Question 1: Would you call this an epidemic? Would you call it an outbreak?

I would call this an outbreak.
When two or more people get the same illness from the same contaminated food or drink, the event is called a food borne outbreak (CDC, 2011).

Reference
Centers for disease control, 2011

Question 2: Review the steps of an outbreak investigation

The steps of an outbreak investigation are;

■ 1. Detecting a possible outbreak
This is done through Public Health surveillance.

■ 2. Defining and finding cases
This is done by investigating features of illness, pathogen or toxin if known, certain symptoms typical for that pathogen or toxin, time range for when illness occurred, geographic region etc.

■ 3. Generating hypotheses
Taking (educated guesses) about likely sources of infection. This is done by deciding likely mode(s) of transmission, pathogen causing illness, incubation period etc using a shot gun questionnaire.

■ 4. Testing the hypotheses
By using analytic studies and laboratory testing of samples.

■ 5. Finding the point of contamination and source of the food
This can be achieved by conducting an environmental assessment, interviewing people involved in the preparation of the food.

■ 6. Controlling an outbreak
By recalling products, removing sources of contamination and revising production process.

■ 7. Deciding an outbreak is over
This is done when the number of new illnesses reported drops back to the number normally reported.
Question 3: List the broad categories of diseases that must be considered in the differential diagnosis of an outbreak of gastrointestinal illness

The broad categories of diseases to consider in an outbreak of gastrointestinal illness are infections and intoxications.
Infections are as a result of the growth of a microorganism in the body. Gastrointestinal illness can result from
- Viruses, bacteria or parasites invading the intestinal mucosa and/or other tissues, multiplying and directly damaging surrounding tissues
- Bacteria and certain viruses invading and multiplying in the intestinal tract and then releasing toxins that damage surrounding tissues or interfere with normal organ or tissue function.

Intoxications are caused by ingestion of food already contaminated by toxins. Sources of toxins include certain bacteria, poisonous chemicals, vitamin toxicity, large amounts of food preservatives and natural toxins found in animals, plants, or fungi (Daniels A., Bergmire- Swear A., Schwab K., Hendricks K., Reddy S., Fankhauser R., 1998).

Reference
Case study on gastroenteritis at a University in Texas United States Centers for Disease Control and Prevention.

Question 4: In epidemiologic parlance, what is a vehicle? What is a vector? What are other modes of transmission?

A vehicle is any substance such as food or water that can serve as a mode of transmission for infectious agents (OMD, 2013).
A vector is any agent (person, animal, micro organism) that carries and transmits an infectious pathogen into another living organism. It transmits infections from one host to another (OMD, 2013).
Other modes of transmission include;
- Direct contact from skin to skin, mucosa to mucosa, skin to mucosa or mucosa to skin examples are sexual contact, faceo- oral contact.
- Air borne spread by droplet or dust.
- Indirect contact examples are formite contact, touching soil contamination or contaminated surfaces.

Reference
Centers for disease control, 2011
• Transplacental transmission (Saini K., 2012).

Reference

Online Medical dictionary (OMD), 2013

Saini K., 2012 What are the different modes of Disease Transmission?

Question 5: If you were to administer a questionnaire to the church supper participants, what information would you collect? Group the information into categories

The information I would collect in the event of a food outbreak are categorized into:

■ Identifying information
It tells the details of the case. This includes name, address, phone number, date of birth, contact information, contact information of the person or agency that reported the case.

■ Demographic information
This depends on the nature of the outbreak. It includes age, gender, race, occupation, place of occupation, travel history

■ Clinical information
The clinical symptom, date of symptom onset, laboratory findings, severity of illness.

■ Risk factor information
These are the factors that determine how and why people became ill. They are likely to predispose to the outbreak, suspected exposures, suspected modes of transmission, hints from who else did and did not become ill. It includes the type and quantity of food eaten, brand name of the processed food or beef eaten, time of eating and water drunk (Alexander L., Koshiol J., Mac Donald D., Mejia G., Mountcastle S., Nelson A., Rentz E., Rybka T., 2011).

References
Focus on field epidemiology North Carolina Center for Public Health Preparedness The North Carolina Institute of Public Health.

Question 6: What is a line listing? What is the value of a line listing?
A line listing is a working document produced by epidemiologists in outbreak investigations that makes it easier to regroup and count cases by their characteristics. It values are numerous;
- It enables the investigator to quickly summarize, visualize and analyze the key components of data.
- It is useful in assessing and characterizing the outbreak of interest
- It allows information about time, person and place to be organized and reviewed quickly (Frontaine R., Goodman R., 2002 pg 79).

References
Retrieved from http://www.state.in.us/isdh/17592.htm

Question 7: What is the value of an epidemic curve?

An epidemic curve is a graphical depiction of the number of cases of illness by the date of illness onset. It gives a simple visual display of the magnitude of outbreaks and its time trend (CDC, 2004).
Its values include;
- Showing the progression of an outbreak over time and helping to see that illnesses are declining.
- Investigators are able to tell where they are in the course of the epidemic and possibly project its future course.
- Investigators will be able to estimate a probable time period of exposure and they can develop a questionnaire focusing on that time period.
- They will also be able to draw inferences about the epidemic curve (CDC, 2009).

References
Centers for disease control and prevention (CDC), 2004 How to investigate an outbreak
Retrieved from http://www.cdc.gov/excite/classroom/outbreak/steps.htm

Centers for disease control and prevention (CDC), 2009 Epidemic Curves
Retrieved from www.cdc.gov/salmonella/typhimurium/epi_curve.html

Question 8: Using the graph paper provided, graph the cases by time of onset of illness (include appropriate labels and title). What does this graph tell you?

Graph of Outbreak associated cases of gastroenteritis following a church supper by hour of onset of illness, Oswego, New York, 1940.
Y axis – number of cases
X axis - date and hour of onset of illness
This graph can be traced as an epidemic curve showing the progression of an outbreak of a gastrointestinal illness following a church supper over time. The horizontal axis represents the date when a person became ill (date and hour of onset of illness). The vertical axis is the number of persons who became ill on each date. The slope of this epidemic curve is a plateau, it indicates an common source outbreak with intermittent exposure, people are exposed to a single source of pathogen at several points in time (UNC, 2002). Onset is abrupt but cases spread over a period of hours than an incubation period. This gastrointestinal illness has a very short incubation period. Susceptible persons are exposed over a period of three to seven hours.

A few cases seem not to be related to the outbreak because of their distances in the epidemic curve. The first and last points seem not to be consistent with other cases. These two cases seem not to be related to the outbreak because of their distances in the epidemic curve. The first point indicates that on the 18th of April, 1940 at 3pm a case of gastrointestinal illness with ID # 52 was reported meanwhile, the church supper began at 6pm so it does not seem to be related to the time of the church supper because the time of meal of case ID # 52 was 11.00am on the 18th of April 1940.

The time of meal and the time of onset of illness of case ID # 52 are inconsistent with the general experience but then, the line listing from investigation of the outbreak shows that the person represented by case ID # 52 had vanilla ice cream and chocolate ice cream from the same source. The conclusion also tells us that this person had these same meals from this source but before the church supper.

The time of onset of illness of case ID # 16 is not consistent with the general experience. The last point indicates that on the 19th of April 1940, at 10.30am a case of gastrointestinal illness case ID # 16 was reported. The incubation period was not ascertained because the time of the meal was not available to indicate if the meal was from the church supper or to ascertain its incubation period; but then, the line listing shows that the person representing case ID # 16 had food from the church supper (baked ham, spinach, rolls, coffee, cakes, vanilla and chocolate ice cream).
Question 9: Are there any cases for which the times of onset are inconsistent with the general experience? How might they be explained?

The times of onset of two cases are inconsistent with the general experience. The time of onset of illness of the first and the last points seem not to be related to the outbreak because of their distances in the epidemic curve. The first point indicates that on the 18th of April, 1940 at 3pm a case of gastrointestinal illness with ID # 52 was reported meanwhile, the church supper began at 6pm so it does not seem to be related to the time of the church supper because the time of meal of case ID # 52 was 11.00am on the 18th of April 1940.

The time of meal and the time of onset of illness of case ID # 52 are inconsistent with the general experience but then, the line listing from investigation of the outbreak shows that the person represented by case ID # 52 had vanilla ice cream and chocolate ice cream from the same source. The conclusion also tells us that this person had these same meals from this source but before the church supper.

The time of onset of illness of case ID # 16 is not consistent with the general experience. The last point indicates that on the 19th of April 1940, at 10.30am a case of gastrointestinal illness case ID # 16 was reported. The incubation period was not ascertained because the time of the meal was not available to indicate the time the meal was taken from the church supper or to ascertain its incubation period; but then, the line listing shows that the person representing case ID # 16 had food from the church supper (baked ham, spinach, rolls, coffee, cakes, vanilla and chocolate ice cream).

Question 10: How could the data in the line listing be better presented?

The data in the line listing can be better presented by including Clinical information: this includes symptoms (number of episodes of diarrhea, nausea, vomiting, abdominal pain), physician’s diagnosis, was the patient hospitalized, what was the outcome? (Boston University School of Public Health, 2013).

References

Boston University School of Public Health, 2013 Collecting and Recording Data: The Line Listing What Information Should Be Collected?
Question 11: Where possible, using the new line listing, calculate incubation periods and illustrate their distribution with an appropriate graph.

Below is a graph showing the incubation periods of outbreak associated cases of gastroenteritis following a church supper, Oswego, New York, 1940.

Y axis – number of cases
X axis – incubation period of illness

Question 12: Determine the range and median of the incubation period

Range of the incubation period = 7 hours – 3 hours = 4 hours
Median of the incubation period = 4 hours

Question 13: How does the information on incubation period, combined with the data on clinical symptoms, help in the differential diagnosis of the illness? (If necessary, refer to attached Compendium of Acute Food borne Gastrointestinal Disease

Important clues to determining the etiology of a food borne illness are the incubation period and the clinical symptoms. Different causes of food borne illnesses have different etiologies and different incubation periods. The incubation period of this food borne illness is 4 to 7 hours its peak is 3 hours. Its clinical symptoms are nausea, vomiting, abdominal pain and diarrhea. The attached compendium of acute food borne gastrointestinal disease’s first three classification are
classified according to duration of incubation period and the clinical symptoms of the gastrointestinal disease.

Question 14: Using the data in the attached line listing, complete the table below. Which food is the most likely vehicle of infection?

<table>
<thead>
<tr>
<th>Food Items Served</th>
<th>Number of persons who ATE specified food</th>
<th>Number of persons did NOT eat specified food</th>
<th>Attack Rate Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ill</td>
<td>NOT Ill</td>
<td>Total</td>
</tr>
<tr>
<td>Baked ham</td>
<td>29</td>
<td>17</td>
<td>46</td>
</tr>
<tr>
<td>Spinach</td>
<td>26</td>
<td>17</td>
<td>43</td>
</tr>
<tr>
<td>Mashed Potato</td>
<td>23</td>
<td>14</td>
<td>37</td>
</tr>
<tr>
<td>Cabbage Salad</td>
<td>18</td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>Jello</td>
<td>16</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Rolls</td>
<td>20</td>
<td>16</td>
<td>36</td>
</tr>
<tr>
<td>Brown bread</td>
<td>18</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>Milk</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Coffee</td>
<td>20</td>
<td>12</td>
<td>32</td>
</tr>
<tr>
<td>Water</td>
<td>13</td>
<td>11</td>
<td>24</td>
</tr>
<tr>
<td>Cakes</td>
<td>27</td>
<td>13</td>
<td>40</td>
</tr>
<tr>
<td>Ice cream, vanilla</td>
<td>42</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>Ice cream, chocolate</td>
<td>25</td>
<td>22</td>
<td>47</td>
</tr>
<tr>
<td>Fruit salad</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Question 15: Outline further investigations that should be pursued.

Further investigations to be pursued are:
A review of all foods (the ingredients, how they were prepared, how they were stored, how they were served, possible ways foods can cause poisoning).
Inquiries should be made about:
- The origins of food
- How the food was prepared
- The time taken to prepare the food
- Where the food was prepared
- Factors that can pose threat of contamination to foods during preparation (example, cutting boards, knives, pots, spoons, ) and cooked foods.
- How food was stored and at what temperatures.
- The food handlers
- How the food was handled and served
- Bacteriological examinations of food items suspected to be sources of contact and parts of the body of food handlers that are likely to harbor organisms isolated.
- Laboratory investigations (phage typing, identification of staphylococcal enterotoxin in food by immunodiffusion or by enzyme linked immunosorbent assay (ELISA)).

Question 16: What control measures would you suggest?

I would suggest the following control measures.

- Prevent additional consumption of foods related to the onset of illness.
- Implement programs that will educate public health officials and the public about ways to prepare, handle and store these foods; the relationship of temperature to storing and preparing foods; requirements for the proper equipment for cooking, cooling, storing and serving foods.
- Dispose contaminated food products. If you do not know it is contaminated, check required temperature, color, and smell.

Question 17: Why was it important to work up this outbreak?

Working up this outbreak is important. It helps to provide organized evidence to suspected cases of illnesses that are detrimental to health of the community. It enables public health professionals to do their best at attacking the problem and implementing epidemiological approaches that will be effective in identifying the etiology of the food borne illness and eliminating the problem. This will assure the public to remain calm (they will be assured there is terrorist attack) and keep up with information provided by the Center for Disease Control and prevention. The outbreak will also identify factors that may have had an association and sources of infections so that further cases will be prevented. Investigating this outbreak will help to understand, control and prevent the spread of diseases; facilitate the development of new vaccines and drugs and legislation for the improvement of public health (Koo I., 2009).

Koo I., 2009 Outbreak Investigation Steps in Investigating an Outbreak
Retrieved from http://infectiousdiseases.about.com/od/basics/a/outbreaks.htm

Question 18: Refer to the steps of an outbreak investigation you listed in Question 2. How does this investigation fit that outline?

This investigation fits into the steps of an outbreak investigation I listed in question 2. This outbreak was detected through Public Health surveillance. The cases were found and defined by investigating the clinical symptoms, source of exposure, time of eating and time of onset of this illness. Hypothesis was generated about likely sources of this illness and it was tested. The point of contamination and food source was found. The outbreak was controlled by condemning the remaining outbreak and then, the outbreak became over.