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A Survey of County Health Departments of Kansas Regarding COVID-19

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ABSTRACT

Introduction. SARS-CoV-2 virus (severe acute respiratory syndrome coronavirus 2) causing COVID-19 (Coronavirus Disease 2019) initially was identified in China in December 2019. It has resulted in a pandemic with increasing spread of the virus in the U.S. The county health departments around U.S. are spearheading the response to contain the spread of this virus.

Methods. This project was a survey of county health departments in the state of Kansas with data collection period from April 15 to April 24, 2020. This study evaluated the staffing, resources, and funding of these health departments and how it was affecting the efforts to contain COVID-19. Descriptive statistics were used to summarize the responses.

Results. A total of 75% of the county health departments in Kansas responded to the survey. In 89% of locations, the staffing had not increased. Most health departments had an average of five people and the four largest ones had 30 to 98 staff working on COVID-19. Most locations used the Kansas Department of Health and Environment criteria for testing and used a combination of state or private laboratories. The results of the tests were available three days or longer in 62% and after five days in 14% of sites. All locations were active in contact tracing, but most had one to three people for this purpose and in 90% the contact tracing interview was via phone calls. There was no change in funding in 21% and decreased funding in 8.5% of health departments. Most locations had an average of five nasopharyngeal swabs on the day of the survey. The most common needs expressed were help to increase testing capability, more public education, more personal protective equipment, increased personnel, and assistance with contract tracing.

Conclusion. There is an urgent need in Kansas to increase support to county health departments for testing capability, personal protective equipment, increased number of staff, increased help with contract tracing, and especially increase support for public education.

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INTRODUCTION

In December 2019, infection with a novel beta-coronavirus was reported in people in Wuhan, China. Subsequently, this virus caused infections worldwide. The World Health Organization identified the infection as Coronavirus Disease 2019 (COVID-19) and the virus was named SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2).[1] The SARS-CoV-2 virus infects the cells in the lower airways, entering these cells through the angiotensin-converting-enzyme-2 (ACE2) receptor and replicates in these cells. Transmission of the virus occurs primarily from person to person via respiratory droplets released when an infected persons coughs or sneezes. As droplets fall away from the infected person; risk of transmission is decreased if people maintain a distance of at least six feet.[2] The virus may persist on surfaces (cardboard, plastic and stainless steel) for days[3] and contamination of surfaces may play a role in transmission.[4]

Clinical infection from the virus can lead to a spectrum of respiratory illness that can range from subclinical (asymptomatic/mild) to very severe cardio-respiratory illness that can result in death.[5] In China, the daily case rate of COVID-19, per million people, increased from 2.0 before January 10, 2020 to 162.9 between January 23 and February 1, 2020, then declined to 17.2 after February 16, 2020.[6] In the U.S., the number of COVID-19 positive patients is in excess of 1 million and the number of deaths from COVID-19 is in excess of 70,000 as of May 6, 2020.

Antiviral treatments are under investigation for efficacy and safety, and currently there is no vaccine to prevent COVID-19. The main intervention is via "non-pharmaceutical interventions" (NPI).[7] Among the NPI measures employed are bans on public gatherings, compulsory stay at home (shelter at home) orders, mandated closure of schools, closure of non-essential businesses (all part of "social distancing"), face mask ordinances, and quarantine. The effectiveness of NPI (in theoretical modeling) when done rapidly after initial detection of a new contagious virus can reduce transmission.

The initial phase of NPI measures in China involved quarantine of confirmed and presumptive cases along with suspension of automobile traffic.[6] However, confirmed cases continued to increase despite the social distancing efforts. With rapid diagnosis, the risk of cross-infection decreased. More than 80% of clusters of transmission were in families. Door-to-door and individual symptom surveying found presumptive cases. These NPI measures and rapid identification of positive cases reduced the average number of transmissions to individuals (the effective reproduction number Rt to <1) and interrupted the chain of transmission. The investigators from China have stressed that the detection of community transmission is critical; these include testing criteria, quarantine guidance, investigation protocols, and mitigation measures.

In a study from the Santa Clara county health department in California, a sentinel surveillance program identified community spread.[8] At four sentinel sites, samples of patients with respiratory symptoms and negative for influenza were tested for SARS-CoV-2 (n = 79) and 11% were positive. As a result, the authors recommended sentinel surveillance (both in community and hospital settings), mortality surveillance, and serologic surveys to monitor COVID-19.

County health departments in the U.S. are the main agents involved in COVID-19 containment. They track case detection, isolate individuals testing positive, perform contact tracing, and quarantine contacts. To be effective in these containment measures, the health departments need enough staff, resources, guidance, and funds. This study evaluated the staffing, resources, and funding of

county health departments in the state of Kansas in their efforts to contain COVID-19.

METHODS

The state of Kansas has a decentralized public health system with 100 local health departments, along with the Kansas Department of Health and Environment (KDHE) that serves 105 counties (some health departments serve more than one county). A listing of 104 director email addresses was obtained from the KDHE website. The survey instrument was developed and validated with input from directors of two county health departments. All county health department directors in the state were invited to participate in an electronic survey via REDCap, a secure web platform for building and managing online databases and surveys. The directors received three to five reminders if they did not respond within 7 to 10 days. The Institutional Review Board of the University of Kansas School of Medicine approved the study.

Statistical Analysis. Descriptive statistics were used to summarize survey responses from the health department directors. Categorical data were presented as frequencies and percentages. Continuous data were summarized as medians, 25th, and 75th percentiles. Open-ended survey responses were evaluated by three researchers for patterns using content analysis. Response patterns were tallied and a verbatim report for open-ended items was summarized.

RESULTS

Of the 104 county health department directors who were invited, 78 responded to the survey (all unique to the county) for a response rate of 75%. Of the 78, 71 completed the survey and 7 provided partial responses (stopped before answering all questions). However, most responders skipped some of the questions; thus, the tables identify either the number of missing responses or the number who responded to each question. All responses were included in the analysis.

Table 1 shows survey items that were categorical in nature. Most locations (89%) reported that staff number remained the same in response to COVID-19. The number of nurses who collect samples was unchanged for most locations (85%). Many health departments (80%) used KDHE criteria for COVID-19 testing (https://coronavirus.kdheks.gov), which was done either in a private laboratory (85%) and/or in a state-run laboratory (70.5%). The turnaround time for the results of the COVID-19 test (nucleic acid detection) was three days or more in a significant number of sites (62%) and it was more than five days in 14% of sites. Testing was free at 45 of 91 sites. When the test was not free (co-pay for testing), the average cost was $62.50 per test (6 responses; see Table 2).

When asked how they would respond to a positive test, a majority (67%) would monitor daily for symptom worsening, while the person was in self-isolation at home for 14 days. However, the response to a positive test (the question did not specify if the person was symptomatic or asymptomatic) resulted in 22% of health departments recommending isolation at home for 7 days or 72 hours without fever, whichever was longer (following CDC [https://www.cdc.gov/coronavirus/2019-ncov/index.html] and KDHE guidelines [https://coronavirus.kdheks.gov]) and to monitor for symptom worsening via phone. Almost all locations (97%) conducted contact tracing, 70 out of 72 reporting. Most had one to three people dedicated for contact tracing (74%), and 4 counties reported having more than 10 staff for contact tracing. Most reported calling the possible contact via phone (90%).

Almost all county health departments (72 of 78) reported that KDHE provided guidance via phone calls, emails, or webinars. Some got the information regarding COVID-19 by visiting the KDHE website (https://coronavirus.kdheks.gov). Seventy percent reported an increase in funding, while 21% had no change in funding, and 8.5% reported a decrease in funding since the start of the COVID-19 pandemic.

The number of personnel and amount of resources dedicated to COVID-19 are shown in Table 2. Most health departments are small with an average of five people employed. In more than 38 health departments, there were one to three people, with an average of three people, who were working directly on COVID-19. The four largest county health departments had between 30 to 98 staff working on COVID-19.

Responders reported an average of four have left the health department workforce, but this number varied considerably (1 to 19.5; 25th percentile to 75th percentile respectively). The median number of people added to the health department workforce was 1.5.

The average number of testing resources per location was one testing site per county, with 38 health departments using Quest Diagnostics (Secaucus, NJ) and 26 using LabCorp (Burlington, NC). The average number of available nasopharyngeal swabs on the day of survey was five per location. Only one location reported they had diagnostic kits available and did the testing in the health department laboratory.

Table 3 shows the cumulative COVID-19 cases and deaths by county reported by responders during the data collection period from April 15 to April 24, 2020, which is contrasted by the May 1, 2020 confirmed cases from the KDHE website. Survey results showed that Johnson County had the highest number of cases with 343 and 22 deaths. Of all counties reporting in the survey, there were 982 cases and 57 deaths. There were no COVID-19 positive cases in 31 county health departments at the time of the survey. However, by May 1, 2020, KDHE reported there were 4,449 confirmed COVID-19 cases and 130 deaths in Kansas with 24 counties free (or not reported) from positive cases. Thus, some counties had significant increases in positive cases since the completion of the survey (https://www.coronavirus.kdheks.gov/DocumentCenter/View/1050/5-1-20-update-numbers).

Table 4 shows the open-ended responses to the question: What in your opinion is most important need for your county health department to be successful in your efforts to contain COVID-19? All three authors conducted the content analysis individually. Categories were

agreed upon when two out of three agreed and are reflected in the total. Thus, Testing, Education/Communication, and Contact Tracing were the top three needs identified by health department directors as important to their success for containing COVID-19. Eight of the respondents needed more personal protective equipment and other supplies.

Table 5 shows the Kansas population by county and provides an estimate of non-emergency and COVID-19 pandemic personnel needed to conduct contact tracing. These numbers are compared with the total number employed and those who are working directly on COVID-19 as reported by responders. For an estimated population of over 2.9 million living in Kansas the suggested number needed for contact tracing is 437 or 100,000.[9] However, for those Kansas counties reporting, at least 30% (21 of 70) failed to meet the criterion for workers needed during a pandemic. In lieu of the fact that all counties have seen an increase in confirmed cases, there appeared to be a major shortfall in workers ready to conduct contact tracing, deemed a necessity for COVID-19 containment.

Table 1. Responses to survey items.

	Response; N = 78		
Survey item	**Missing**	***f***	**%**
In response to COVID-19, the number of people working at your county health department has (choose one):	5		
Increased		4	5.5
Remained the same		65	89.0
Decreased		4	5.5
Since the start of COVID-19 - The number of nurses who collect samples from suspected cases has (choose one):	6		
Remained the same		61	84.7
Increased		7	9.7
Decreased		4	5.6
Where is the COVID-19 testing done in your county (please select all that apply)?	7		
County Health Department		1	1.3
State lab		55	70.5
Private lab		66	84.6
How fast do you get the results of COVID-19 tests?	7		
Same day		0	0.0
1 day		6	8.5
2 days		21	29.6
3 days		23	32.4
4 days		11	15.5
5 or more days		10	14.1
What criteria do you use to test for COVID-19?	8		
KDHE		56	80.0
CDC		4	5.7
Other		10	14.3
Yes, the COVID-19 tests are free	13	45	69.2
KDHE has provided the following guidance regarding COVID-19	6	72	100.0
phone calls		61	78.2
emails		69	88.5
test kits		38	48.7
other[1]		11	14.1
How often do you contact KDHE regarding COVID-19:	8		
daily phone call		16	22.9
weekly phone call		20	28.6
daily emails		14	20.0
weekly emails		20	28.6

Table 1. Responses to survey items. *cont.*

	Response; N = 78		
Survey item	**Missing**	***f***	**%**
If test results are positive for COVID19 what is (or will be) your response:	6		
recommend to self-isolate at home for 14 days		7	9.7
monitor them daily for symptom worsening while isolating at home for 14 days		48	66.7
monitor them daily for symptom worsening in a location other than home for 14 days (e.g., hotel, dorm)		1	1.4
other[2]		16	22.2
Do you (or will you) do contact tracing for positive cases of COVID-19? (Yes)	6	70	97.2
If yes: How many people are involved in contact tracing in your county:	8		
1 to 3		52	74.3
4 to 6		11	15.7
7 to 10		3	4.3
more than 10		4	5.7
Methods you use (or will use) for contact tracing (choose all that apply)	8		
Phone call		70	89.7
FaceTime or Zoom		5	6.4
Face-to-face interview		4	5.1
Other[3]		6	7.7
Since the start of COVID-19 has your funding:	7		
Increased		50	70.4
Decreased		6	8.5
No change in funding		15	21.1
If COVID-19 test kits were available, do you have funds to purchase them? (No)	9	24	34.8
Can we call you if we have follow-up questions? (Yes)	7	59	83.1

[1]KDHE webinars, website, press conferences, funding
[2]Other responses to a positive COVID test result:
- All of the above depending on the situation.
- Already isolated the day swab is complete. Watch for 72 hours after fever free or 7 days symptom free - whichever is longer.
- Depends on the patient condition and living arrangements.
- Following the 7 day/72-hour fever free (whichever longer per KDHE guidance).
- Isolate 7 days or 72 hours after symptoms resolve.
- Isolate at home 7 days or 3 days symptom free (with exceptions to cough as it can linger) for 3 days - whichever is longer.
- Isolate at home if able for 7 days or 72 hours fever-free without antipyretics, whichever is longer.
- Isolate minimum of 7 days after onset of symptoms and can be released after afebrile and feeling well without fever reducing medication for at least 72 hours.
- KDHE 7 days post symptom onset, improvement in symptoms, and 72 hours post fever whichever is longer.
- Monitor daily for 7 days after symptom onset or until fever free for 3 days without the use of fever reducing medication whichever is longer in their own home if possible.
- Monitor daily for symptoms worsening for 7 days from symptoms or no fever for 4 days without medication whichever is the longest.
- Monitor daily until symptoms subside at least 7 days and 72 hours fever free, whichever is longer.
- Quarantine 14 days.
- Self-isolate 7 days, or fever free 72 hours, or significant improvement in symptoms, whichever is the longest.
- Self-isolate for 7 days from symptom onset or date of test or fever free for 72 hours without fever reducing medicine, whichever is longest and have them monitor and report to health department.
- Follow KDHE recommendation - 7day from onset of signs/symptoms, no fever for 72 hours, etc.

[3]Other methods of contact tracing: email, text messages, private messaging, letter, and family.

Table 2. Personnel and resources dedicated to COVID-19.

Survey item	N	Median	25th percentile	75th percentile
Personnel				
How many people work at your county health department?	73	5.0	4.0	8.0
How many people in your county health department are directly working on COVID-19?	72	3.0	2.0	5.0
How many people have departed the workforce at your health department (furloughed, self-quarantined, laid off, quit, etc.)?	4	2.0	1.0	19.5
How many people have been added to the workforce at your health department?	4	1.5	0.5	4.0
How many nurses have departed the workforce at your health department (furloughed, self-quarantined, laid off, quit, etc.)?	4	0.0	0.0	0.5
How many nurses have been added to the workforce at your health department?	7	0.0	0.0	3.0
At the beginning of the pandemic, how many nurses were designated to collect samples for suspected cases of COVID-19?	73	0.0	0.0	1.0
How many other individuals (not including the nurses) are involved in collecting samples from suspected cases of COVID-19?	72	0.0	0.0	0.0
Testing Resources				
How many locations offer lab testing for COVID-19 in your county? (swabbing suspected cases for Corona-virus)	72	1.0	1.0	2.5
Labs used for COVID testing				
Quest	38			
LabCorp	26			
Other	5			
Don't know	2			
How many naso-pharyngeal swabs or oro-pharyngeal swabs do you have today?	70	5.0	0.0	22.0
If testing is done in your county health department, how many diagnostic kits does your lab have today?	1	688.0	688.0	688.0
What is the co-pay per test?	6	62.5	0.0	115.0

Table 3. Cumulative cases of COVID-19 and mortality by county.

	Survey Responses April 15-24, 2020		May 1, 2020
Location	**Positive Cases**	**Deaths**	**Positive Cases***
Atchison	3	0	10
Barber	--	--	1
Barton	6	0	9
Bourbon	--	--	6
Butler	--	--	16
Chase	--	--	1
Chautauqua	3	0	4
Cherokee	--	--	8
Cheyenne	--	--	2
Clark	0	0	1
Clay	--	--	4
Cloud	--	--	4
Coffey	--	--	48
Comanche	0	0	--
Cowley	1	1	2
Crawford	6	1	6
Decatur	0	0	--

Table 3. Cumulative cases of COVID-19 and mortality by county. *cont.*

	Survey Responses April 15-24, 2020		May 1, 2020
Location	**Positive Cases**	**Deaths**	**Positive Cases***
Dickinson	1	0	2
Doniphan	--	--	3
Douglas	--	--	51
Edwards	0	0	4
Elk	0	0	1
Ellis	--	--	8
EllisCounty	8	0	--
Ellsworth	0	0	--
Finney	40	1	386
Ford	--	--	702
Franklin	--	--	14
Geary	9	0	14
Gove	1	0	1
Graham	0	0	--
Grant	0	0	5
Gray	0	0	5
Greeley	0	0	--
Greenwood	0	0	3
Hamilton	--	--	2
Harper	0	0	1
Harvey	5	0	7
Haskell	0	0	7
Hodgeman	0	0	--
Jackson	1	0	2
Jefferson	--	--	9
Jewell	1	0	4
Johnson	343	22	471
Kearny	10	0	19
Kingman	0	0	--
Kiowa	0	0	1
Labette	--	--	22
Lane	0	0	--
Leavenworth	--	--	372
Lincoln	0	0	--
Linn	5	0	5
Logan	0	0	--
Lyon	47	0	210
Marion	5	0	5
Marshall	0	0	--
McPherson	14	0	22
Meade	0	0	6
Miami	4	0	5
Mitchell	--	--	3

Table 3. Cumulative cases of COVID-19 and mortality by county. *cont.*

	Survey Responses April 15-24, 2020		May 1, 2020
Location	**Positive Cases**	**Deaths**	**Positive Cases***
Montgomery	--	--	17
Morris	2	0	3
Morton	2	0	3
Nemaha	--	--	1
Neosho	--	--	2
Ness	0	0	--
Norton	0	0	1
Osage	4	0	5
Osborne	--	--	2
Ottawa	4	0	4
Pawnee	0	0	--
Phillips	--	--	1
Pottawatomie	6	0	13
Pratt	1	0	1
Rawlins	0	0	--
Reno	15	0	36
Republic	--	--	4
Rice	0	0	3
Riley	25	0	48
Rooks	4	0	6
Rush	0	0	--
Russell	0	0	--
Saline	17	2	21
Scott	1	0	1
Sedgwick	231	3	384
Seward	--	--	514
Shawnee	82	5	121
Sheridan	--	--	2
Sherman	1	0	4
Smith	2	0	2
Stafford	--	--	1
Stanton	--	--	4
Stevens	3	0	9
Sumner	2	1	3
Thomas	0	0	--
Trego	0	0	--
Wabaunsee	--	--	22
Wallace	0	0	--
Washington	0	0	--
Wilson	--	--	1
Woodson	11	1	6
Wyandotte	56	20	710
Total	**982**	**57**	**4,449**

Table 3. Cumulative cases of COVID-19 and mortality by county.
cont.
*https://www.coronavirus.kdheks.gov/DocumentCenter/View/1050/5-1-20-update-numbers. (Reported as of 9 a.m., May 1, 2020)
• 4,449 cases from 81 counties with 130 deaths.
• 534 of 3,204 cases that have been hospitalized.
• 28,585 negative tests conducted at KDHE and private labs.
• Age range: 0 years to 99 years (median 44 years).
• 1,587 positive tests at KHEL and 2,862 at private labs.
• 2,045 cases are female and 2,359 are male and 45 are unknown.

Table 4. Content analysis: Comments on most important needs to contain COVID-19.

What in your opinion is most important need for your county health department to be successful in your efforts to contain COVID-19?	Testing	Education and Communication	Contact Tracing	Staffing	PPE and Supplies	Funding
Additional funds and staffing!!!!! COVID-19 has definitely taken over our office even though we do not have a positive in our county yet. We are continuously working on local response, quarantines related to travel, safety measures for businesses and families in our county, tons of education, supply searching and disbursement, etc.		X		X		X
Adequate staff for contact monitoring if cases increase during re-opening phases. We do not collect specimens and one hospital mostly uses KHEL and the other predominately uses LabCorp unsure of cost they charge for their testing when using private labs, no charge for KHEL lab.			X	X		
Appropriate contact tracing and ability to test.	X		X			
Assistance with contact tracing when we get to that point.			X			
At this time, we do not have any major needs. One thing we are trying to do is express to the citizens the importance of the stay at home order.		X				
Clear communication with KDHE and KDEM and Local ESF/LEPC partners.		X				
CLIA-waived on-site testing ability.	X					
Consistency across the state. Our local lab (that does the testing) will call us and let us know when they are testing someone, whether they are from our county or not, so that we can let the appropriate Health Department know. Not all labs are doing that and we are concerned that some testing could be done and Health Departments aren't notified until the case is in EpiTrax which can take several days. That is lost time for disease investigation not to mention the follow up that is necessary with close contacts of the potential positive case.		X	X			
Contact tracing assistance from KHDE.			X			
Continual updates with information changing quickly and help in knowing what information to chart in EpiTrax.		X				
Continued social distancing and following of recommendations.		X				
Due to the fact that we are very small and the need to ration PPE the decision was made early on that testing would be handled via HCP, through individual assessment of the PUI at the time they seek care. The county also has an agreement with the local hospital that should the need arise and someone needs testing and there is limited resources that will be done at a designated drive through area. That said the local hospital has the test kits that were sent to PCHD for use should the specimen be sent to KDHE. The local hospital and clinic often utilize Quest and quest turn around time is usually 1-2 days. The local FQHC utilizes LabCorp and the turn around time for results can take up to 5 or more days but this is maybe getting a little better. Our most important role in the containment is follow up of contacts for quarantine and isolation of cases. We have 2 RNs on staff and 1 office manager. Those are full time positions. We have a Healthy Start Home Visitor that works part time but would probably not be able to assist with the COVID response.			X	X	X	
Early testing and early investigation of positive cases.	X		X			
Education of the general population that STAY AT HOME means STAY AT HOME!		X				
Education to the public and even to the hospital. The hospital does not have a clear understanding of public health and has been difficult to work with. With two staff, and no positives yet, we are already feeling overwhelmed. Nervous if there were an outbreak. Thankful there hasn't been!		X		X		
Financial support for workers managing contact investigations, providing community education.		X				X

Table 4. Content analysis: Comments on most important needs to contain COVID-19. *cont.*

What in your opinion is most important need for your county health department to be successful in your efforts to contain COVID-19?	Testing	Education and Communication	Contact Tracing	Staffing	PPE and Supplies	Funding
For Kansas to get rapid test.	X					
For the LHD to be successful in containing COVID-19, assistance would be needed for contact tracing, and following up with each of the contacts. Getting information out to the public could also be an issue since we are a rural community with only a weekly paper that not all residents subscribe to, limited internet in some areas, and a small number of non-English speaking families.		X	X			
Funding for overtime. Cooperation from the public to abide by stay at home/distancing/etc rules.		X				X
Funding, direct communication with county officials to explain the importance of our work.		X				X
Good communication.		X				
Help with testing, technology to help with contact tracing.	X		X			
I need help with entering cases in EpiTrax. I need help locating and following contacts to a case and entering them in EpiTrax.			X			
If the IGM approved test came out this would be beneficial along with being able to randomly test more people.	X					
In our county, Health Center is drawing our labs and depending on the criteria sending them to KHEL or LabCorp. The health department is calling the tested patients and instructing them on quarantining and answering any questions they may have regarding COVID-19. Our health department has received funding from the COVID-19 grant and Sunflower Foundation. I am applying for funding from Kansas Health Foundation.						X
Increased volume of testing needs to be done.	X					
Mask, cleaning supplies for PUI in isolation, education.		X			X	
More help in contact tracing.			X			
More liberal testing capacity and population-based testing to better facilitate policy and guideline decisions.	X					
More test supplies!! PPE is also a concern.... good now but not sure about down the road....mainly masks and gowns are needed.	X				X	
More testing capability.	X					
Need more personnel when we do get our first positive but KDHE just said today they will help with contact tracing.			X	X		
Need PPE Supplies.					X	
No positive cases in our county.						
One place to find the latest, clear instructions regarding; supply requests, requirements to screen, what to do regarding if positive/negative, fillable documents to issue. Documents can be found a little everywhere, KDHE, CDC, EpiTrax, KEFF, KALHD.		X				
Our hospital does 99% of the testing, we do the few that are home bound. We have adequate PPE, if we get many positives in a row, not sure (4 nurses total), we will be able to keep up. Our county does not have a number to call with questions or to get information (that is staffed). A resource line or hotline. That I feel is our biggest need. Too many elderly people we can not get information to. We may do more testing if the numbers rise in our county.	X	X		X		
Our hospital does the collections for COVI-19. More supplies to do that testing either from LabCorp or KDHE. We have only tested 10 people. There may be more that meet the criteria but are not reporting to the physician because they think testing isn't available. I have no way to know that.	X					
Our main need at this time for our community is the availability of testing supplies to be able to perform the COVID-19 testing.	X					
PPE.					X	
PPE.					X	

Table 4. Content analysis: Comments on most important needs to contain COVID-19. *cont.*

What in your opinion is most important need for your county health department to be successful in your efforts to contain COVID-19?	Testing	Education and Communication	Contact Tracing	Staffing	PPE and Supplies	Funding
PPE, Test Kits.	X				X	
Public cooperation and the tools to respond.		X				
Staff for contact tracing.			X	X		
Staffing, we have reached out to our local school nurses and they are on loan for us to use for phones, and have met with them and on a moment's notice can be here to work.				X		
Sufficient supplies to test.	X					
Support from KDHE and assistance if needed. Because we are a small agency and there are only 2 of us that are working on COVID-19, if we would get an outbreak....we would need help. As of right now we are not doing testing here at the Health Department, our county hospital/clinic is performing the testing. We work closely with them and are in contact daily on patients being tested and the process of it all.				X		
Testing ability.	X					
Testing availability and additional epidemiology staff.	X			X		
Testing capabilities.	X					
Testing supplies.	X					
Testing supplies.	X					
Testing. More surgical masks and gowns.	X				X	
The ability (test kits) to do mass testing once we have confirmed cases in our county.	X					
The need to get up to date information to the community. When we get a positive, it will be to be able to reach all contacts daily.		X	X			
To provide community testing. My only fear with that is, for symptomatic patients, if there is a differential diagnosis, we would not capture that. Other than that, we would be willing to do more testing to have a better understanding of prevalence in our community.	X					
We are a 4-county health department. Our most important need is communication from those clinics testing.		X				
We are just waiting for things to get worse...at that point we will direct more staff to contact investigations when cases increase. We will assist local hospital with specimen collection when testing site is opened, but swabs and test kits will be needed.	X			X		
We have a team system going here in the county. Our health department does not do testing but refers to the local hospital for testing-will not be doing testing unless our hospital requests we do so. We focus on case investigations; we follow everyone we know who has been testing to make sure they isolate pending results. My concern is being able to do all the contact tracings with 2 nurses who will be doing the case investigations.			X	X		
We need rapid testing material.	X					
We need to be able to test patients at our facility and have the testing supplies to do so. Currently all testing is centralized at our local hospital.	X					
We need to provide accurate information to our residents as far as social distancing and travel restrictions and the need to quarantine due to travel in certain areas.		X				
We would like to be able to do population testing like some of the other counties. We would also like to participate in the drive thru testing centers to be able to do the population testing and we would like to include serum Igg and Igm testing when it becomes available. I have applied for a KHF grant to help fund this if we cannot get funding through KDHE.	X					X

Table 4. Content analysis: Comments on most important needs to contain COVID-19. *cont.*

What in your opinion is most important need for your county health department to be successful in your efforts to contain COVID-19?	Testing	Education and Communication	Contact Tracing	Staffing	PPE and Supplies	Funding
When numbers increase assistance with monitoring and contact investigation.			X			
When we have a positive COVID test we will need help to do contact tracing. Our local hospital is doing the testing for our county			X			
Total	**27**	**20**	**17**	**12**	**8**	**6**

The content analysis was conducted individually by all three authors. Categories were agreed upon when two out of three agreed and are reflected in the total. Thus, Testing, Education/Communication, and Contact Tracing were the top three needs identified by health department directors as important to their success for containing COVID-19.

Table 5. Comparing recommended number needed for contact tracing versus number of employees by county.

		Estimated Number of Personnel for Contact Tracing		Responses from County Health Departments	
County	**July 1, 2019 Estimate**	**Non-emergency: 15 per 100,000**	**COVID-19 pandemic: 30 per 100,000**	**Number employed**	**Number involved in tracing**
Allen	12,369	2	4	--	--
Anderson	7,858	1	2	--	--
Atchison	16,073	2	5	2	1 to 3
Barber	4,427	1	1	--	--
Barton	25,779	4	8	19	4 to 6
Bourbon	14,534	2	4	--	--
Brown	9,564	1	3	--	--
Butler	66,911	10	20	--	--
Chase	2,648	0	1	--	--
Chautauqua	3,250	0	1	7	1 to 3
Cherokee	19,939	3	6	--	--
Cheyenne	2,657	0	1	--	--
Clark	1,994	0	1	1	1 to 3
Clay	8,002	1	2	--	--
Cloud	8,786	1	3	--	--
Coffey	8,179	1	2	--	--
Comanche	1,700	0	1	2	1 to 3
Cowley	34,908	5	10	20	1 to 3
Crawford	38,818	6	12	25	7 to 10
Decatur	2,827	0	1	2	--
Dickinson	18,466	3	6	6	1 to 3
Doniphan	7,600	1	2	--	--
Douglas	122,259	18	37	--	--
Edwards	2,798	0	1	4	1 to 3
Elk	2,530	0	1	2	1 to 3
Ellis	28,553	4	9	4	1 to 3
Ellsworth	6,102	1	2	4	1 to 3
Finney	36,467	5	11	28	4 to 6
Ford	33,619	5	10	--	--
Franklin	25,544	4	8	--	--
Geary	31,670	5	10	10	1 to 3

Table 5. Comparing recommended number needed for contact tracing versus number of employees by county. *cont.*

		Estimated Number of Personnel for Contact Tracing		Responses from County Health Departments	
County	**July 1, 2019 Estimate**	**Non-emergency: 15 per 100,000**	**COVID-19 pandemic: 30 per 100,000**	**Number employed**	**Number involved in tracing**
Gove	2,636	0	1	4	1 to 3
Graham	2,482	0	1	3	1 to 3
Grant	7,150	1	2	5	1 to 3
Gray	5,988	1	2	4	1 to 3
Greeley	1,232	0	0	2	1 to 3
Greenwood	5,982	1	2	3	1 to 3
Hamilton	2,539	0	1	--	--
Harper	5,436	1	2	9	1 to 3
Harvey	34,429	5	10	13	1 to 3
Haskell	3,968	1	1	4	1 to 3
Hodgeman	1,794	0	1	4	1 to 3
Jackson	13,171	2	4	4	1 to 3
Jefferson	19,043	3	6	--	--
Jewell	2,879	0	1	6	1 to 3
Johnson	602,401	90	181	140	--
Kearny	3,838	1	1	3	1 to 3
Kingman	7,152	1	2	4	1 to 3
Kiowa	2,475	0	1	4	4 to 6
Labette	19,618	3	6	--	--
Lane	1,535	0	0	4	1 to 3
Leavenworth	81,758	12	25	--	--
Lincoln	2,962	0	1	4	1 to 3
Linn	9,703	1	3	6	1 to 3
Logan	2,794	0	1	5	1 to 3
Lyon	33,195	5	10	14	4 to 6
McPherson	28,542	4	9	7	4 to 6
Marion	11,884	2	4	8	--
Marshall	9,707	1	3	6	1 to 3
Meade	4,033	1	1	5	4 to 6
Miami	34,237	5	10	7	1 to 3
Mitchell	5,979	1	2	--	--
Montgomery	31,829	5	10	--	--
Morris	5,620	1	2	3	1 to 3
Morton	2,587	0	1	4	1 to 3
Nemaha	10,231	2	3	--	--
Neosho	16,007	2	5	--	--
Ness	2,750	0	1	2	1 to 3
Norton	5,361	1	2	6	1 to 3
Osage	15,949	2	5	5	1 to 3
Osborne	3,421	1	1	--	--
Ottawa	5,704	1	2	5	1 to 3

Table 5. Comparing recommended number needed for contact tracing versus number of employees by county. *cont.*

		Estimated Number of Personnel for Contact Tracing		Responses from County Health Departments	
County	**July 1, 2019 Estimate**	**Non-emergency: 15 per 100,000**	**COVID-19 pandemic: 30 per 100,000**	**Number employed**	**Number involved in tracing**
Pawnee	6,414	1	2	4	1 to 3
Phillips	5,234	1	2	--	--
Pottawatomie	24,383	4	7	6	1 to 3
Pratt	9,164	1	3	5	1 to 3
Rawlins	2,530	0	1	2.5	1 to 3
Reno	61,998	9	19	52	4 to 6
Republic	4,636	1	1	--	--
Rice	9,537	1	3	5	1 to 3
Riley	74,232	11	22	45	4 to 6
Rooks	4,920	1	1	4	--
Rush	3,036	0	1	3	--
Russell	6,856	1	2	5	1 to 3
Saline	54,224	8	16	36	4 to 6
Scott	4,823	1	1	5	1 to 3
Sedgwick	516,042	77	155	130	7 to 10
Seward	21,428	3	6	--	--
Shawnee	176,875	27	53	65	7 to 10
Sheridan	2,521	0	1	--	--
Sherman	5,917	1	2	5	4 to 6
Smith	3,583	1	1	8	1 to 3
Stafford	4,156	1	1	--	--
Stanton	2,006	0	1	--	--
Stevens	5,485	1	2	4.5	1 to 3
Sumner	22,836	3	7	20	1 to 3
Thomas	7,777	1	2	7	4 to 6
Trego	2,803	0	1	3	1 to 3
Wabaunsee	6,931	1	2	--	--
Wallace	1,518	0	0	3	1 to 3
Washington	5,406	1	2	3	1 to 3
Wichita	2,119	0	1	--	--
Wilson	8,525	1	3	4	--
Woodson	3,138	0	1	13	1 to 3
Wyandotte	165,429	25	50	85	--
Kansas	**2,913,314**	**437**	**874**	**962**	

DISCUSSION

The county health departments are leading the charge to contain the spread of the SARS-CoV-2 virus. However, our survey of these health departments in the state of Kansas showed significant issues in many areas. In a significant number of health departments, both big and small, the staff number had not changed despite the increased workload dealing with COVID-19 pandemic. The public health workforce in the U.S. has decreased by funding cuts in the past 15 years with 28% reduction in federal funding for public health preparedness.[10] In addition, there was a loss of 50,000 positions in public health organizations during the 2008 recession. This lack of adequate staffing can hamper the efforts of public health departments in their efforts to contain COVID-19. The COVID-19 pandemic has brought awareness to increase the public health workforce in the U.S. and particularly planning for the next pandemic.

When the survey was sent, the KDHE recommendation for COVID-19 testing was based on meeting specific criteria (as downloaded from KDHE website and these recommendations may change over time). Those criteria were: a person with close contact with another person with confirmed COVID-19 and has symptoms within 14 days of contact such as fever or cough/shortness of breath; or a person with history of travel outside of Kansas within 14 days of symptom onset and symptoms of fever/cough/shortness of breath and if other respiratory tests are negative; and a Kansas resident who is in a county with sustained community transmission with symptoms of severe respiratory illness needing hospitalization and if other respiratory tests are negative. The testing guidelines from KDHE also suggested that testing can be performed at Quest Diagnostics, LabCorp, Mayo Clinic laboratories, and Viracor. Testing for COVID-19 at KDHE laboratories was done for public health purposes and urgent need. A recent report by Arons et al.[11] indicated that asymptomatic persons had a major role in the transmission of SARS-CoV-2 in a skilled nursing facility in Washington state. Evidence of spread from asymptomatic persons should lead to broader testing.[12] There was an urgent need for increased COVID-19 testing capability in Kansas at the time of this study. It is possible that KDHE may broaden the testing criteria once the availability of diagnostic kits is significantly increased.

It takes three or more days to obtain the results of the test for SARS-CoV-2 at most locations in Kansas. It is estimated that each person who is positive for SARS-CoV-2 can infect two to three others if not immediately isolated.[13] If, for example, one person passes the virus to three others, the first person who is positive can lead to 59,000 or more cases after 10 rounds of infection in a very short period of time. As shown in China, rapid identification can reduce the number of people exposed to the infected individual and interrupt transmission.[9] This is one of the most effective ways of decreasing the effective reproduction number Rt to < 1 (or "flatten the curve"). In addition to increasing the capability of COVID-19 testing in Kansas, it is important to have the results of the testing faster than was available at the time of the survey.

The average number of nasopharyngeal swabs available, on the day of the survey at the county health departments, was five per location. There is an urgent need to improve the supply chain so that all county health departments have enough nasopharyngeal swabs (or oropharyngeal swabs) and viral transport media to collect the specimens for testing.

For symptomatic people with a SARS-CoV-2 positive test, many respondents recommended self-isolation for at least seven days or 72 hours without fever and resolving symptoms (whichever is longer) per CDC and KDHE guidelines. However, a recent report from China showed that median duration of communicable period (the period from the first SARS-CoV-2 RT-PCR positive test to negative conversion) was 14 days (IQR: 10 to 18 days).[14] Given emerging evidence, it is not clear if it is necessary to isolate positive cases for longer than currently recommended or until two negative tests done 24 hours apart when testing is more readily available. On May 3, CDC issued a new recommendation, for those recovering from COVID-19 illness, for isolation be maintained for at least 10 days after the onset of illness (the date of symptoms), and at least three days (72 hours) after recovery (cdc.gov/coronavirus/2019-ncov/community/strategy-discontinue.isolation.html).

Our survey showed that though all county health departments in Kansas actively were involved in contact tracing and they had in most cases one to three people dedicated to this activity. However, in Massachusetts, there are plans to hire at least 15 contact tracers per 100,000 population and in Wuhan, China, there were 81 per 100,000 people.[9] Aggressive contact tracing is important in the U.S. as the virus has spread unabated for several weeks leading to highest number of positive cases in the world and due to the fact that testing is not freely available. It makes sense for specific counties, particularly more populated urban counties in Kansas, to hire significantly more people trained to do contact tracing.

Most of the contact tracing by county health department staff in Kansas was by telephone contact. In contrast, contact tracing in South Korea involved patient interviews as well as use of medical records, cell phone GPS records, credit card transaction records, and closed-circuit television.[15] In Singapore, a mobile app called TraceTogether, that uses Bluetooth signals, was used to trace contacts. It is important to consider using technology, when available, to help with contact tracing in Kansas.[17]

While many of the health departments reported an increase in funding since the start of pandemic, some health departments reported a decrease in funding. We did not ask the extent of funding increase and the source of increased funding. Adequate funding of the county health departments is important to staff and to be able purchase resources to contain SARS-CoV-2 virus.

CONCLUSIONS

Our survey, with data collection period from April 15 to April 24, 2020, suggested that county health departments in Kansas would benefit from increased support for public education, testing supplies, increased testing capability, faster turnaround time for test

results, and increased staffing, and in particular, trained workers to conduct contact tracing. A funding reserve at the state level that could be drawn upon when needed for public health emergencies could address this issue. Additionally, a reserve of personal protective equipment at the state level should be available. Pandemics reinforce the need for increased public health spending and preparedness.

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