

# **A comparison of the 1918 Flu and COVID-19 in four Missouri counties: disease transmission and county characteristics**

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# Purpose of this talk

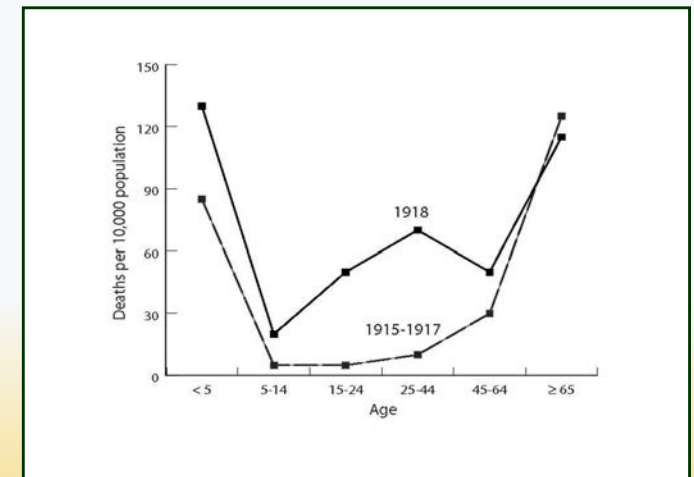
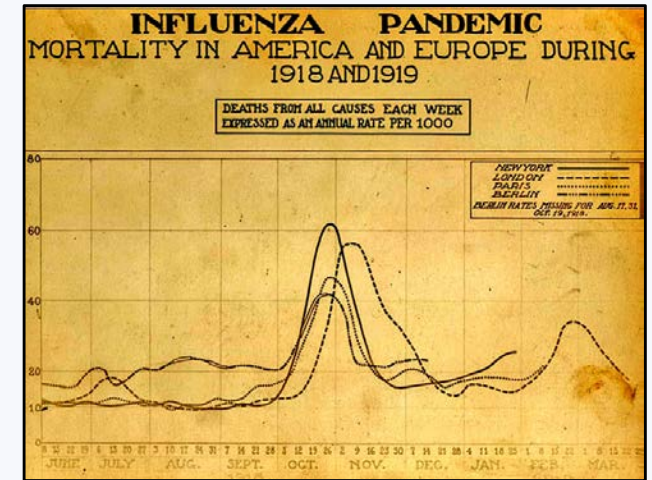
- Preliminary results from recently funded NSF project
- Project goal: to investigate how the experiences of individuals living in small cities and rural areas during a major pandemic differ from those observed in large, urban areas, with an emphasis on differences between counties
- Focus today on just 4 counties in Missouri: Boone, Buchanan, Jasper, Pemiscot

# Project activities

1. A comparison of the patterns of illness and death within specific counties during both the 1918 flu and the 2020 COVID-19 pandemics
2. Developing county profiles to characterize each county in both 1918 and 2020
  - Important variables include overall population size and age distribution, population density, socioeconomic status, availability and accessibility of health care resources, ethnic and racial composition, major occupations, transportation constraints, etc.
3. Assessing what characteristics of different counties may be most important in determining epidemic outcomes
4. Identifying control strategies that were used in 1918 and evaluating their potential effectiveness now

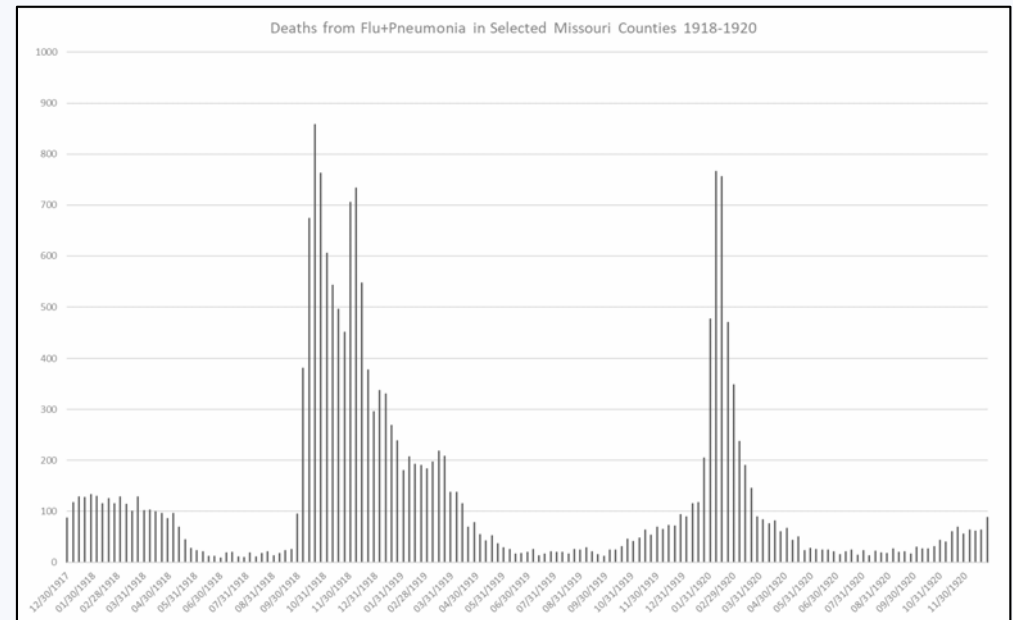
# 1918 Flu – quick overview

- Total global mortality estimated at 50 million or more
- Worldwide mortality rate averaged 2.5-5%, but highly variable with a range of < 1% to the death of nearly everyone in a community (mostly very small communities)
- Global spread clearly associated with troop movements at the end of WWI
- Mortality high for all ages; young adults especially hard hit relative to other flu epidemics



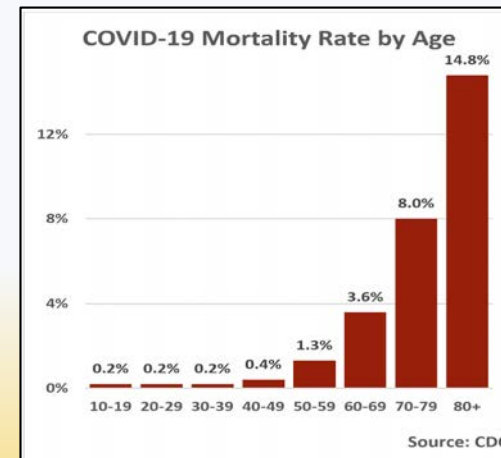
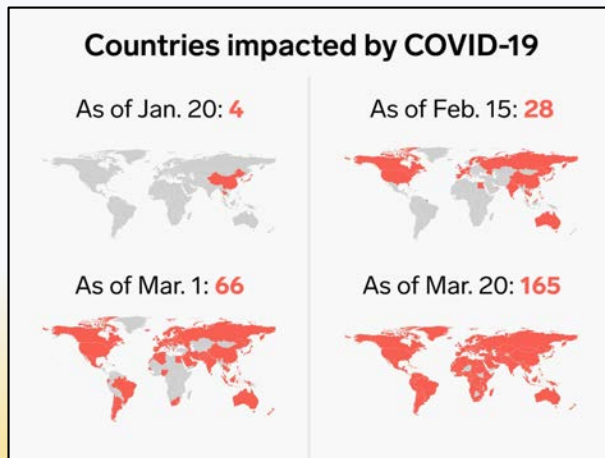
# 1918 Flu – quick overview

- Multiple waves; not all waves appeared in all locations
  - Wave I: Feb/Mar - July 1918
  - Wave II: late Aug 1918 - early winter 1919
  - Wave III: spring 1919
  - Echo: spring 1920
- Wave I relatively mild; majority of mortality associated with Wave II
- Some deaths due to influenza itself; many due to pneumonia or other secondary infections



# General characteristics of the COVID-19 pandemic

- Total global mortality has reached almost 750,000; US mortality is about 165,000
- Global spread linked to travel during the winter holidays; spread within countries is highly localized and variable
- Mortality highest for elderly and others with predisposing conditions; mortality very low for healthy young individuals



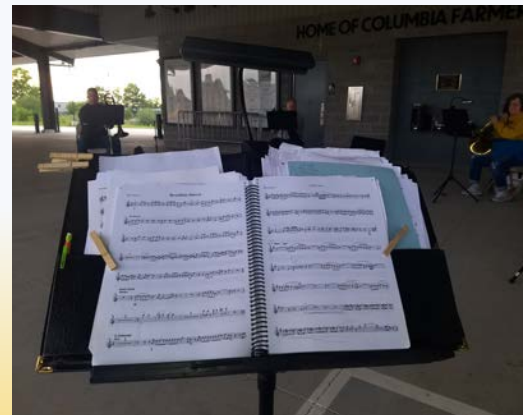
# Mortality during the 1918 flu and 2020 COVID pandemics

Region	Variable	1918 influenza	COVID-19
US	Total deaths	675,000	165,000
	Population	103,000,000	330,000,000
	Mortality Rate	660 deaths per 100,000 persons	50 deaths per 100,000 persons
World	Total deaths	50-100,000,000	725,000
	Population	1.8 billion	7.8 billion
	Mortality Rate	2800-5600 deaths per 100,000 persons	9.3 deaths per 100,000 persons

Remember, though, that the 1918 flu deaths were counted over 2 years, while the estimates for COVID-19 are over an 8-month period

# Similarities between the two pandemics

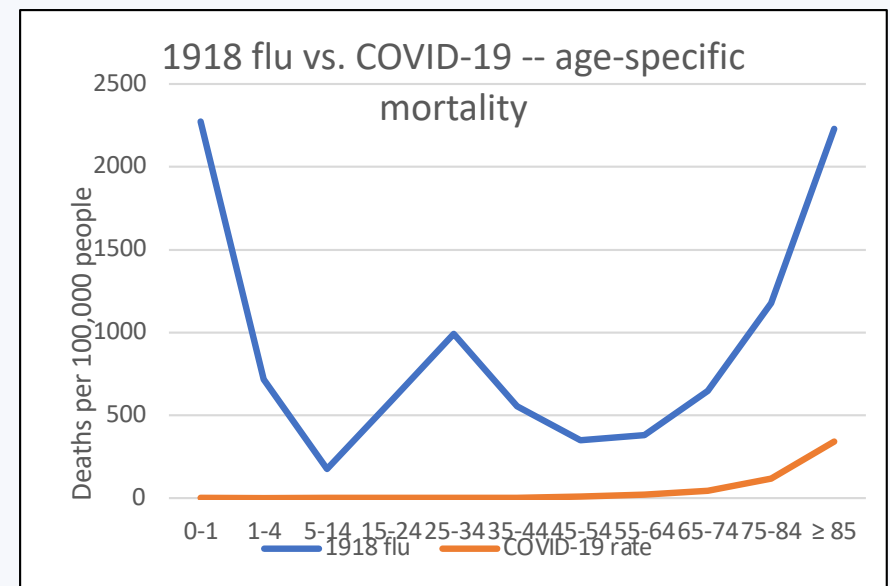
- Caused by respiratory viruses with predominantly droplet transmission
- Worldwide spread, but much variation across space
- Isolated communities, lower socioeconomic groups, and institutionalized persons at higher than average risk
- Social distancing and vaccination considered important mitigation strategies



Playing music while social distancing

# Some biological differences between the two diseases

- Different viruses
- Very different age distributions
  - Most marked difference between the pandemics
- Influenza has shorter serial interval (~3 days vs. ~4 days) – spreads faster



# Social/behavioral differences between the two pandemics

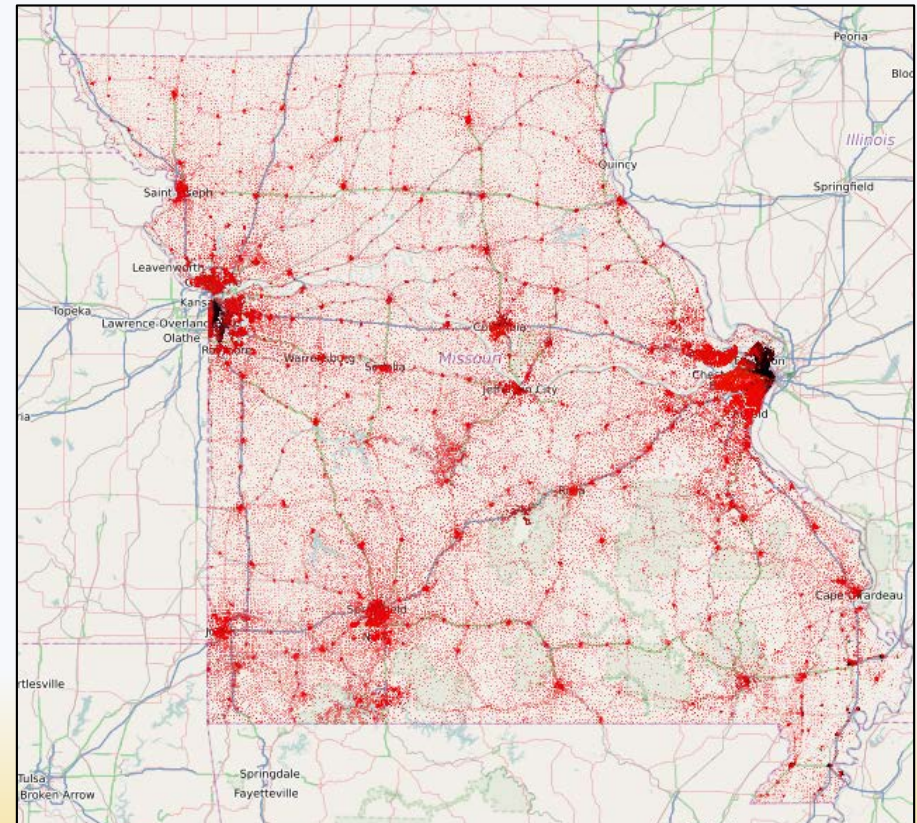
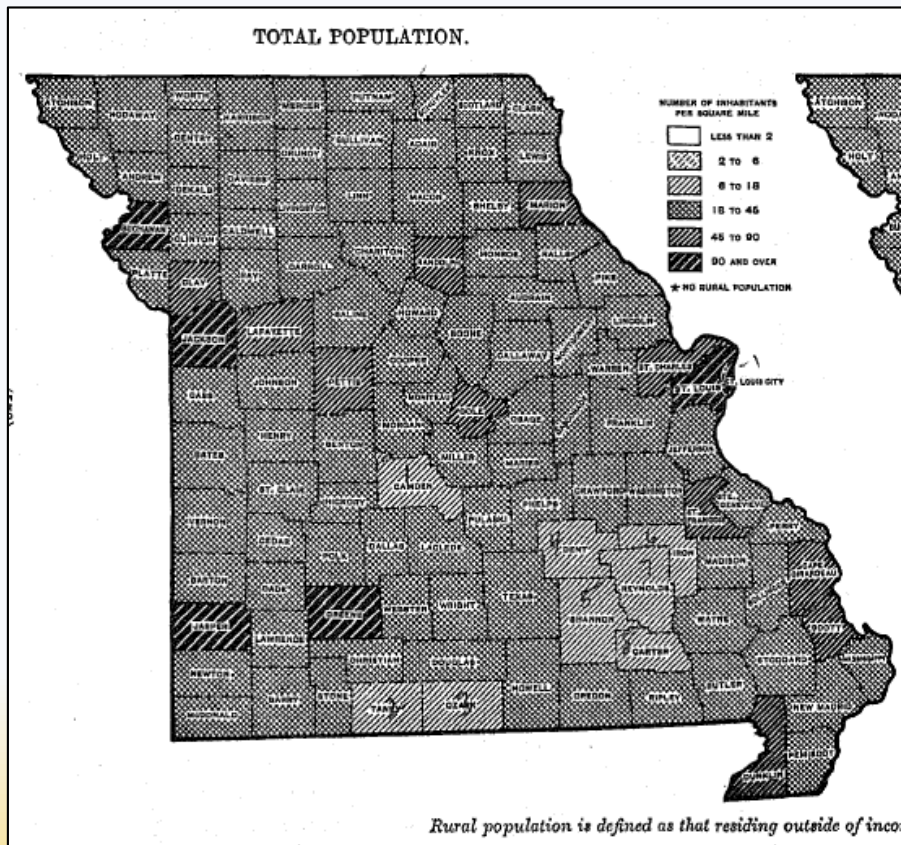
- Technological changes
  - Better treatments
  - Faster development of new treatments
  - Faster dissemination of information
- Differences in the types of important institutions and facilities
  - 1918 flu – orphanages, residential schools, mental asylums, factories
  - COVID-19 – nursing facilities, factories, recreational spaces



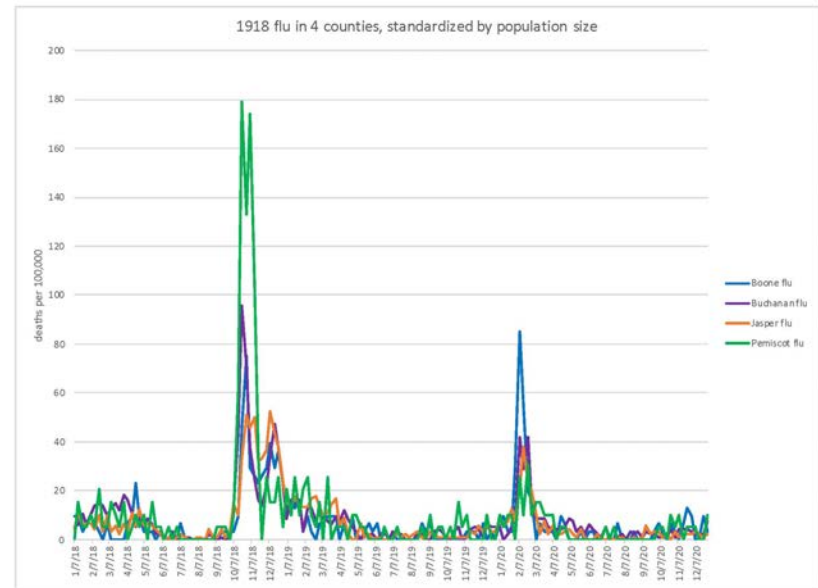
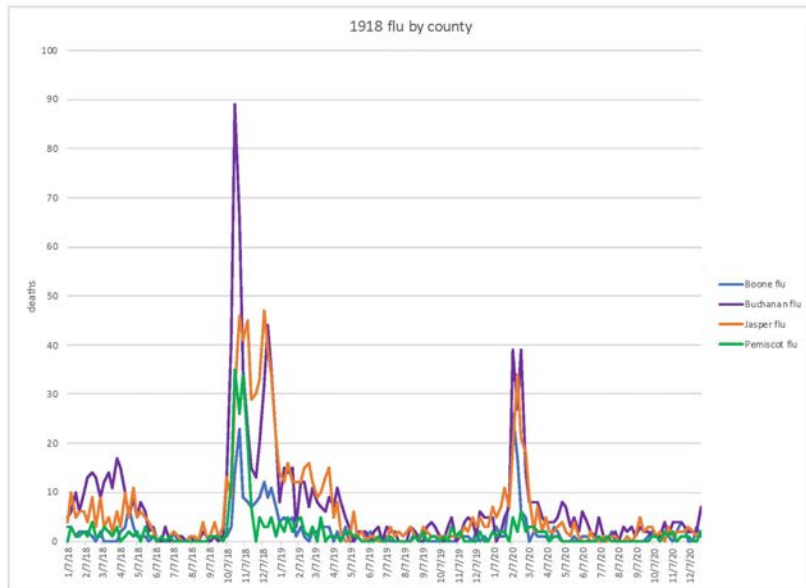
# Missouri – broad demographic comparisons

- 1910 population
  - 3,293,335
  - 51.3% male, 48.7% female
  - 42.5% urban, 57.5% rural
- Literacy rate 95.7%
  - Whites 97.1%
  - Non-white 82.6%
- 2010 population
  - 5,988,927
  - 49.0% male, 51% female
  - 70.4% urban, 29.6% rural
- Literacy rate 93% (2003 est)

# 1910 vs 2010 population density



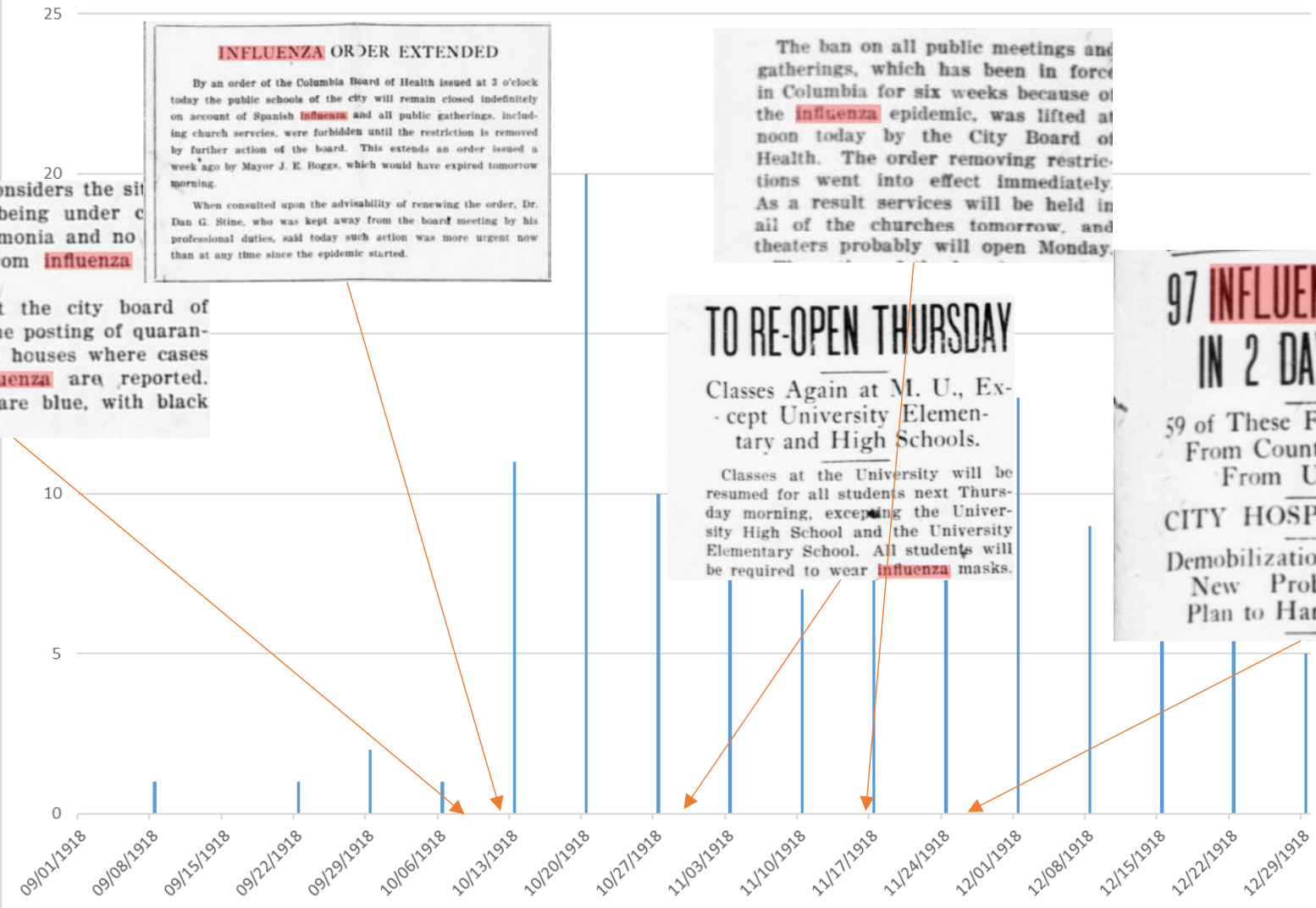
# 1918 flu comparison



# 1910 County Characteristics

	Population	Illiteracy rate	Dwellings	Families	Farms	Farm value
Boone	30,533	8.7%	7,167	7,421	3,442	7,860
Buchanan	93,020	3.4%	19,573	20,635	2,572	12,560
Jasper	89,673	2.6%	20,623	21,494	3,117	7,500
Pemiscot	19,559	11.9%	4,080	4,129	2,008	3,484

Boone County Second Wave Flu and Pneumonia Deaths (Sept 1918 to April 1919)



**INFLUENZA ORDER EXTENDED**

By an order of the Columbia Board of Health issued at 3 o'clock today the public schools of the city will remain closed indefinitely on account of Spanish **influenza** and all public gatherings, including church services, were forbidden until the restriction is removed by further action of the board. This extends an order issued a week ago by Mayor J. E. Boggs, which would have expired tomorrow morning.

When consulted upon the advisability of renewing the order, Dr. Dan G. Stine, who was kept away from the board meeting by his professional duties, said today such action was more urgent now than at any time since the epidemic started.

The ban on all public meetings and gatherings, which has been in force in Columbia for six weeks because of the **influenza** epidemic, was lifted at noon today by the City Board of Health. The order removing restrictions went into effect immediately. As a result services will be held in all of the churches tomorrow, and theaters probably will open Monday.

**TO RE-OPEN THURSDAY**

Classes Again at M. U., Except University Elementary and High Schools.

Classes at the University will be resumed for all students next Thursday morning, excepting the University High School and the University Elementary School. All students will be required to wear **influenza** masks.

**97 INFLUENZA CASES IN 2 DAYS' REPORT**

59 of These From Town, 31 From County and Seven From University.

**CITY HOSPITAL FULL.**

Demobilization to Make New Problem—Stores Plan to Handle Patrons.

However, he considers the situation in the city as being under control. No case of pneumonia and no deaths have resulted from **influenza** in the city.

Saturday night the city board of health ordered the posting of quarantine cards on all houses where cases of Spanish **influenza** are reported. The new cards are blue, with black letters.

—All of the parochial and public schools of the city were re-opened Monday, after being closed for a period of six weeks on account of the influenza epidemic. Although the street car strike made it difficult for some of the teachers and pupils to reach their destinations, the schools were generally well attended.

—A decided improvement in the influenza situation was evidenced in the

—Upon recommendation of Dr. H. DeLamater, city health officer, the public schools of St. Joseph were closed last Wednesday until December 30. Due to the fresh outbreak of influenza, the board of education held a meeting that day to consider the question of closing the schools. Although there has been only one death of a pupil since Nov. 20 in 12,000 children, the schools have become so badly demoralized by small attendance the board thought it advisable to put the closing order into effect again. There is nothing alarming about the conditions of pupils, as shown by Dr. DeLamater's report, and the closing order is simply a precautionary step that appears entirely justified at this hour. Many of the larger cities have taken the same action, and the citizenship of St. Joseph doubtless will be in full accord with the action taken by the board.

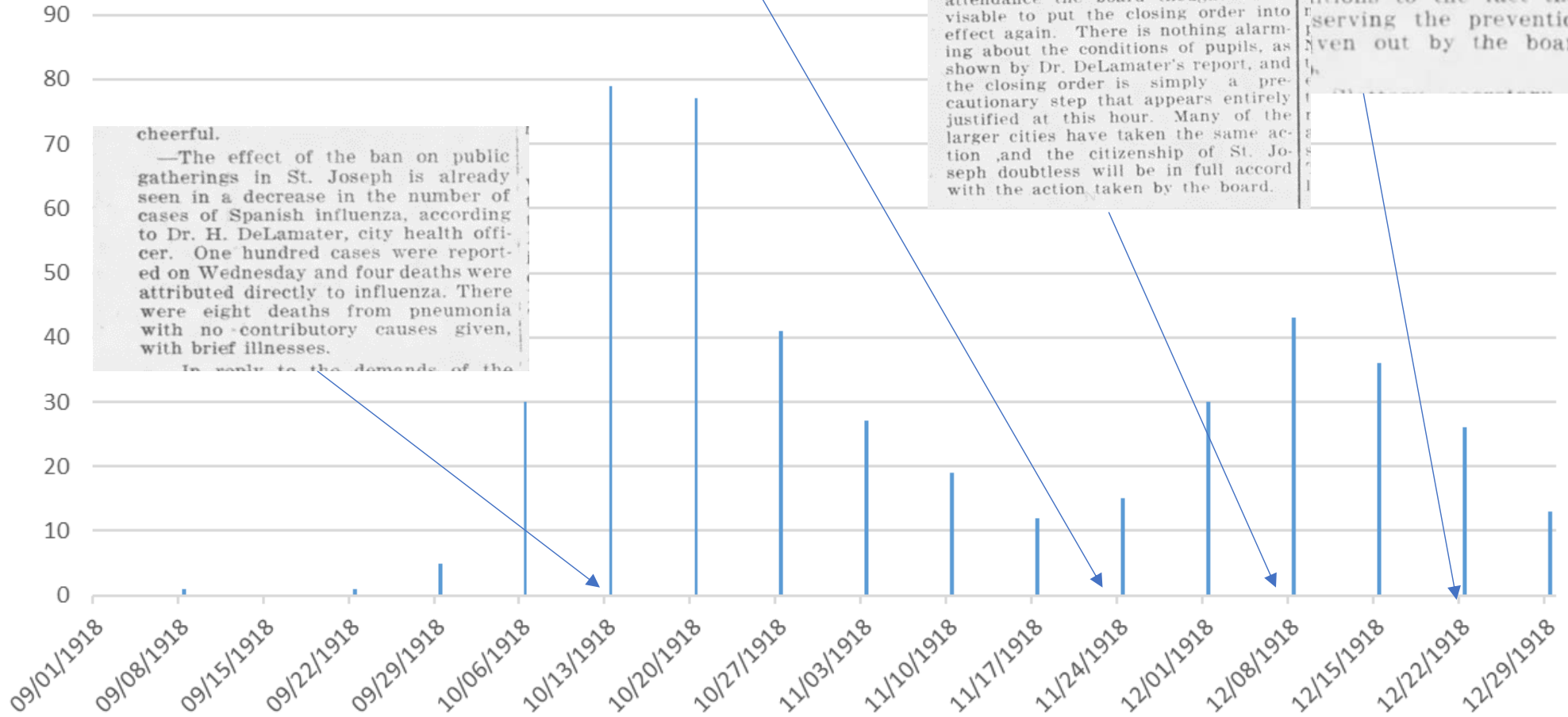
when only nine new deaths were reported of health. The number reported have been steady right along. There were cases reported Monday, 3:30 o'clock Sunday afternoon a new case was reported of health credits the conditions to the fact that serving the prevention given out by the board

cheerful.

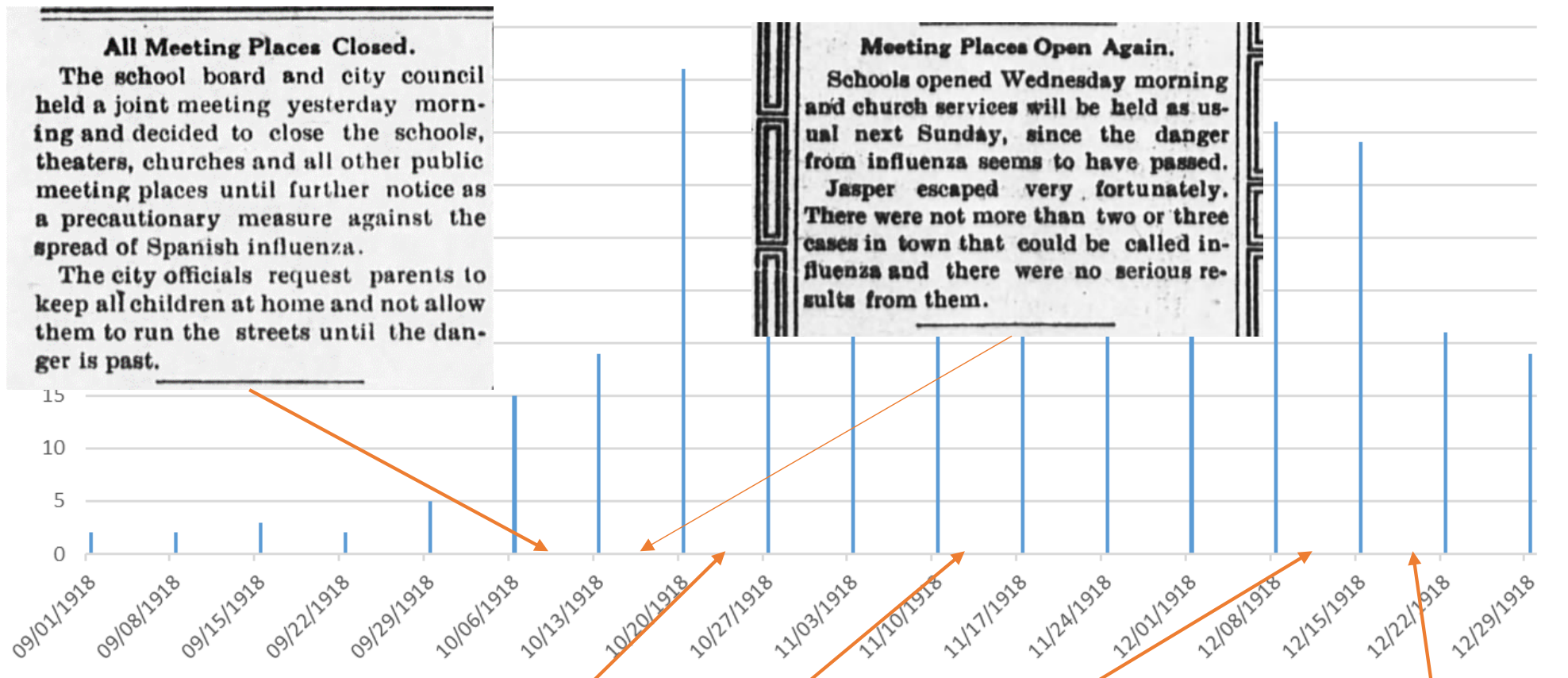
—The effect of the ban on public gatherings in St. Joseph is already seen in a decrease in the number of cases of Spanish influenza, according to Dr. H. DeLamater, city health officer. One hundred cases were reported on Wednesday and four deaths were attributed directly to influenza. There were eight deaths from pneumonia with no contributory causes given, with brief illnesses.

In reply to the demands of the

## Buchanan County flu+Pneumonia deaths Se



## Jasper County Flu+Pneumonia deaths Sept to Dec 1918



### All Meeting Places Closed.

The school board and city council held a joint meeting yesterday morning and decided to close the schools, theaters, churches and all other public meeting places until further notice as a precautionary measure against the spread of Spanish influenza.

The city officials request parents to keep all children at home and not allow them to run the streets until the danger is past.

### Meeting Places Open Again.

Schools opened Wednesday morning and church services will be held as usual next Sunday, since the danger from influenza seems to have passed. Jasper escaped very fortunately. There were not more than two or three cases in town that could be called influenza and there were no serious results from them.

### To All Good Citizens.

Because of the spread of influenza it has become necessary to enforce the most stringent regulations against its spread. Therefore it is hereby ordered that there be no public meetings of any kind. All school children, large or small, must keep off the streets. A strict quarantine will probably be placed on every house where the disease is known to be. If out of town people, having influenza at home, are known to be in town you will please notify the town health board. Observe the health rules—don't gather even in small groups on the street. It is serious in many places.

L. T. McCune, mayor.

### Influenza About Gone.

Of the 100 or more cases of influenza at one time scattered over the vicinity of Jasper probably but about four remain and they are all doing well. Following are the cases reported to The News yesterday: Burl Vincent, Claude Tabler, Ernest Rex and Guy Chapman.

### INFLUENZA ENJOYS BOOM

Nearly 80 Cases in Town But Confined to 20 Families.

Influenza got another good start here last week after being nearly stamped out. Friday night the city council had a meeting and put the ban on all public meetings, appointed an officer to look after families who were confined by the epidemic, to post quarantine signs on all infected homes and see that the quarantine rules were obeyed. W. H. Hager is this officer.

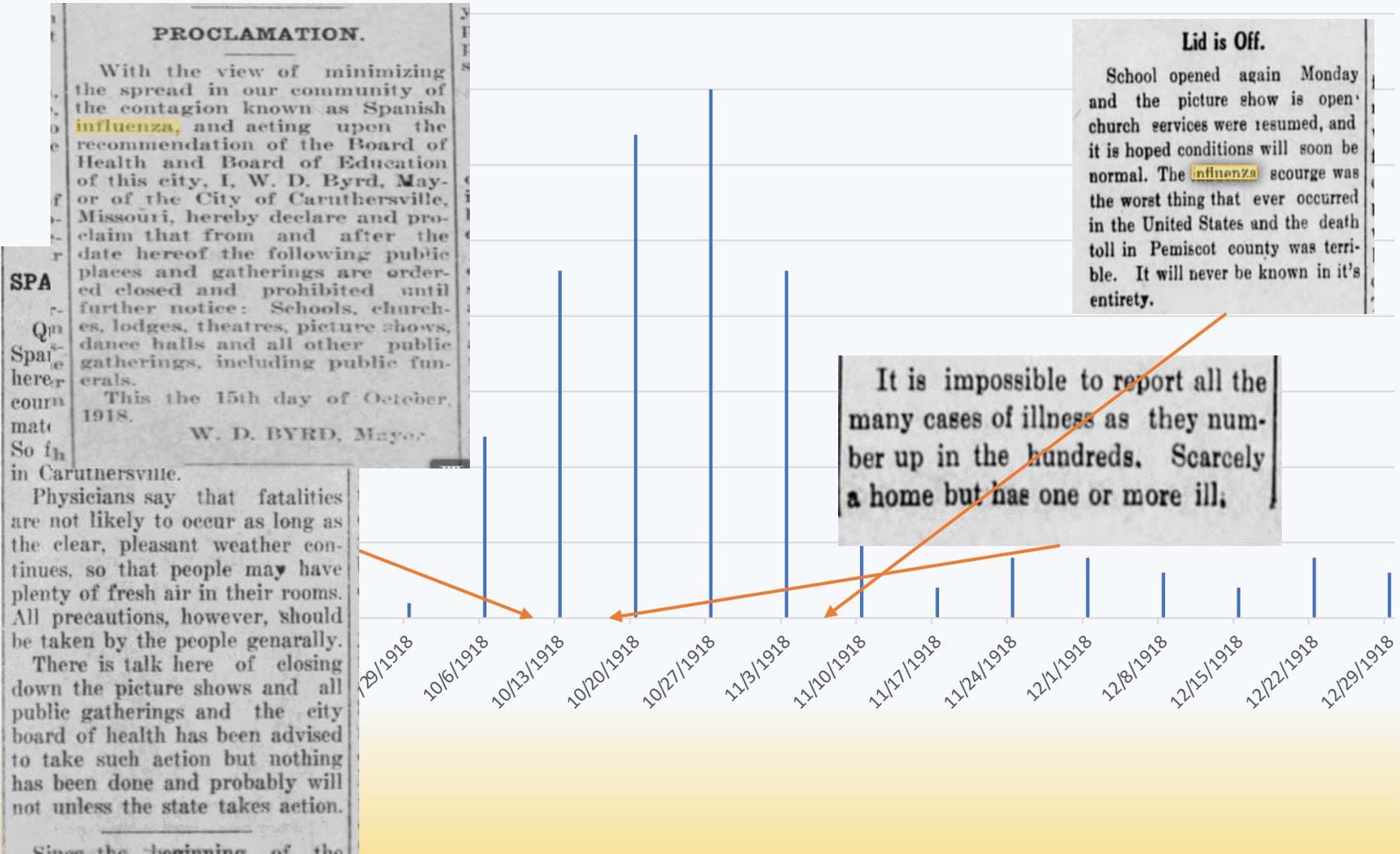
### Influenza on the Wane.

At this time last week there were some 80 cases of influenza in Jasper, but the number is close to 50 this week although there are a few new cases. The only very serious case in town today (Tuesday) is Mrs. Wm. Cline, Mrs. Fairfield's daughter, who lies very low of pneumonia. It is understood that there is little hope for her recovery.

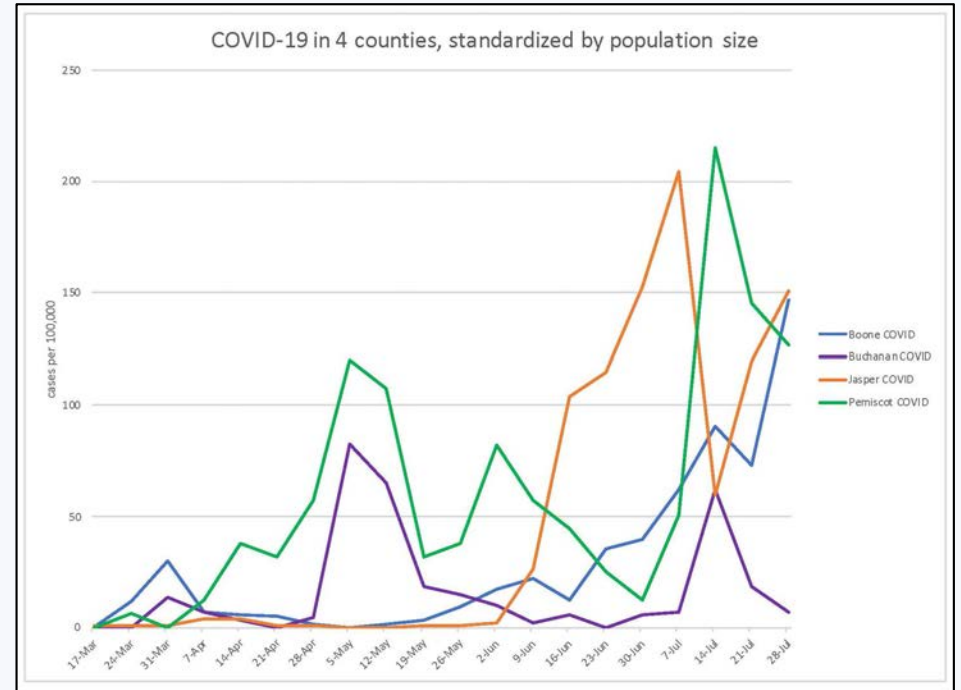
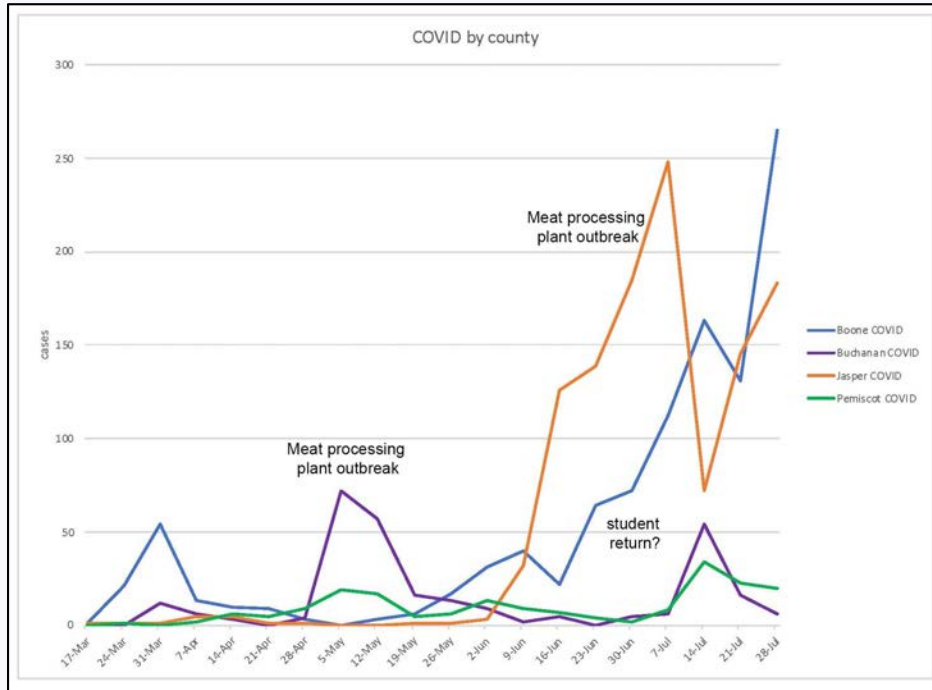
Charley Woodrow's household are all on their feet again, after a two-weeks' engagement in which Mr. Woodrow was nurse for his son George and his daughter, Mrs. Will Grifflit, and her husband and little daughter.

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# Pemiscot County Flu+Pneumonia Deaths Fall 1918



# Covid-19 comparison



# 2018 County Characteristics

	Population	Average age	HS grad rate	Per capita income	% poverty	% no health insurance
Boone	162,642	35.8	94.2	\$29,365	16.8	10.6
Buchanan	89,201	39.3	88.2	\$25,419	15.6	12.2
Jasper	117,404	38.1	87.0	\$24,086	16.6	15.1
Pemiscot	18,296	39.2	77.1	\$19,846	29.1	12.8

# Discussion – what did we learn? What can we learn?

- Know your potential hotspots
  - In both epidemics, local institutions played important roles in spread of virus
- How long is long enough?
  - Can the bimodal mortality curves in 1918 be explained looking at relaxation of NPIs? What does this tell us about COVID?
- Historical knowledge is important!
  - Most of the interventions we are turning to now were tried in the past. People today are interested and engaged in learning about the 1918 flu.

# What we hope will ultimately result from our project

1. A better understanding of the different constraints faced by rural vs. urban people in the face of widespread epidemics
2. Identification of additional county-level characteristics that may help to assess risks from future waves of COVID-19 or other epidemics to come
3. Additional insights from the historic record on how people have dealt with infectious disease epidemics when technological approaches and available drugs and other recent approaches to curing disease are limited
4. Good communications with state health authorities and others who might be in a position to make use of our results

# The MU Flu-COVID research team

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Jane McElroy, Department of Family and Community Medicine

XiuFeng (Henry) Wan, Departments of Molecular Microbiology, Veterinary Pathobiology, and Electrical Engineering and Computer Science

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Michael Andrade, Undergraduate student in Health Sciences

Catherine Hutinett, Undergraduate student in Anthropology and History

Grant Wallace, Graduate student in Statistics

Angelo Zorn, Undergraduate student in Mathematics and Economics (Occidental University, California)

*Previous undergrad assistants:* Sonia Clark, Willow Hutton

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