



Covid-19 Information on County Health Department Websites: The Case of Rural Illinois

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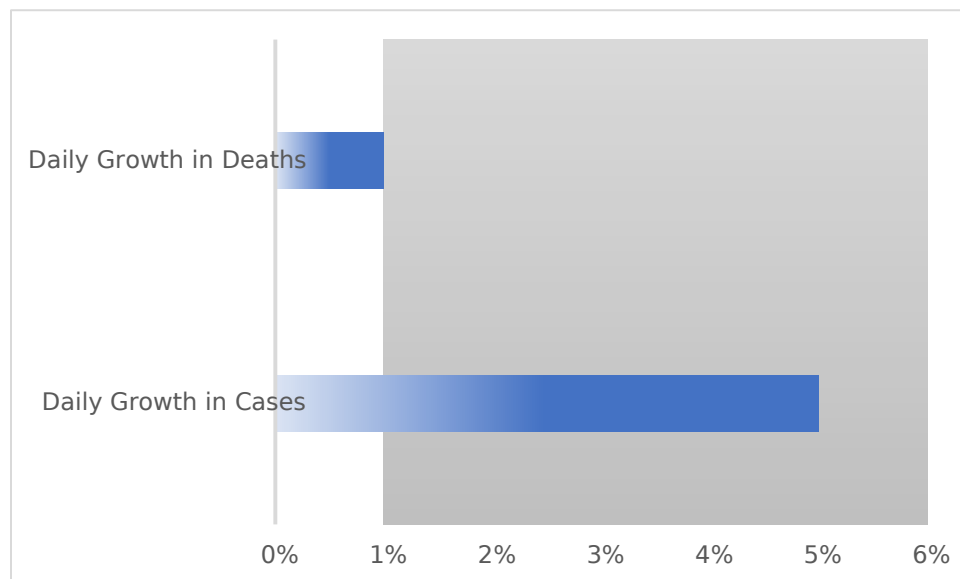
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It has been almost three months since the first case of Covid-19 appeared in Cumberland County. Since then the number of cases in rural Illinois² has grown at the rate of 5% per day, and as at May 29, 2020, the region reported a 4% death rate³ (Figure 1).

Figure 1: Covid-19 in Rural Illinois



Note: Number of cases as at May 29, 2020 = 2,652; number of deaths = 116.

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² Appendix 1 lists the growth rate for all the rural counties, from Adams to Whiteside.

³ Comparatively, the metro counties registered a 7% daily growth rate in Covid-19 infections and a 5% death rate. They have been living with the infection for more than 4 months now; the first case appeared in Cook County, January 24, 2020.

To inform the general public about the Covid-19 pandemic, and to persuade them to comply with stay-at-home orders, county health departments have created Covid-19 webpages; see for example, the website for Adams County:

<https://www.co.adams.il.us/government/departments/health-department>.

Communications theory⁴ suggests that during high-risk situations such as a pandemic, the general population has to be convinced to accept public health initiatives such as social distancing; acceptance is defined as the resident-decision-maker's personal agreement with a claim in the public service announcement. However, a recent ABC News / Ipsos Poll suggests that slightly more than 20% of the survey respondents are unsure or not confident that they know where to go to get tested for the Coronavirus (Table 1).

County health departments are seen as trustworthy sources of information (Platt, Raj, and Kardia, 2019). The general public expect county health department websites to provide information about the pandemic and guidelines to safeguard oneself against Covid-19. This paper evaluates all 61 rural, county-health-department websites for Covid-19 contents; terms or topics of Covid-19 that are discussed.

Table 1: Results of ABC Poll Conducted During May 20-21, 2020⁵

Q. How confident are you that you would know where to go to get tested for the Coronavirus if you thought you needed to?⁶

	Metro	Nonmetro	Total US
Not confident at all	7%	6%	7%
Not so confident	16%	11%	15%
Somewhat confident	37%	33%	37%
Very confident	40%	50%	41%
Total	100% (n=630)	100% (n=95)	100% (n=725)

Q. How confident are you that you would be able to get tested for Covid-19 if needed?⁷

	Metro	Nonmetro	Total US
Not confident at all	8%	7%	8%
Not so confident	22%	9%	20%
Somewhat confident	38%	42%	39%
Very confident	32%	42%	33%
Total	100% (n=630)	100% (n=98)	100% (n=728)

⁴ The theory is cognitive response theory and it states that when an individual is exposed to a message, the individual will relate the message to her existing knowledge structure. This comparison will generate a number of message-relevant thoughts and images (cognitive responses). If these cognitive responses are mostly favorable, the message will be accepted (see Rolloff and Miller (1980)).

⁵ The survey involved 733 US adults (ages 18+); see Kaiser Family Foundation Poll: May 2020 Kaiser Health Poll 31117411.

⁶ A Chi-square test did not reject the hypothesis of independence between the metro and the nonmetro regions.

⁷ Responses were similar for metro and nonmetro; Computed Chi-square statistic was less than the critical level.

Methods

The list of county health department websites was obtained from the Illinois Department of Public Health⁸. For each county, webpages related to Covid-19 were mined for special words that characterize the topic, excluding stop words⁹. HTML, pdf pages, and images were scraped. The TF.IDF measure was used to identify salient words; TF (term frequency) was computed as the ratio:

$$TF_{ij} = \frac{f_{ij}}{\max_k f_{kj}} \text{ where,}$$

f_{ij} is the number of occurrences of term i in webpage j ; the denominator is the maximum number of occurrences of any term in the same webpage.

The IDF (inverse document frequency) for a term is defined as:

$$IDF_i = \log_2 \frac{N}{n_i}, \text{ where}$$

N is the total number of Covid-19 webpages, and n_i is the number of webpages in which the term i appears.

The terms with the highest $TF \times IDF$ scores are taken to be representative of the county's Covid-19 webpage.

To cluster counties with similar webpages, shingles were constructed out of words; specifically, a shingle was defined to be a stop word followed by the next two words. For example, for the statement, "In response to the COVID-19 pandemic, Gov. JB Pritzker has extended the statewide stay-at-home order through May 29", the first three shingles would be:

In response to
to the Covid-19
the Covid-19 pandemic

Jaccard similarity was applied to shingles to cluster county health departments; Jaccard similarity of sets S and T is:

$$SIM(S, T) = \frac{|S \cap T|}{|S \cup T|}$$

⁸ See http://www.idph.state.il.us/IDPHPrograms/v_LHDDirectory/Show-V-LHDDirectory-Public.aspx

⁹ Stop words are common words such as "the" or "and" which help build ideas or construct sentences, but do not carry any significance themselves.

Results

Figure 2 is the cloud representation of terms; the larger the size of the term, the higher is its TF.IDF value. Appendix 2 provides examples of terms that are frequently mentioned in county health department websites and their TF.IDF scores.

Figure 2: Terms and their Frequency of Mention in County Health Department Websites

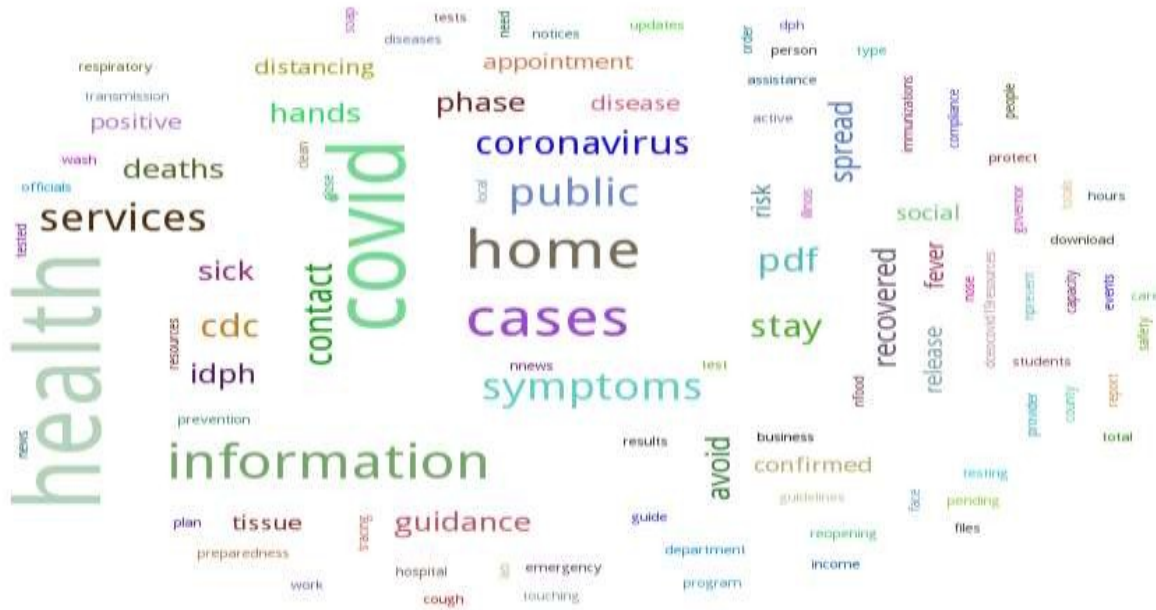


Table 2 shows the county health departments that have websites on Covid-19 (dis)similar to that of the IDPH website. Comparison with the IDPH website is based on the notion that state-level information on Covid-19 should be combined with happenings in the county to gain insights into healthcare processes involved in combatting the pandemic; the transaction cost perspective supports this combining of state and county health information to gain market insights.

Table 2: Similarity or Correlation of County Health Websites with IDPH Website

County	Jaccard Similarity, Rank	County	Jaccard Similarity, Rank
Hancock	1	Franklin	46
Christian	2	Morgan	47
Montgomery	3	Lee	48
Bureau	4	Marion	49
White	5	Knox	50

Discussion

Covid-19 is growing in rural Illinois at the rate of 5% per day. It is essential that county health departments keep residents informed about behavioral norms to combat the pandemic. Our analysis shows that Covid-19 information is limited on county health department websites; there is limited integration and standardization between websites and IDPH. Does it mean that information provision is suboptimal?

Twenty percent of Illinoisans between the ages of 16 to 65 experience difficulty in comprehending printed material, and 30% are functionally innumerate (NCES, 2020). They are likely to work in jobs that are interactional such as checkout clerks in supermarkets; it is essential that they are aware about the spread of Covid-19 in the community and actions to prevent the spread. For these residents, public service announcements on TV and radio are required.

For the segment of Illinoisans who visit the county health department websites to learn about Covid-19, the “law of the lens” concept in psychology reminds us that people view information from different viewpoints; for example, a healthcare professional could view the spread of Covid-19 from a clinical perspective, whereas an economic developer could process the information from industry output, job losses, etc. The implication is that information should be presented in a way that is useful to the county resident; county health departments should structure Covid-19 website to sense and respond to different needs.

References

Platt, J., Raj, M. and Kardia, S.L.R. (2019), "The public's trust and information brokers in health care, public health and research", *Journal of Health Organization and Management*, Vol. 33 No. 7/8, pp. 929-948.

M. E. Rolloff and G.R. Miller, eds. (1980). *Persuasion: New Directions in Theory and Research*, Beverly Hills, CA: Sage.

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Appendix 1: Covid-19 Growth Rates for Rural Illinois

County	No. of Cases	No. of Deaths	No. of Days Active	Growth Rate: Cases	Growth Rate: Death
Adams	45	1	70	5%	0%
Brown	11	0	28	9%	0%
Bureau	15	1	63	4%	0%
Carroll	14	2	62	4%	1%
Cass	71	0	39	11%	0%
Christian	33	5	70	5%	2%
Clark	11	0	60	4%	0%
Clay	3	0	45	2%	0%
Coles	125	14	52	9%	5%
Crawford	11	0	60	4%	0%
Cumberland	10	0	76	3%	0%
Douglas	28	0	65	5%	0%
Edgar	1	0	0		0%
Edwards	2	0	16	4%	0%
Effingham	7	1	56	3%	0%
Fayette	20	3	62	5%	2%
Franklin	12	0	64	4%	0%
Fulton	11	1	49	5%	0%
Gallatin	2	0	54	1%	0%
Greene	5	0	49	3%	0%
Hamilton	3	0	41	3%	0%
Hancock	16	0	51	5%	0%
Hardin	1	0	38	0%	0%
Henderson	8	0	42	5%	0%
Iroquois	131	4	63	8%	2%
Jasper	48	8	55	7%	4%
Jefferson	101	17	53	9%	5%
Jo Daviess	32	1	68	5%	0%
Johnson	7	0	46	4%	0%
Knox	97	0	61	7%	0%
LaSalle	147	13	72	7%	4%
Lawrence	4	0	52	3%	0%
Lee	79	1	55	8%	0%
Livingston	32	2	68	5%	1%
Logan	11	0	57	4%	0%
Marion	50	0	60	7%	0%
Mason	18	0	55	5%	0%

Massac	7	0	58	3%	0%
McDonough	87	8	48	9%	4%
Montgomery	39	1	61	6%	0%
Morgan	36	1	65	6%	0%
Moultrie	11	0	57	4%	0%
Ogle	211	3	59	9%	2%
Perry	42	0	48	8%	0%
Pike	1	0	55	0%	0%
Pope	1	0	21	0%	0%
Pulaski	51	0	50	8%	0%
Putnam	2	0	13	5%	0%
Randolph	267	4	60	9%	2%
Richland	3	0	52	2%	0%
Saline	7	0	60	3%	0%
Schuyler	12	0	50	5%	0%
Shelby	16	1	52	5%	0%
Stephenson	199	2	68	8%	1%
Union	151	9	44	11%	5%
Wabash	2	0	53	1%	0%
Warren	114	0	48	10%	0%
Washington	18	0	72	4%	0%
Wayne	11	1	42	6%	0%
White	2	0	39	2%	0%
Whiteside	140	12	75	7%	3%

Appendix 2: Examples of Terms and TF.IDF Scores

County	Term	TF.IDF
Effingham	Illinois	0.038891468
	health	0.034588521
	capacity	0.032424277
	hospital	0.032394
	phase	0.028099108
	social	0.028087738
	distancing	0.026390438
Knox	tissue	0.213666452
	cough	0.199726911
	wash	0.165025658
	hands	0.165025658
	avoid	0.155783661
	close	0.155783661
	contact	0.155783661
	fever	0.155783661
	risk	0.110155683
	soap	0.110155683
Lee	deaths	0.083333333
	cases	0.070379812
	positive	0.061701241
	totals	0.058925565
	recovered	0.041666667
Williamson	spread	0.074601186
	disease	0.067325541
	avoid	0.065328019
	sick	0.064377616
	tissue	0.05638372
	touching	0.052505028
	respiratory	0.052049086