Case-Control Study of a Cryptosporidiosis Outbreak Associated with a Petting Zoo: Empowering Communities using Secure and Confidential Direct Web Entry in a NEDSS

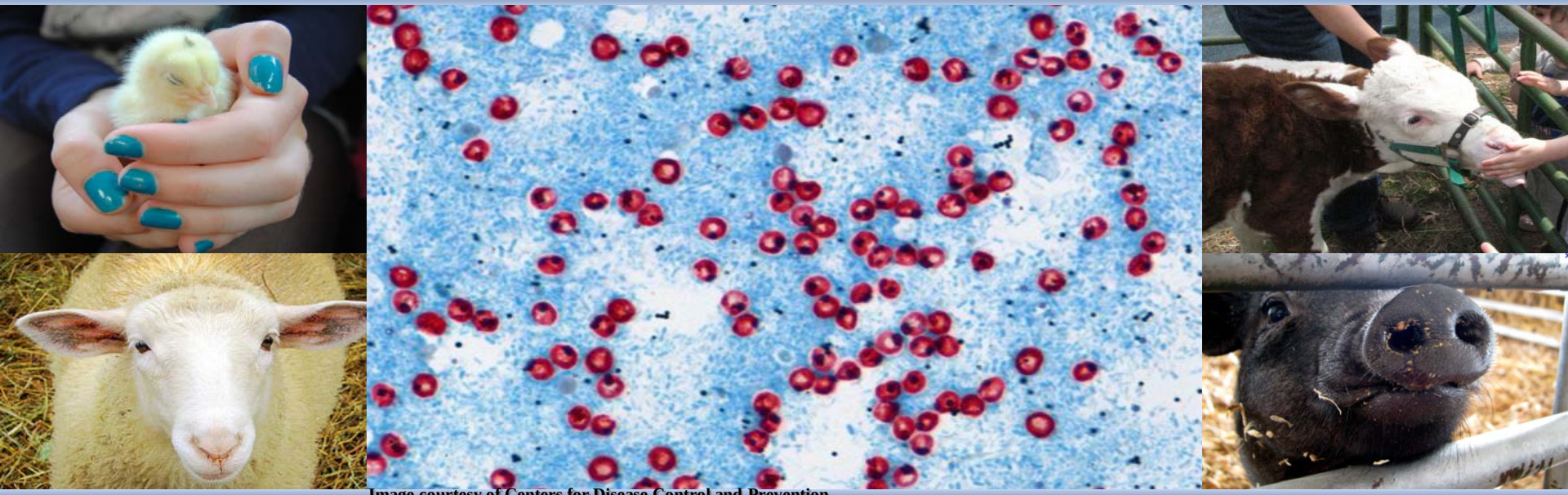

Image courtesy of Centers for Disease Control and Prevention

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SOUTH DAKOTA DEPARTMENT OF HEALTH

SDEDSS Access Portal

- Allows case/patient/control to enter additional information that are outside of scope of the traditional reach of Public Health
- Smart phone, tablet enabled
- Web-link can be sent to their preferred email address or text message for investigation

- Information received directly into SDEDSS and immediately viewable/exportable/analyzable

SDEDSS Vision

CLINICIAN REPORT

SDEDSS

ELR-EMR EXCHANGE

Local, State, Federal, International Exchange Partners

PATIENT DRIVEN DATA FLOW

PARTNER DRIVEN DATA FLOW

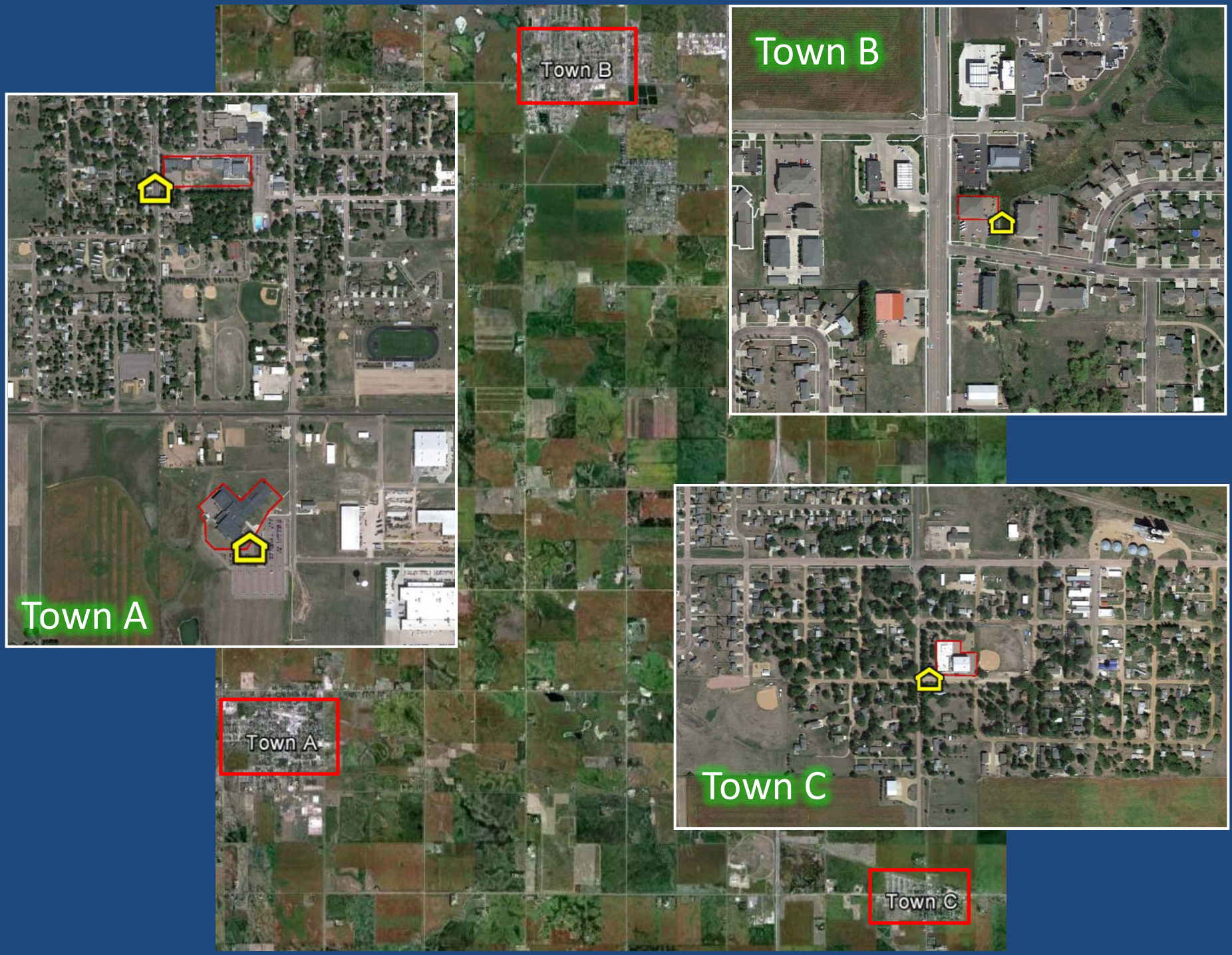
Empowering Communities

- Equip them and give them their advocacy role
- Public health can “see” the patients more quickly
- Investigations more effective while patient still infectious
- Intervention efforts are closer to the fire
- Tracking population trends and statistics
- Clearly identify problems and gaps in need
- Evaluate and increase effectiveness of population-based prevention & control
- Prompt and quality feedback to clinical medicine
- Enhancing diagnostic acuity for clinical engagement

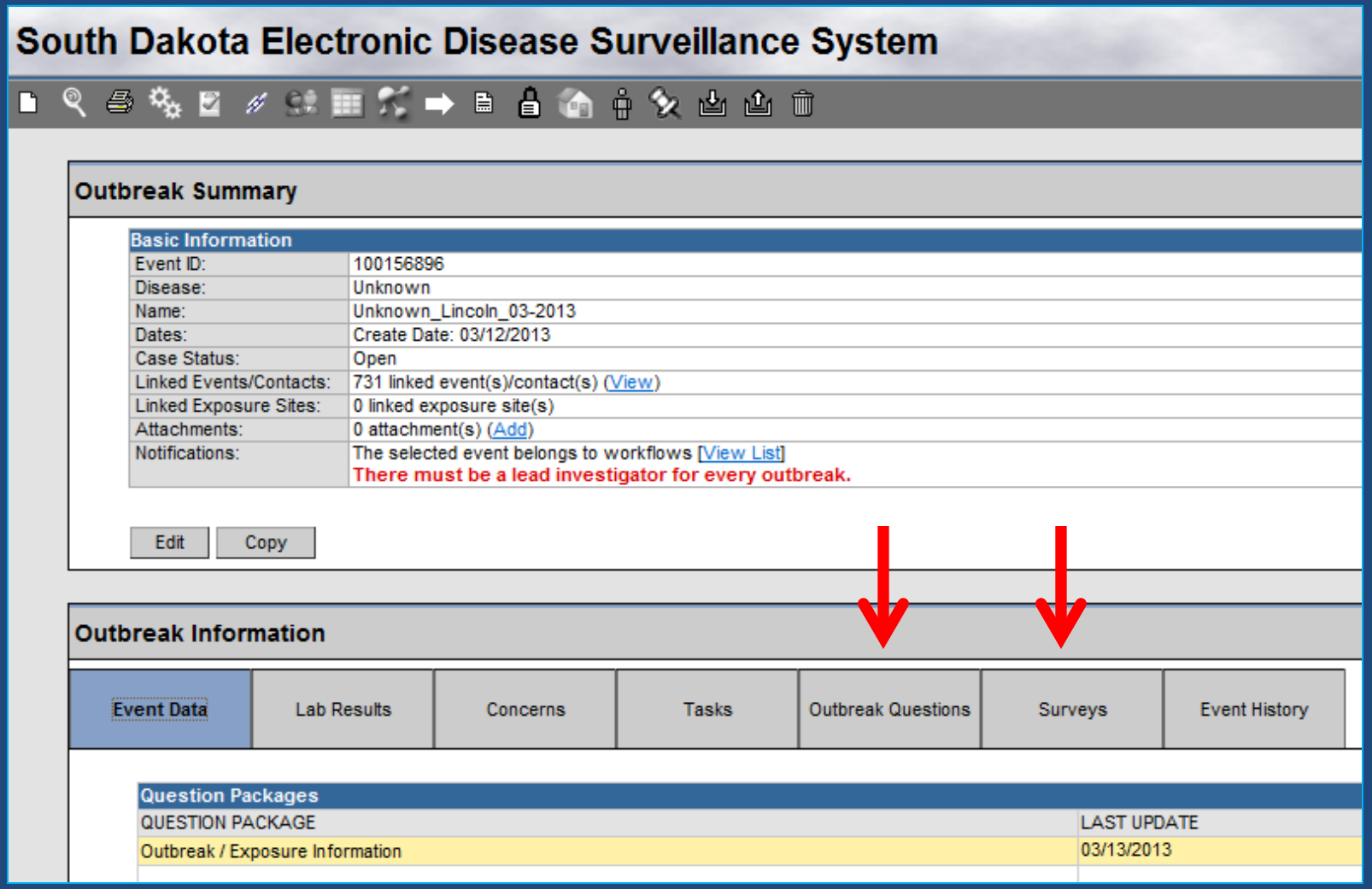
Outbreak Detection

Tuesday, March 12

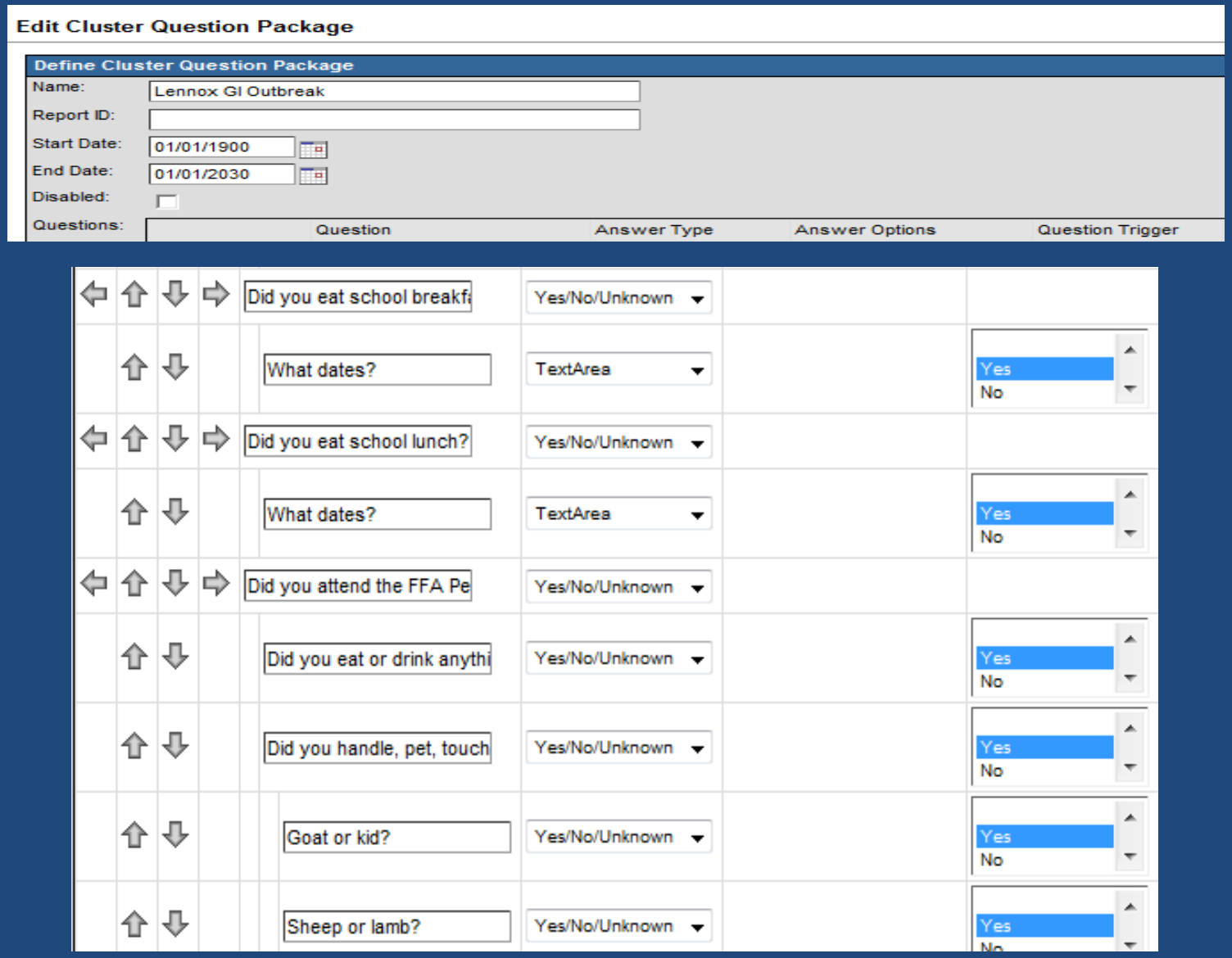
- School RN contacted SD-DOH about an increase in student absence due to a diarrheal illness
- Some students reportedly ill for more than 4 days
- It was mentioned a petting zoo event was recently held on Feb. 28 and could that have been the likely cause?
- SD-DOH initiates outbreak investigation


Town B
Town B
Town A
Town A
Town C
Town C

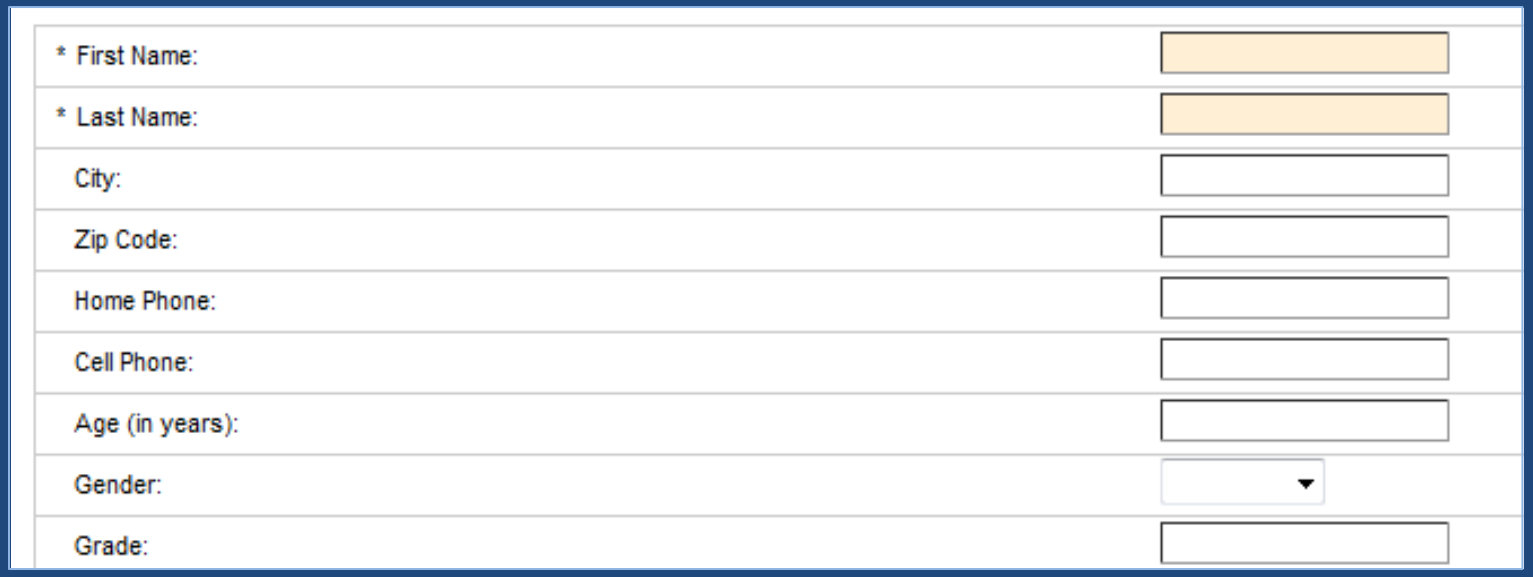
SDEDSS Dynamic Outbreak and Survey Builder



SDEDSS Dynamic Questionnaire Builder



SDEDSS Dynamic Questionnaire



SDEDSS Dynamic Questionnaire

Were you ill any time between Wednesday, March 6, and today?	
Did you eat school breakfast?	
Did you eat school lunch?	
Did you attend the FFA Petting Zoo at Lennox High School on Thursday, Feb. 28?	Yes
Did you eat or drink anything while at the Petting Zoo (including chewing gum or candy)?	
Did you handle, pet, touch, or feed any animals at the Petting Zoo?	Yes
Goat or kid?	
Sheep or lamb?	
Cow or calf?	
Pig or piglet?	
Chicken or chick?	
Rabbit or bunny?	
Horse?	
Donkey?	
Llama?	
Did you enter the pen of any animal(s) at the Petting Zoo?	
Did you touch the fence or pen enclosing the animal(s)?	
Did you use hand sanitizer after any contact with the animal(s) or pen?	
Did you wash your hands with soap and water after any contact with the animal(s) or pen?	
Is there anything else you would like to add or you believe contributed to your illness?	

SDEDSS Email Invitation

Wednesday, March 13

- DOH obtained a roster list of 732 individual email addresses, including students and faculty
- Roster list imported into SDEDSS
- Email requests were sent with unique URLs containing encryption keys for access to the SDEDSS questionnaire

SDEDSS Email Invitation

Subject:

South Dakota Department of Health Voluntary Survey

Body:

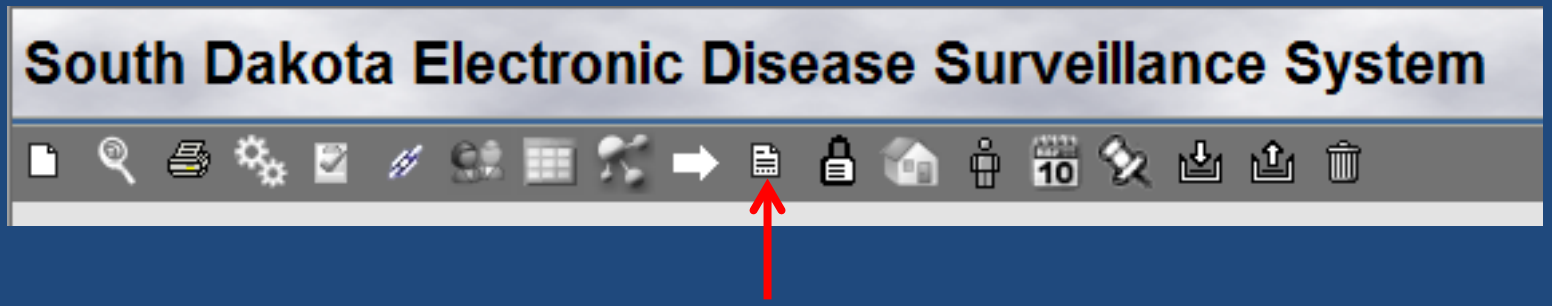
The South Dakota Department of Health is investigating an outbreak of gastrointestinal illness related to the Lennox High School and Worthing Elementary school systems. We are asking your help to determine the source of the outbreak by completing a questionnaire about you/your child's activities at the schools. We are requesting your participation whether or not you/your child became ill. Your participation is voluntary and your information will be held confidential. Thank you for your time.

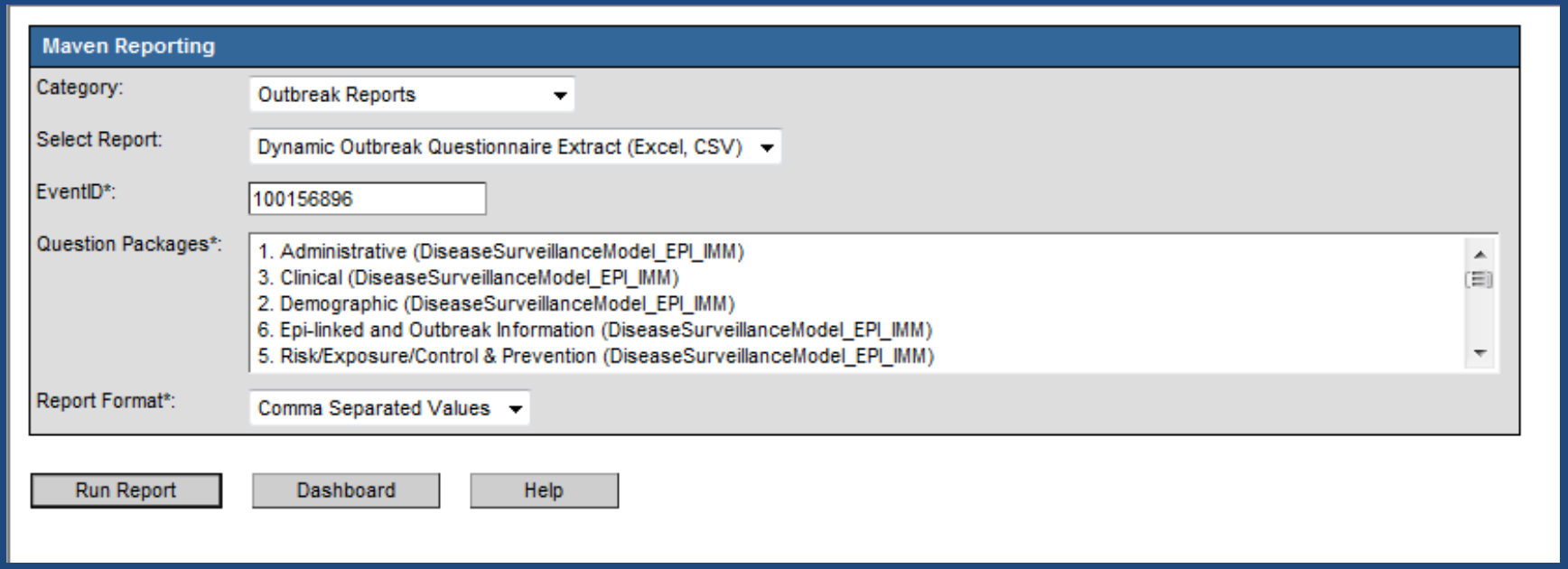
To begin, follow this link: https://edsstest.sd.gov/maven/PLACEHOLDER

This link will expire at the end of 03/14/2013.

Sincerely,
South Dakota Department of Health

SDEDSS Analysis





Results

732 people received email invitation to SDEDSS questionnaire

319 (44%) people accessed their questionnaire

211 (29%) people completed questionnaire

Cases, N=47	Controls, N=151
Self-reported diarrhea and/or vomiting	No illness reported

Excluded from analysis: 13 people reporting an illness with no diarrhea and no vomiting

Results

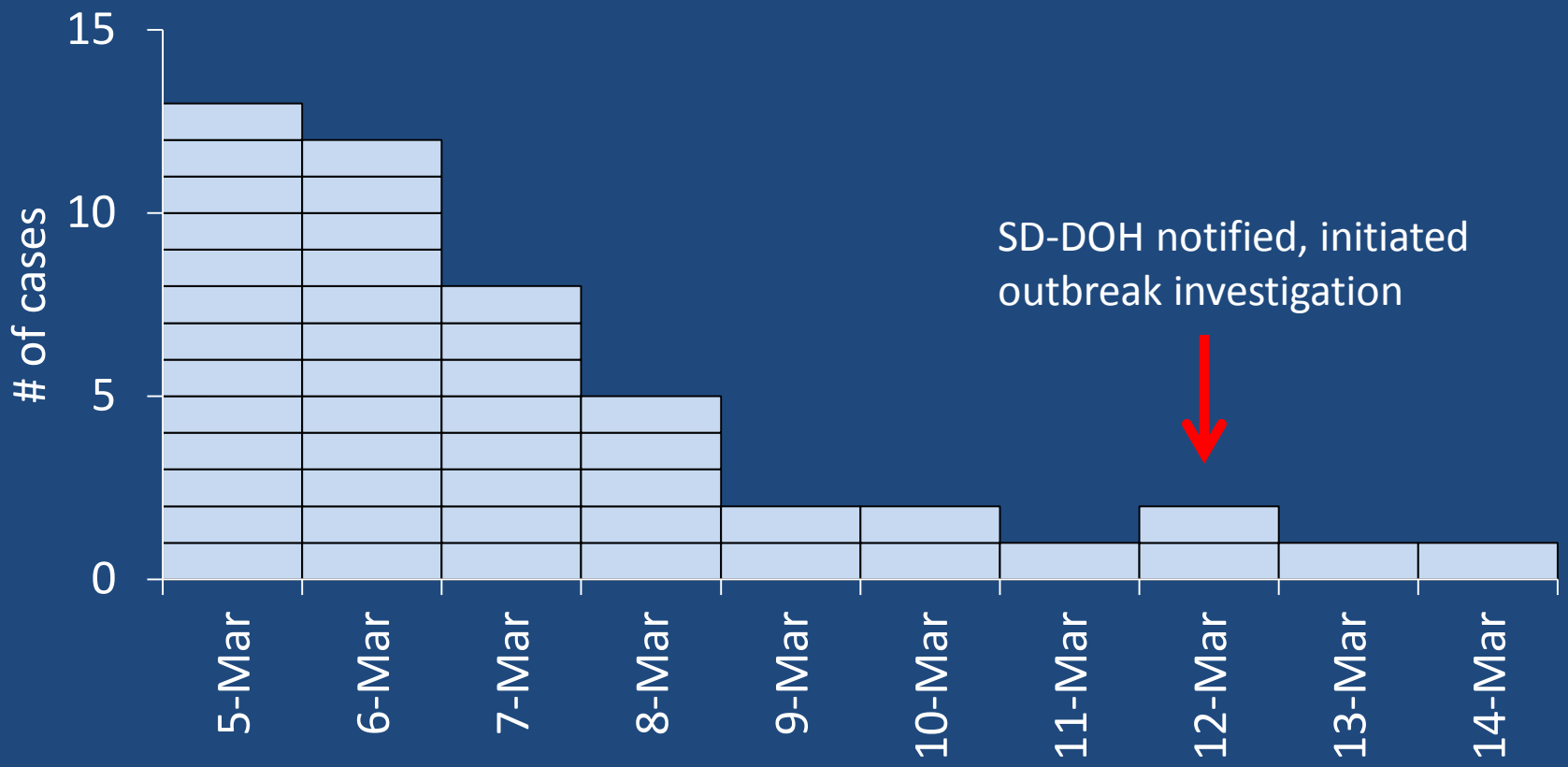
Symptoms of cases (N=47)

Symptom	Responses	Number with Symptom	%
Abdominal Cramps	47	43	91%
Nausea	46	41	89%
Diarrhea	46	40	87%
Watery Diarrhea	46	37	80%
Weakness	47	36	77%
Vomiting	46	35	76%
Headache	47	27	57%
Chills	46	20	43%
Fever	46	17	37%
Bloody Stool	46	0	0%

- Median duration of symptoms: 96 hours (range 10-240)
- Number visited a health care provider: 15 (32%)
- Number hospitalized: 2 (4 %)
- 4 cases tested positive for *Cryptosporidium spp.* by EIA

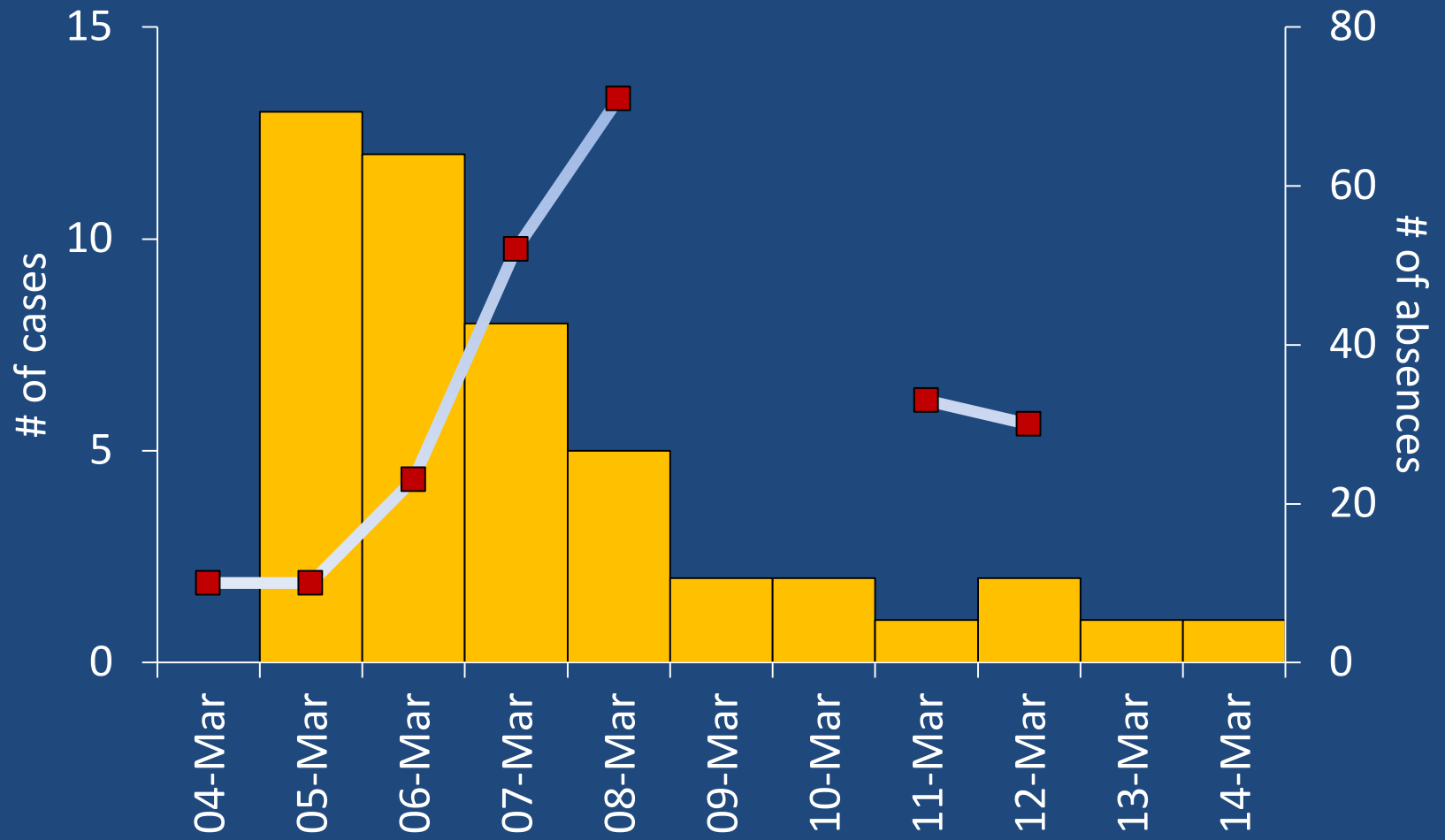
Results

Cases by date of onset (N=47)



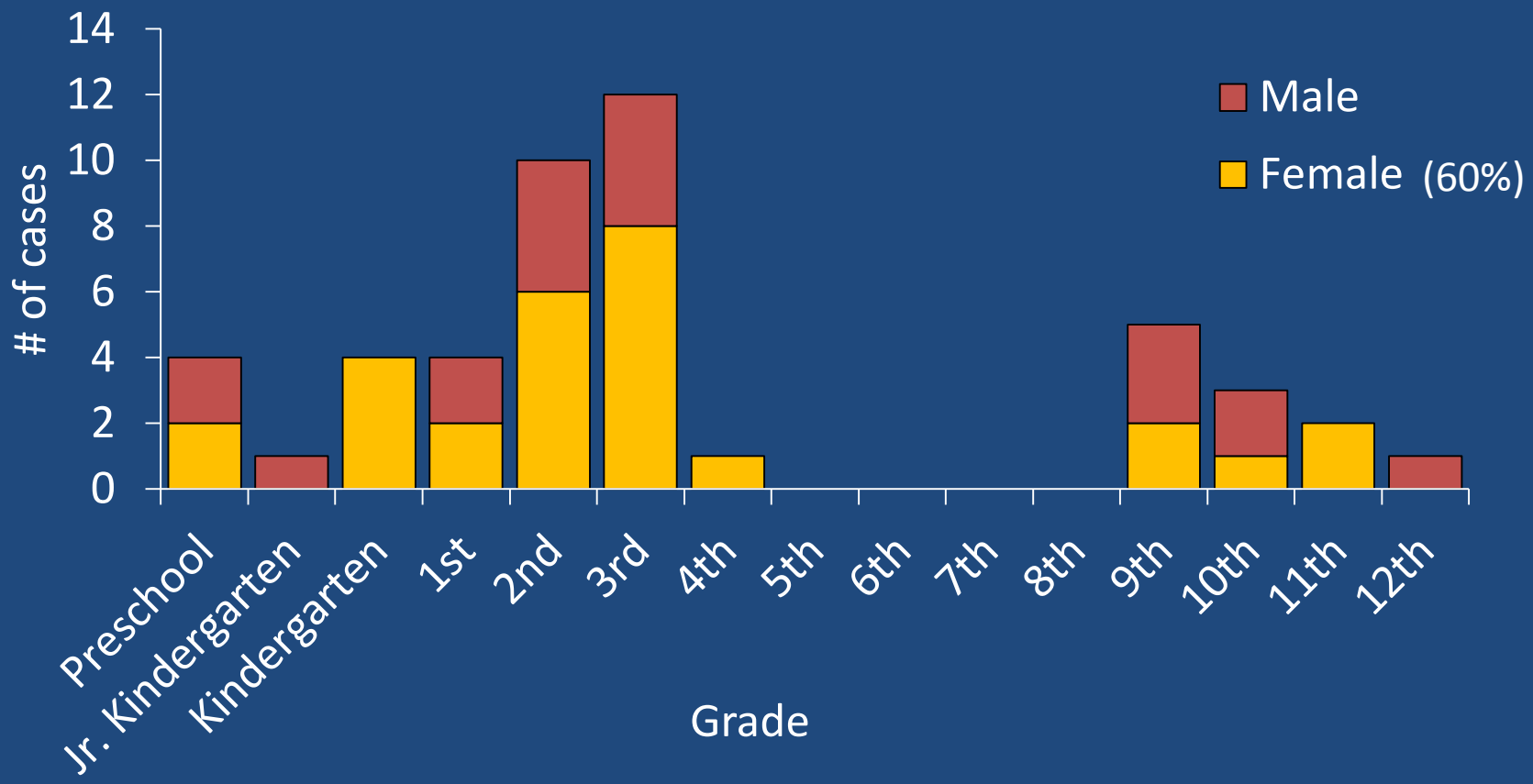
Results

Cases by date of onset and School Absenteeism



Results

Cases by gender and grade (N=47)



Did you have headache?	No
Did you have constipation?	Unknown
Please describe any other symptoms:	History of gluten intolerance and chronic constipation which altered clinical presentation. Started with Nausea and vomiting on Thursday. Sent home from school by school nurse. Progressed to fever of 100.2 to 101.8 with malaise on Friday, Saturday, and Sunday.... still severe vomiting intermittently. Pallor with a slight blue tinge to lips. Became dehydrated with urinary frequency and incontinent of urine x 1. Blue tinge, urinary frequency, and incontinence resolved when we were able to keep her from vo...
Did you miss any school?	Yes
How many days?	4
Did any family members become ill with diarrhea or vomiting?	Yes
Did you eat school breakfast?	No
Did you eat school lunch?	Yes
What dates?	Every school day she eats school lunch but SHE EATS A SPECIAL GLUTEN FREE LUNCH PROVIDED BY THE SCHOOL.
Did you attend the FFA Petting Zoo at Lennox High School on Thursday, Feb. 28?	Yes
Did you eat or drink anything while at the Petting Zoo (including chewing gum or candy)?	No
Did you handle, pet, touch, or feed any animals at the Petting Zoo?	Yes
Goat or kid?	Yes
Sheep or lamb?	Yes
Cow or calf?	Yes
Pig or piglet?	Yes
Chicken or chick?	Yes
Rabbit or bunny?	Yes
Horse?	Yes
Donkey?	Yes

Case/Control Results

Case/Control Study

- Attended petting zoo (p<.0001)
- Animal contact (p=.02)

Statistical breakdown of animal contact

	Did you handle, touch, pet or feed animal?						
	Ill Persons		Well Persons				
Animal	Yes	No	Yes	No	OR	95% CI	P-value
Rabbit/bunny	32	1	43	9	6.70	0.81 - 55.58	0.0478
Chicken/chick	23	10	10	27	2.39	0.95 - 5.97	0.0616
Sheep/lamb	24	6	36	19	2.11	0.74 - 6.05	0.1621
Llama	22	9	33	19	1.41	0.54 - 3.67	0.4868
Pig/piglet	24	9	35	18	1.37	0.53 - 3.56	0.5181
Cow/calf	24	8	43	11	0.77	0.27 - 2.17	0.6190
Horse	26	6	45	8	0.77	0.24 - 2.47	0.6616
Donkey	21	10	33	17	1.08	0.41 - 2.81	0.8724
Goat/kid	22	11	36	19	1.06	0.42 - 2.63	0.9081

Case/Control Results

Hygiene

	OR	P-value
Hand washing with soap and water	0.70	0.44
Hand sanitizer	1.56	0.36

"…she used the hand sanitizer twice (once during the petting zoo session and once just before leaving)…they returned to school. They went to the classroom and read. Then the had recess, then lined up for lunch where she used the hand sanitizer just before eating, but did not use soap and water."

Summary

- This outbreak of acute gastroenteritis was caused by *Cryptosporidium* spp.
- A petting zoo event held at a local high school was strongly implicated as the source

Interventions:

- Environmental disinfection of the school
- Education provided to students, teachers and parents on *Cryptosporidium* illness and prevention
- State officials met with school administrators and youth organizations to discuss minimizing risks associated with animals in future public settings

Conclusions

- Public Health may empower communities through web-enabled technology as a highly effective, timely and inexpensive means for conducting outbreak investigations
- SD-DOH has successfully implemented the Access Portal technology in SDEDSS
- We have expanded its use for routine investigations to assist outbreak detection, investigation and response efforts

Acknowledgements

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