concerns*		
No concerns	145	75.5 (68.8, 81.4)
Water/sewage issues	26	13.5 (9.0, 19.2)
High cost for utilities	6	3.1 (1.2, 6.7)
House upkeep	3	1.6 (0.3, 4.5)
Environmental concerns	2	1.0 (0.1, 3.7)
Other	10	5.2 (2.5, 9.4)

*Some household respondents listed multiple concerns