

OUTBREAK: COZUMEL! INSTRUCTOR'S GUIDE

Introduction. This guide is intended to give you the tools you need to host a simulated, semester-long outbreak in your own classroom. In this simulation, an emergent strain of norovirus breaks out on a fictitious Disney Cruise ship (the S.S. Mickey Morgue) in the Caribbean. However, it could easily take place on any cruise ship anywhere in the world that best fits your needs. You could even bring the whole thing indoors to a hotel or a college campus. Included in this guide are:

- 1) A description of **how the outbreak begins**. Only the instructor will know this information, at first. The students must figure it out for themselves.
- 2) A description of my **outbreak class management** strategies
- 3) A **summary of each day's events**, along with suggestions for their implementation.
- 4) **Appendices**
 - Appendix 1. Characteristics of the emergent Norovirus
 - Appendix 2. Deck plan of the S.S. Mickey Morgue
 - Appendix 3. Patient demographics and responses to questions.
 - Appendix 4. Menu on board the S.S. Mickey Morgue, food vendors and sources.
 - Appendix 5. Spread of the Foley, Alabama outbreak.
 - Appendix 6. Solving the Outbreak: Responses to student questions and actions during days 12-14 in Foley, Alabama.

How the Outbreak Begins. The outbreak begins in late summer (or mid winter, if you teach your class in the spring) at Bly and Ely's Oyster Shack in Foley, Alabama. Bly and Ely Phoid are twin brothers who own and run their own oyster farm/restaurant. Their younger brother Ty works on the USS Mickey Morgue, the pride of the Disney cruise line, as a sous chef. In this scenario, a tropical storm has just blown through the Gulf of Mexico, dropping over 8" of rain in some locations and causing flash flooding and extensive runoff all along the Gulf coast. Oyster farms in the Gulf have been forced to shut down temporarily due to unacceptably high fecal coliform numbers in the coastal waters, and Bly and Ely are not happy. Not only is their business affected, but they are also planning to host a small party to celebrate their birthday in the upcoming week. Oysters, of course, were supposed to take center stage in the meal plans. Thus, the night before the party finds the brothers standing on the shoreline, looking out at their oyster farm despondently.

"Well, Bly. Desperate times *do* call for desperate measures, after all," muses Ely as Bly nods sagely. "I am thinking that this is one oyster party that is going to happen, tropical storm or no."

So, ignoring the coliform warnings, Bly and Ely take their boat out late that night to harvest oysters for their party. The event the next day is a huge success, and everyone goes home happy, most with their bellies full of "Phoid's World Famous Oysters". Of course, the oysters are not only world famous, but also contaminated by an emergent strain of norovirus (see "Appendix 1: Norovirus Characteristics" at the end of this guide for details). The game is now afoot!

The youngest Phoid brother, Ty Phoid, heads off from the party to his job as a sous chef in the galley of the USS Mickey Morgue (the pride of the Disney Cruise Line) with a lot of happy memories.

Unfortunately, he is asymptotically carrying and shedding significant amounts of the norovirus, too. As the ship pulls out of port in Mobile, Alabama, Ty busies himself preparing the raw seafood bar for the luxurious buffet that the 200 passengers will eat that afternoon. As previously mentioned, he is unknowingly shedding norovirus. He also does not wash his hands adequately prior to food prep that

morning, and thus contaminates the seafood. As the ship steams towards its first stop in Progreso, Yucatan, all of the passengers who ate items from Ty's raw seafood bar begin to fall ill.

By the time the ship reaches Progreso the next morning 10 passengers are ill with diarrhea, vomiting, fevers and severe stomach cramps, although only two seek aid from the ship's medical staff, so the extent of the illness is not yet apparent. The healthy passengers have a wonderful day in Progreso, although a few more are starting to feel ill by the end of the day. As the ship leaves Progreso and continues on to Cozumel, the full extent of the outbreak begins to be felt onboard. By the time the ship docks in Cozumel, 22 more passengers are quite ill, the ship's sickbay is overwhelmed and the captain calls out for help, unsure of what to do next.

Captain Olivia T (OT) Break's Message:

"The S.S. Mickey Morgue Cruise Ship, the gem of the Disney Cruise Line, has just docked in Cozumel as part of its 7-day Caribbean Cruise. Over 20 of our passengers are suffering stomach flu symptoms. Some have died. Your help is requested".

While the outbreak rages on board the Mickey Morgue, it is also beginning to spread amongst the residents of Foley, Alabama, first affecting the partygoers, who assume it was just Ty's 'famous' egg salad again, then their family and co-workers, and then the local elementary and high schools and a nursing home. When the latter groups become impacted a new call goes out to the CDC giving the students, if they have not already done so, reason to delve into the activities of the Phoid brothers.

This is where Outbreak! Cozumel begins for the Students. The CDC receives the captain's message, and this message is immediately passed on to the appropriate epidemiologists (the students) at the beginning of the "The Outbreak Begins!" class in the syllabus. This day is set as epidemic "Day 1" in the **Student Discussion Board** and **Summary of Each Day's Events** sections of this guide. After they read the captain's message, students should be given the instructions below, and then allowed the rest of the class time to get organized. The instructor should remain in the classroom to answer questions and to provide guidance.

Student Instructions:

As CDC agents, you must decide what to do about this disease outbreak. Throughout the rest of the semester, you will have time (half of the remaining class time) to do your work, report your findings to the rest of the class, etc. By the end of the semester, you must have controlled this outbreak. A description of your efforts to contain and control the outbreak will serve as your final paper in this class, and class tests will contain questions that require you to be conversant with not only your own work on the outbreak, but also that of your peers.

This virus will be an *emergent* strain of a known virus. That is, it will differ in at least one critical way from a "typical" virus of its type. The difference(s) could include, but will not necessarily be limited to, mode of transmission, symptoms, incubation time, etc.

This outbreak will be conducted in "semi-real" time. Specifically, every class day will represent a new "live" day in the outbreak. You may feel free to do whatever research, collaboration and communication you want to do during the "off" (non-class) days. In fact I strongly encourage you to do just that. However, your actions will only produce results on live days. So, if you ask

health care workers to initiate a particular course of action on an off day, they will begin to do so at the beginning (8:00 am, local epidemic time) of the next class day.

Unlike in the real world, you will *not* be able to count on the expertise of others. You are the only experts. For example, if you want patients to receive treatment, you must detail that treatment to the appropriate doctors and nurses. They will do nothing on their own. If you want to perform a particular laboratory test, you must provide a procedure, and convince me that you understand it. I will give you test results (in the correct time frame for the requested tests), but will not provide interpretations. You will need to figure out what the data mean. While cost is a factor (you may not buy your own Lear jet to get around), you do have the considerable resources of the CDC on which to draw. Most equipment, tests and travel are within your budget.

We will be using the Blackboard discussion board to keep track of all outbreak activities. All questions and planned actions must be posted to Blackboard or they will not happen. If your questions/actions are posted by 8:00 am the day before a class, I will post my replies before that class, and any requested actions will occur on that next "live" day. I encourage you all to subscribe to *all* message board threads so that you can benefit from, and not duplicate, the work of other classmates.

That's it for now. By the end of today's class, you must tell me what your intentions are. Feel free to ask questions. I will answer them all as I can. Remember that some answers may require some travel, and all will require specific details and procedures.

Good luck!

OUTBREAK CLASS MANAGEMENT

Time. Once the Outbreak starts, each class day counts as one day in epidemic time. In my class we meet twice a week and end up having about 18 epidemic days. I budget half of the remaining class time for work on the epidemic, and half for ongoing classwork in virology.

Communication. In my class all outbreak conversations and actions are logged and responded to using the Blackboard discussion board. I am sure that any other blog/chat system would work just fine. Any actions that the students want to take (travel, treatment, quarantine, lab tests, etc.) must be posted by 8:00 am the day *before* the next class, or they will not take effect until the class period after that. If a student action or question is not posted on Blackboard, then it does not happen at all. I try to respond to Blackboard posts at least once daily between the hours of 8:00 am and 4:00 pm. This structure serves two purposes. It allows students to keep track of their classmates' actions and questions, thus (theoretically) avoiding duplicating or even conflicting actions. It also keeps me from missing student actions and questions that can come fast and furious at times.

Emergent strain. In order to make the outbreak more challenging (and less Google-able), I make up an emergent strain of virus. This virus will generally share the basic characteristics of its parent strain: virion structure, genetic material and replication strategy, but will have at least one major difference. For example, a virus that is normally not fatal may become so, or the mode of transmission may differ (oral-fecal to airborne), or perhaps the incubation time will change significantly...or perhaps all three. In my class the changes are not so dramatic that current identification techniques (PCR, ELISA, etc.) will not

work, but if the focus of your course includes experimental design you could definitely set it up so that the experimental conditions would need to be altered to be successful.

Support from fictional characters involved in the outbreak. Unlike real life, students must assume that nobody that they deal with knows anything about dealing with an epidemic. Thus, common sense measures ranging from quarantining sick individuals to administering supportive fluids will simply not happen unless the class tells the right person to do it (and how). People will also not simply walk up to the class members to provide information...they must be asked specific questions to which they will respond as well as they are able (dead victims cannot answer questions, and little kids may not remember what they ate, for example). Most people will be as helpful as they can be, but some people may lie...When they do, I always make it possible to catch the person in the lie at some point.

Laboratory tests. In order to have lab work performed on a patient, food product, etc., students must provide a valid written procedure, and will, in turn, receive the data they would get from that procedure (blood cell counts, x-rays and MRI images, electron micrographs, pictures of gels, quantitative rtPCR data, sequence data, etc.). The data should also be given in real time, so if the test takes a week to perform, then the students should not get the data for seven full epidemic days.

Real Life Applications. It is important that students be regularly challenged with real life situations during this outbreak, or it will quickly lose its urgency, victims will become irrelevant, and solving the epidemic will take a back seat to their other academic responsibilities. Fortunately, students care *deeply* about saving virtual victims and "getting it right", so these desires can be capitalized upon when students seem to be losing interest. Techniques that I use to keep students engaged when they are getting lazy include:

- Quarantined individuals/their families become irate and demand that individuals be released, particularly if more than one week has passed.
- More patients begin to die if the class has not focused on treating the sick.
- Individuals escape, or run away, if quarantines are not sufficient, and new "mini" outbreaks occur in their home towns when they return. These new outbreaks follow the rules of the original one.

Other real life "twists" should be designed to help students understand that the way that epidemics are dealt with must be culturally sensitive. For example, a dead victim might come from a culture or religion with which your students have limited familiarity. Have the family contact the students, concerned that the body be handled appropriately until (and after) they arrive. The students must not only learn about the family's traditions, but also must figure out how to work with them within the constraints of an ongoing epidemic. Setting the epidemic in another country can also accomplish this goal.

Finally, some twists are provided by the world itself as the epidemic unwinds. I constantly scan the news for anything that happens in the region that might be important. When I first taught outbreak Cozumel!, hurricane Rima was bearing down on Cozumel. So, 12 Days into the outbreak, the captain realized if she stayed in port her ship could be lost, left Cozumel and headed to her home port of Mobile, Alabama. Once at sea, she sent the CDC a message, and the students had to decide what to do.

Student FAQs. Some student questions and actions can be anticipated and prepared for in advance, so you should definitely prepare the answers and results of the most likely of these up front, as the others

will take up plenty of your time as they arise. I have provided information for the most common student actions and questions in the Summary of Daily Events and Appendices. The rest will be up to you!

SUMMARY OF EACH DAY'S EVENTS

This section summarizes the spread of the epidemic in detail from Day -2 (the Phoid's party) through Day 1 (The Captain's Message) as this will be identical for all classes. The next few days will also be very likely to be similar for all classes. However, the progression of the epidemic after Day 1 will vary widely and will depend on the actions of the students themselves. If they fail to isolate sick individuals, for example, the norovirus should spread more widely. It is up to you to decide how widely, although it could even involve port cities on the Mickey Morgue's route. If the students do not adequately treat sick individuals, more should die. Because of the uncertainty of student actions, the daily summary becomes less specific as time passes, and you will need to make more and more decisions on the fly. Of course, that is why this activity is also so much fun.

Epidemic Day -2: Bly and Ely Phoid's Birthday Party

Seven individuals attended Bly and Ely's birthday party. They are listed below. Everyone except for Irene and Gene Clean ate oysters (those who ate oysters are indicated with an asterisk), and everyone (except for Ty Phoid) who ate the oysters also got sick. The 'epidemic day' of the onset of their illness is indicated parenthetically. Elen and Glen Fault are high school students, and when they return to school on Day 7 (still shedding virus), the Foley outbreak really gets going. The progression of the Foley Outbreak is summarized in **Appendix 3**.

- *Bly Phoid (-1)
- *Ely Phoid (-1)
- *Ty Phoid (asymptomatic carrier)
- *Walt Fault (1)
- *Elen Fault (-1)
- *Glen Fault (-1)
- *Amy Fault (1)
- Irene Clean
- Gene Clean

Day -1: Ty Phoid Strikes!

On Board the Mickey Morgue

Ty Phoid travels to Mobile, Alabama, boards the SS Mickey Morgue and immediately begins prepping that day's raw fish for the lunch buffet. He pulled an all-nighter just to get to work from the party, is running late, and only half-heartedly washes his hands before starting to prep the raw seafood bar, which contains oysters, mussels and shrimp with cocktail sauce. As previously mentioned, he is shedding norovirus and thoroughly contaminates the seafood bar. Every passenger who eats the raw seafood items gets sick within the next three days.

Foley, Alabama

Back in Foley, Bly and Ely's party guests begin to get sick with "stomach flu" (nausea, cramps, fever and vomiting). Bly Phoid, Ely Phoid, Glen and Elen Fault get sick on this day. The partygoers all assume that it is just Ty Phoid's egg salad (again), but for once it is not. Everyone in Foley recovers without incident, but they continue to shed virus that, left unchecked, will quickly spread to the town as indicated in

Appendix 4.

Day 0:

On Board the Mickey Morgue

The Mickey Morgue has spent the night at sea, and now docks at Progreso, where it takes on some fresh fruit, and the passengers disembark to enjoy the port. A few passengers have started to feel ill, and those stay in their state rooms, but only two contact the ship's sickbay, so the onset of the epidemic goes unnoticed. At the end of the day the ship heads towards Cozumel.

Day 1:

On Board the Mickey Morgue

The ship arrive in Cozumel, and the students receive the Captain's note and their instructions. Further queries on their part (they can talk to the Captain or to the ship's Chief Medical Officer, Dr. Neal Heal) will reveal that 29 total individuals on the ship are now sick and 3 have died. The 12 sickest victims are in the ship sickbay and the rest are in their rooms. All of the ship's crew will be as helpful as they can be, and will follow instructions given to them to the letter.

Foley, Alabama

The outbreak continues in Foley, but has not yet spread to anyone but the original party goers. Glen Fault stays home from high school and his sister Amy and his father Walt both get sick. Amy and Glen will not return to high school until Day 7, so in the unlikely event that your students have already identified Foley as the place in which the epidemic started *and* have isolated Amy and Glen, the rest of the Foley epidemic will not happen.

Likely student actions:

- **Travel to Cozumel:** They must travel via commercial airplane. Have them show you the flight(s) they intend to take, and verify that those flights currently have enough seats for the entire travel team. Take note of the arrival time. This will be important for the epidemic's progression.
- **Quarantine:** Students must tell you where and how the patients will be quarantined. The captain and medical personnel will follow orders to the letter, but will not think on their own in this regard, unless the quarantine requirements are not possible given the ship's structure. The ship's deck plan, including the location of the staterooms of sick individuals, (if the students ask) can be seen in **Appendix 2**. If quarantines are not imposed, feel free to spread the epidemic off of the ship. For example, you could have 2 passengers go back home per day until a quarantine is established, or you could have the virus spread on shore in Cozumel. This, of course, could start mini outbreaks in the other locations. You can decide whether or not the 'escaped' passengers are infected, and whether or not they spread the virus.
- **Treatment:** **Appendix 1** shows treatments that work for norovirus as of 2016. Remember that the health care workers will only administer treatments specifically ordered by your students. This is an unusually virulent strain of norovirus and will kill up to 25% of its victims (very young and very old are most susceptible) if supportive fluids are not administered to the seriously ill within the first 48 hours. The ship does not have the ability to treat more than about a dozen seriously ill patients with supportive fluids, and cannot help the critically ill patients at all. If the students want to hospitalize

patients, several hospitals and clinics are available, but the ship's captain (if asked) will recommend Cozumel Medical Center (<http://costamed.com.mx/welcome/our-facilities/cozumel-facility/>). If the outbreak spreads into the local population in Cozumel, most of the locals will go to Centro de Salud (the General Hospital).

- **Student Questions**

- **Questioning Sick Patients.** I generally require students to interview patients in person, after they arrive in Cozumel, as the ship's medical personnel are overwhelmed with caring for the patients and don't have time for extensive surveys. However, the doctors and nurses can answer some simple questions immediately regarding patient symptoms and when the patients first reported feeling ill. Once the students arrive in Cozumel, they will ask patients who are healthy enough to answer a wide variety of questions ranging from basic demographics to the food they have eaten recently, to recent travel and even sexual activity. **Appendix 3** contains an Excel spreadsheet with patient names, addresses, onset date of illness, other demographics, and the answers to all of the questions my students asked that year (yes or no indicates whether or not an individual ate a particular food product). The lunch buffet is the same every day, and patients who are not yet sick will continue to eat exactly the same foods every day. *The raw seafood in the lunch buffet is only contaminated on Day -1.* Sick individuals stop eating.
- **Questioning the Crew:** There are 150 Crew members. Students asked about whether or not any of the crew were sick, and in this case the answer was no.
- **Food Served on the Mickey Morgue.** **Appendix 4** contains a menu for the first four days of meals aboard the Micky Morgue. These foods are listed in order in the Excel spread sheet in **Appendix 3**. The questions that the students asked about the sources of all of the food and drink items onboard are also indicated, as well as the answers to those questions.
- **Spread:** In addition to any escapees' impacts, the epidemic is spreading in its own in Foley, Alabama, unless the students have done anything to prevent that (this is quite unlikely). The spread of this part of the epidemic is detailed in **Appendix 5**. At first, only a few individuals are affected. However, by day 14 it is running rampant in the local high school and elementary school, and you should provide the students with the following message: "The CDC has just been notified that an outbreak with symptoms similar to those on board the S.S. Mickey Morgue is occurring in Foley, Alabama. The local elementary and high schools and a nursing home are particularly hard hit, with well over 40 sick individuals documented at this time."

Day 2:

On Board the Mickey Morgue

The second day of the epidemic is a very important one, in terms of the spread of the virus on- and off-board. If individuals are quarantined (including currently asymptomatic carriers who will manifest on Day 3), then 15 new individuals (already infected) will show symptoms today, but there will be no new infections on board ship. Six more people will die if supportive fluids are not administered, but only 2 if they are.

To help students learn more about a religion or culture with which they have little experience and to foster a sense of time urgency with regard to response to the epidemic, have a family member from that unfamiliar culture/religion demand access to one of the dead bodies on Day 2 so that they can observe proper mourning, funeral and burial rites. The students must decide the best way to deal with that demand.

In Cozumel

If no quarantine has been ordered on board ship, several asymptomatic carriers of the norovirus will go back on shore today, and will infect at least one person (a shop owner, waiter, etc.). A few days later sick folks will start to accumulate in Cozumel.

Foley, Alabama

Nothing new happens in Foley. The Phoids and the Faults are all home sick. The Cleans are, well, clean.

Day 3 through the end of the outbreak.

On Board the Mickey Morgue

By day 3, the students have often controlled the spread of the virus on the ship, have administered the questionnaire to patients, and are starting to wrestle with the resulting data. Transmission at this point is entirely fecal/oral, and spread only occurs onboard if quarantines and instructions to passengers regarding good hygiene have not been implemented effectively. You should use your own judgement, but 5-6 cases per day is manageable, with crew members impacted in increasing numbers by day 7. You will probably not need to come up with additional patient names and demographics at that time, but be prepared to respond quickly if you do. The spread will eventually impact the ship's ability to function, and the captain will take matters into her own hands and steam home to Mobile once 15% of her crew is ill. No further deaths will occur if supportive fluids are provided each time a patient is admitted. Deaths will continue at a 25% rate (1-2 per day) if fluids are not administered.

Day 7:

On Board the Mickey Morgue

Any currently healthy individuals (the first wave of sick are starting to feel better at this time, too) who have not been allowed to leave the ship begin to complain and to contact lawyers. They can be controlled with explanations that include real data about the real virus, its incubation period and its spread, but nothing else. They can easily be kept on board as there is no way to get to shore.

Foley, Alabama

Amy and Glen Fault return to high school, and are still shedding virus. The Foley epidemic begins in earnest.

Day 12.

On Board the Mickey Morgue

Hurricane Rima appears and heads towards Cozumel. If the ship is still docked there, the captain will leave port and head back to Mobile, Alabama. She will wire the CDC once she is safely at sea.

Day 14-18.

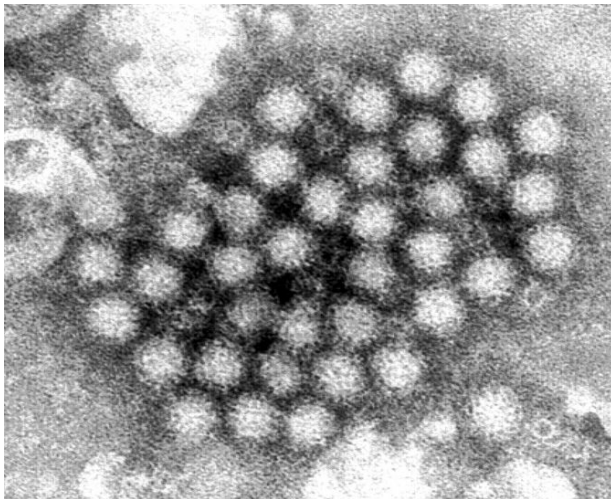
Foley, Alabama.

The students get notification of the Foley outbreak, "The CDC has just been notified that an outbreak with symptoms similar to those on board the S.S. Mickey Morgue is occurring in Foley, Alabama. The

local elementary and high schools and a nursing home are particularly hard hit, with well over 40 sick individuals documented at this time," and begin (if they have not already done so) to piece together the relationship between the Phoids and both epidemics. **Appendix 6** contains a log of student questions and activities during those last days, along with my answers.

APPENDIX 1: Characteristics of the Emergent Norovirus

This strain is highly infective via a fecal-oral route and has an incubation time of only 1-2 days. Symptoms last 2-7 days and victims can continue to shed virus for up to a month after symptoms have ceased. Fatality rates are 20% without supportive fluids and 10% with fluids. The very young and the very old are more susceptible to severe disease and death, with fatality rates as high as 50% if left untreated. In all other ways this virus is normal. Tests such as ELISAs (or other immune-based assays) will detect it, as will PCR-based assays. The transmission electron micrograph of the virus, if the students provide a valid procedure, is:



<http://www.public-domain-image.com/free-images/science/microscopy-images/norovirus-infection/transmission-electron-micrograph-revealed-some-of-the-ultrastructural-morphology-displayed-by-norovirus-virions>

Symptoms of the viral infection include nausea, vomiting, headaches, watery diarrhea, fever (as high as 103°F), and in critical cases severe dehydration and death.

Treatment for most individuals will involve drinking plenty of fluids such as () to keep hydrated until the illness resolves. People with severe nausea and vomiting will respond well to intravenous promethazine, prochlorperazine, or ondansetron to help stop the vomiting. Rectal suppositories of these drugs can also be administered and will be effective. Individuals who become severely dehydrated

will need to be hospitalized and given intravenous fluids with electrolytes. As individuals begin to recover, a bland diet (bread, plain rice and pasta, bananas, applesauce, clear fluids) should be encouraged.

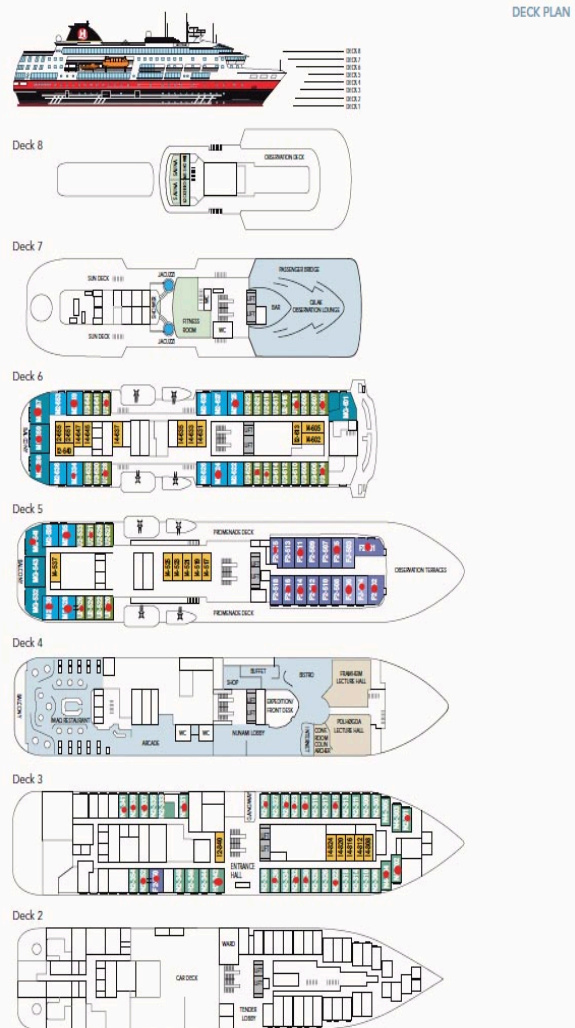
Returning to school or work: People can return to work in most settings three days after the last symptoms have ended. However, they can shed norovirus for up to two weeks in their feces and must follow strict hygiene with good hand washing.

APPENDIX 2: Floor Plan of the U.S.S. Mickey Morgue
 Red dots indicate the state rooms of infected individuals



MS Fram continues the heritage of the original Fram, using the most advanced technology making it extraordinarily suited for expedition voyages in polar regions. Fram means forward – raising expectations of the voyage at hand.

Ship yard:	Fincantieri, (I)	MG	Outside grand suite	Sitting area, TV, minibar, double bed, shower/wc. Some have private balcony. MG 601 with separate sleeping area.	Deck 5, 6
Year of construction:	2007	M	Outside suite	One room, sitting area, TV, minibar, double bed, shower/wc.	Deck 5, 6
Gross tonnage:	11 647	F	Outside superior cabin	Sitting area, TV, minibar, double bed, shower/wc.	Deck 3, 5
Passengers:	318	U	Outside cabin	One bed, one sofa bed, table, refrigerator, TV, shower/wc. (U 538*)	Deck 5, 6
Cabins:	127	N	Outside cabin	One bed, one sofa bed, table, refrigerator, TV, shower/wc. (N 352*)	Deck 3
Overall length:	114 m	FJ	Inside superior cabin	Sitting area, TV, minibar, double bed, shower/wc, limited or no view FJ 363 with twin bed	Deck 5
Beam:	20.2 m	I	Inside cabin	One bed, one sofa bed, refrigerator, TV, shower/wc.	Deck 3, 5, 6
Loadings:	1A/1B	H	Outside cabin	Cabin for disabled. One bed, one sofa bed, table, refrigerator, TV, shower/wc.	Deck 3
Service speed:	13 knots	*These cabins have upper and lower berths. Subject to change.			



APPENDIX 4. Information regarding food and drink on board the U.S.S. Mickey Morgue

Menu on Board the Mickey Morgue:

Each morning on ship has a cold buffet, and lunch is also a buffet. Breakfast choices consist of: cereal, eggs, smoked fish, cold cuts and cheeses, loaves of multi-grain bread and berry jams. You can also order eggs or pancakes off a menu. Lunch offers more cold fish, raw seafood, cold meats and excellent cheeses, not to mention caviar (yellow and red), a salad bar, several veggies, and a couple of hot dishes such as chicken with rice, duck breast or pasta. Desserts are ice cream, cakes and pies. The only free drinks are water, tea and coffee. Wine, beer and mixed drinks are available for cash. BYOB is allowed. There is no room service. There are also two cafes that sell tea, coffee, hot chocolate, cookies and cakes. Dinner is a sit-down, four-course affair. Here is the menu:

Day 1 of Cruise: Baby Arugula Salad (Tossed with sliced red onion, cherry tomatoes, mushrooms and a warm bacon dressing. Topped with smoked bacon and chopped egg); Dungeness Crab Cakes (Spiral shaved cucumber and sweet chili-mustard sauce); Broiled King Salmon (Troll-caught for sustainability in Alaskan waters, quick seared and broiled, served with your choice of lemon garlic herb splash or sesame-soy kalbi); and Fresh Strawberries with Raspberry Sorbet.

Day 2 of cruise: Julienne of Herring Salad (Thinly sliced herring served nicoise style on a bed of crisp lettuce with beets, potatoes, hard-boiled egg, and crisp onion rings. Topped with a light sour cream mustard dressing); Chilled Three Berry "Minestrone" (A bright blend of strawberries, blueberries and raspberries, topped with tangy lime sorbet); Brisked of Beef Hodge Podge (Slowly simmered beef in a deeply rich butter sauce with peak-flavor root vegetables. Served on a hodge podge of carrots, onion and potatoes); Caribbean Rum Cake.

Day 3 of cruise: Mixed gourmet greens (delicate yet flavorful lettuces sprinkled with a garden's bounty of fresh tomato, crisp cucumber, alfalfa sprouts, cured olives, red cabbage and crunchy croutons); Antilles Shrimp Cocktail (A ripe cantaloupe filled with bay shrimp and chunks of glistening fruits in a brandy cocktail sauce); chicken cordon blue (breaded chicken breast filled with herb-garlic boursin cheese and ham. Served with snow peas, carrots, pont neuf potatoes); flambe bananas foster.

Day 4 of cruise: Cantaloupe and Papaya cocktail in lime syrup; smoked trout mousse quenelle on pumpernickel toast and salad bouquet; pan-seared fillet of fresh Haddock with dill-beurre blanc; Trio of Tiramisu (espresso, lemon and Amaretto).

Additional Food-Related Student Questions and Answers

"From where has all of the food, drink, and water been acquired?" "Has any food or drink been replenished at previous ports and, if so, what and where?"

Most of the food was purchased from Aramark, and loaded in Mobile, as was the water. Fresh fruit was purchased in Progreso at the Progreso market.

"What is the ranking of cleanliness of the ship kitchens? When was the last inspection conducted?"

CDC Vessel Sanitation Program score was 95. The ship was inspected 48 hours before departure.

We would like to ask both the mayor of Progreso and the port authority of Progreso a few questions:

"Could we please have an inventory of the fruit that was loaded onto the SS Mickey Morgue?"

Cantaloupes and Papayas were loaded onto the SS Mickey Morgue, as were Tomatoes.

"Have any locals/"fruit loaders" been showing any signs of illness within the past week, including but not limited to flu-like symptoms?"

Not that we are aware of.

Questions for Aramark:

"Where do you get your fresh seafood (ie. fish, caviar, etc.) from? Please provide specific names of fisheries and locations."

*Sushi and most fresh fish is from Wild Ocean Seafoods, Honolulu, HI
Oysters are from the Southern Fish and Oyster Company, Mobile, AL
Smoked fish, caviar and herring are from Olma Wholesale Distributor*

"Where do you obtain your fresh strawberries? Please provide name and location of farms."

Strawberries are from Burris Farm Market, Loxley, AL

"What company provides the water served on board the ship?"

Water is from Aquafina

APPENDIX 6: Solving the Outbreak. Student actions and questions from Day 14-18 in Foley, Alabama

"The CDC has just been notified that an outbreak with symptoms similar to those on board the S.S. Mickey Morgue is occurring in Foley, Alabama. The local elementary and high schools and a nursing home are particularly hard hit, with well over 40 sick individuals documented at this time,"

When the students got this message, there was a flurry of activity. They called the hospital staff in Foley, Alabama, and asked the sick individuals the following questions. When they arrived in Foley, they asked all non-hospitalized individuals, checking with the school districts for the names and addresses of children who were absent. By this time, the students thought that the raw seafood in the lunch buffet on Day -1 was to blame (all early sick individuals had consumed it, and no healthy individuals did), but still suspected water and strawberries, which were also very popular.

- Did you consume any seafood in the past 2 weeks? If so, from where did you get it?

Many of the sick consumed seafood in the past 2 weeks, but not all. Those that did ate at Bly and Ely's Seafood Shack in Foley, Alabama. Most also went to the 40th Annual National Shrimp Festival Held at Gulf Shores Public Beaches. Many of the sick consumed bottled water: Aquafina, Evian, Poland Spring, Deer Park were the most common.

- Did you drink any bottled water in the past 2 weeks? If so, what brand or from where did you get it?

Many of the sick consumed bottled water: Aquafina, Evian, Poland Spring, Deer Park were the most common.

- Did you eat any strawberries in the past two weeks? If so, what brand or from where did you get them?

Yes. Several, but not all, did. They purchased their produce at the Uptown Foley Fall Market.

- Ask the owners of Bly and Ely's Seafood Shack where they obtain their seafood from.

It is all fresh seafood from the following providers:

Joe's Fishing Company (Fish)

Windy Shores Seafood Company (Clams)
Bly and Ely Phoid's Oyster Farm (Oysters)

- Ask organizers of the Uptown Foley Fall Market for a list of vendors, especially names of farmers selling strawberries.

Vendors for Uptown Foley Fall Market:

Smiling Cows Dairy (Raw milk cheese, Organic milk)
Vedner's Farms (Strawberries, other produce)
Westbay Farm (Strawberries, other produce)
The Bee's Knees Apiary (Honey)
Briarbrook Farm (Strawberries, other produce)
Hutchins Farm (Apples, Corn, Vegetables)
Kimbell Fruit Farm (Strawberries, other fruit)
Bellhaven Bakery (Baked Goods)
Nicene Family Farm (Vegetables)
Toppings! (Salsas, Sauces, Pesto)
Sunny Gardens Farm (Fresh Flowers, Herbs, Eggs)
MacArthur Farm (Fruit, Strawberries, Vegetables)
Silverbeard Farm (Vegetables)
Mack's Meats (Meats, Fresh Seafood)
Proven Poultry (Poultry)
Smilin' Bob's Subs (Hot and cold subs, fries, Sausage Sandwiches, Drinks)
Hearty Fare Hot Truck (Wraps, Salads, Drinks)
Doggone! (Hot dogs, sausage sandwiches, drinks, fries)
Slippin' and Slidin' (Raw oyster bar)

- Ask the victims where they are employed and where other members in their direct household are employed.

Victims in Foley:

**Sick folks designated with an asterisk. School children go to the public schools in Foley.*

**Mel Ancholy co-owns Smiling Cows Dairy*
Sally Ancholy co-owns Smiling Cows Dairy
Alissa Ancholy is a high school student
Areanna Ancholy is a high school student
**Abraham Ancholy is an elementary school student*

**Jane Calamity works in the Foley Nursing Home*
Horace Calamity is a high school teacher
**Jesse Calamity is a high school student*
**Jarrod Calamity is an elementary school student*
**Helen Calamity is two*

**Selena Complaina resident at Foley Nursing Home*

**Helena Complaina resident at Foley Nursing Home*
**Rowena Complaina resident at Foley Nursing Home*

**Bart Depart works at Walmart*
**Elena Depart works at Walmart*
**Susan Depart is a high school student*
**Sam Depart is a high school student*
**Jenny Depart is an elementary school student*

**Wade Fade works at Walmart*
**Jade Fade works at Toys 'R Us*

**Walt Fault works at Bly and Ely's Seafood Shack*
**Elen Fault works in the home*
**Glen Fault is a high school student*
**Amy Fault is a high school student*

**Bly Phoid co-owns Bly and Ely's Seafood Shack*
**Ely Phoid co-owns Bly and Ely's Seafood Shack*

**Carl Woe works at Monroe Auto Parts in Foley*
**Jane Woe works at Susan's Flowers in Foley*
**Joe Woe is a high school student*

- Where do the vendors get their seafood and strawberries from? (Those that do not grow them themselves)

They grow them and catch them themselves.

- We would like the procedure described and previously used successfully to test all of the fish and seafood at Bly and Ely's Seafood Shack.

In the back of the freezer, there is a bag of oysters labeled "For Party, September 8". It tests positive. No other seafood does. All other seafood is packaged and comes from Bly and Ely's normal suppliers. It is negative for norovirus.

- We would like the guest list for the Phoid birthday party.

It was a small party: Walt, Elen, Glen and Amy Fault were there as were Walt's bosses Bly and Ely Phoid, their brother Ty Phoid and Irene and Gene Clean.

- And when did sick individuals from Foley begin to show symptoms?
- We would like to have a list of the first ten children to show symptoms (become sick) and the particular symptoms shown in addition to the name of the school they attend and the district the school is located. In addition, we would also like to know where Glen and Amy Fault attend school and when both of them first showed signs (symptoms) of becoming sick in addition to the

particular symptoms shown. Finally, we would like to know if both of the Fault children are still attending school despite being sick.

See Appendix 5 for all of these answers, although I answered the question in text form, rather than the flowchart.

All of the elementary school children go to Foley Elementary

All of the high school children go to Foley High School

- The final day of the outbreak arrives, and the students prepare the following public service announcement to the residents of Foley

Dear Residents of Foley,

There has been a recent viral outbreak in our town and school system. The virus is transmitted orally from person to person. This mode of infection is elevated in our school children due to poor hygiene methods. In order to alleviate this risk please encourage your children to wash hands, before and after going to the bathroom as well as before and after eating for at least twenty-seconds. Also, use hand sanitizer ad libitum.

Schools will be closing for the next couple days because of this outbreak. If children show symptoms of watery diarrhea, vomiting, and fever, be sure to seek medical care. Offer your child electrolytes and small amounts of water frequently to prevent dehydration. Please do not worry about the outbreak as your children are safe. Rest assured that the intelligent members of the CDC response team are dissolving this problem from the source.

Sincerely,

The CDC