

Influenza and mortality for non-small cell lung cancer

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Background

Lung cancer is the leading cause of cancer deaths in the United States and worldwide. While influenza illness is known to be particularly dangerous for frail and elderly patients, the relationship between influenza illness and outcomes in cancer patients remains largely unknown.

Methods

Monthly mortality rates for all patients at risk, as well as newly diagnosed patients, with non-small cell lung cancer (NSCLC) diagnosed between 2009 and 2015 were compared during high and low flu months using data from the Surveillance, Epidemiology, and End Results (SEER) Program and the Center for Disease Control and Prevention (CDC) website. Influenza severity was determined by the percentage of outpatient visits to healthcare providers for influenza-like illness (ILI). CDC ILI activity levels were matched with SEER data by month and state. State-months with an ILI activity level of 8 or higher were considered to be high flu months, as defined by the CDC.

Results

- 194,409 patients with NSCLC from 13 states were included in the analysis.
- Monthly mortality rates for low and high flu months were 4.9 and 5.7%, respectively ($p = .001$).
- The monthly mortality rate for newly diagnosed patients was also significantly higher during high flu months (9.4 vs. 10.2%, $p = .01$).
- When the analysis was limited to winter months only, monthly mortality rates for low and high flu months were 4.7 and 5.3%, respectively ($p = .02$).
- The relationship between flu severity and mortality was also observed at the individual state level.

Conclusion

Increased influenza severity is associated with higher mortality rates for NSCLC patients. Future research should elucidate the relationship between vaccination and survival in lung cancer patients.

References

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2. Falsey, Ann R., & McElhaney, Janet E. (2018). Influenza burden in frail elderly. *The Lancet Respiratory Medicine*, 6(1), e2. doi: 10.1016/S2213-2600(17)30442-3.
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Patient Characteristics

	Count	%
Age	69 (median)	
Sex		
Female	91,366	47.0%
Male	103,043	53.0%
Race		
American Indian/Alaska Native	992	0.5%
Asian or Pacific Islander	14,140	7.3%
Black	24,085	12.4%
White	154,660	79.6%
Unknown	532	0.3%
AJCC 6th Stage		
I	42,870	22.1%
II	8,907	4.5%
III	47,841	24.6%
IV	92,830	47.7%
Occult	1,961	1.0%
State		
Alaska	266	0.1%
California	65,713	33.8%
Connecticut	9,555	4.9%
Georgia	24,782	12.7%
Hawaii	2,992	1.5%
Iowa	8,734	4.5%
Kentucky	18,056	9.3%
Louisiana	13,984	7.2%
Michigan	12,584	6.5%
New Jersey	21,803	11.2%
New Mexico	3,339	1.7%
Utah	2,301	1.2%
Washington	10,300	5.3%

Monthly Mortality Rates

Mortality Table

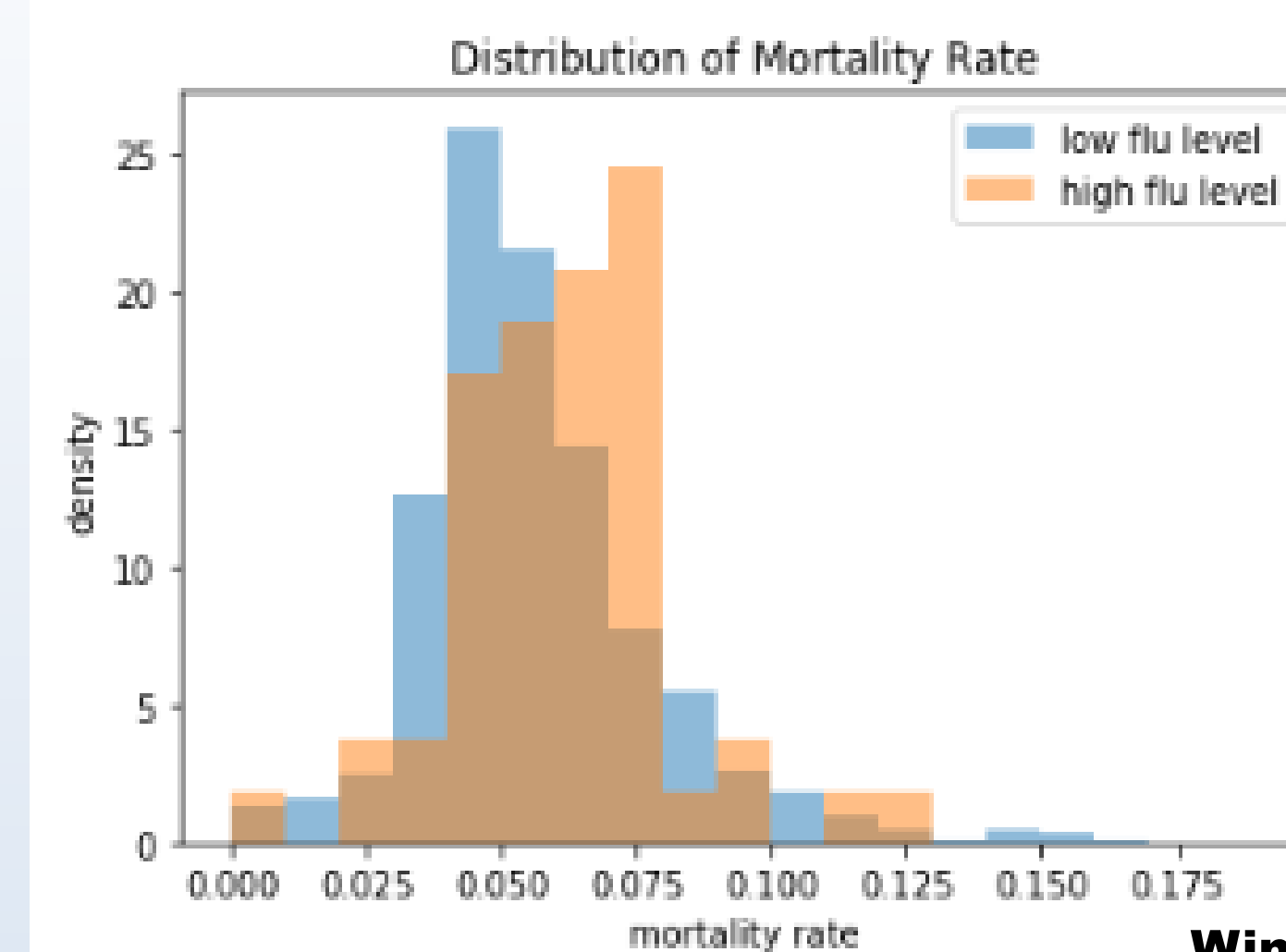
Month	State	# Tracking @ month beg	# Diagnosed	# Died	# Last FU Alive	# Tracking @ month end	Death Rate
Jan 2009	California	0	818	87	1	731	0.056
Feb 2009	California	730	765	171	1	1324	0.082
...
A _i	B _i	G _{i-1} - F _{i-1}	D _i	E _i	F _i	C _i + D _i - E _i	E _i / (C _i + D _i)
...
Nov 2015	Washington	1551	122	12	1	1585	0.052
Dec 2015	Washington	1556	134	7	19	1665	0.019

Remarks:
 # of Patients tracked at the beginning of month = # patients tracked end of the prior month - # Alive last FUs
 # of Diagnosed + # Tracking at beginning of month = # Died + # Tracking at end of month

Mortality Summary

Low Flu Mortality Rate: 0.0489
 High Flu Mortality Rate: 0.0572
 Difference: 0.0084

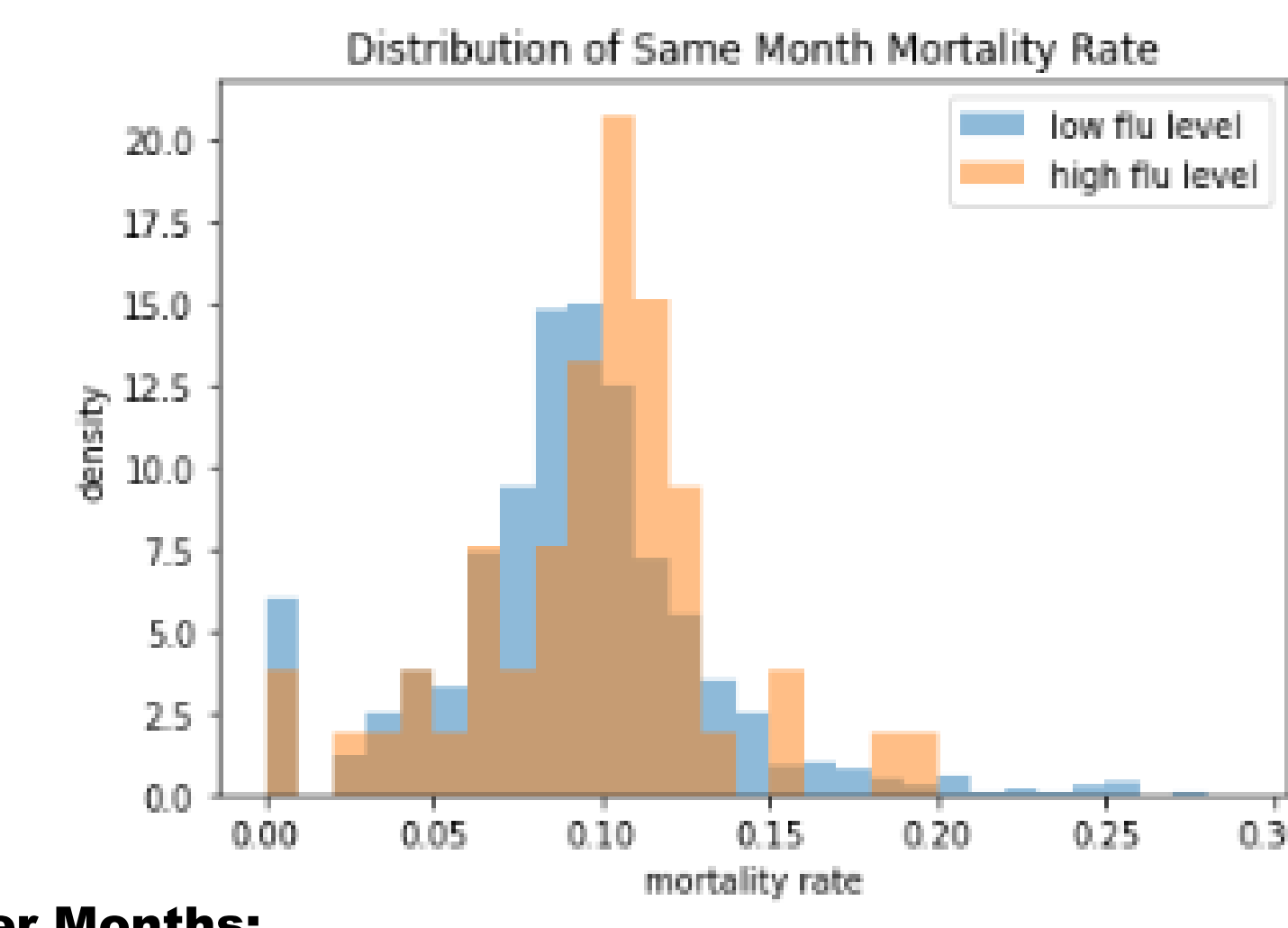
Running Permutation Test...
 p-value: 0.001



One Month Mortality Summary

Low Flu Mortality Rate: 0.0937
 High Flu Mortality Rate: 0.1018
 Difference: 0.0082

Running Permutation Test...
 p-value: 0.0103

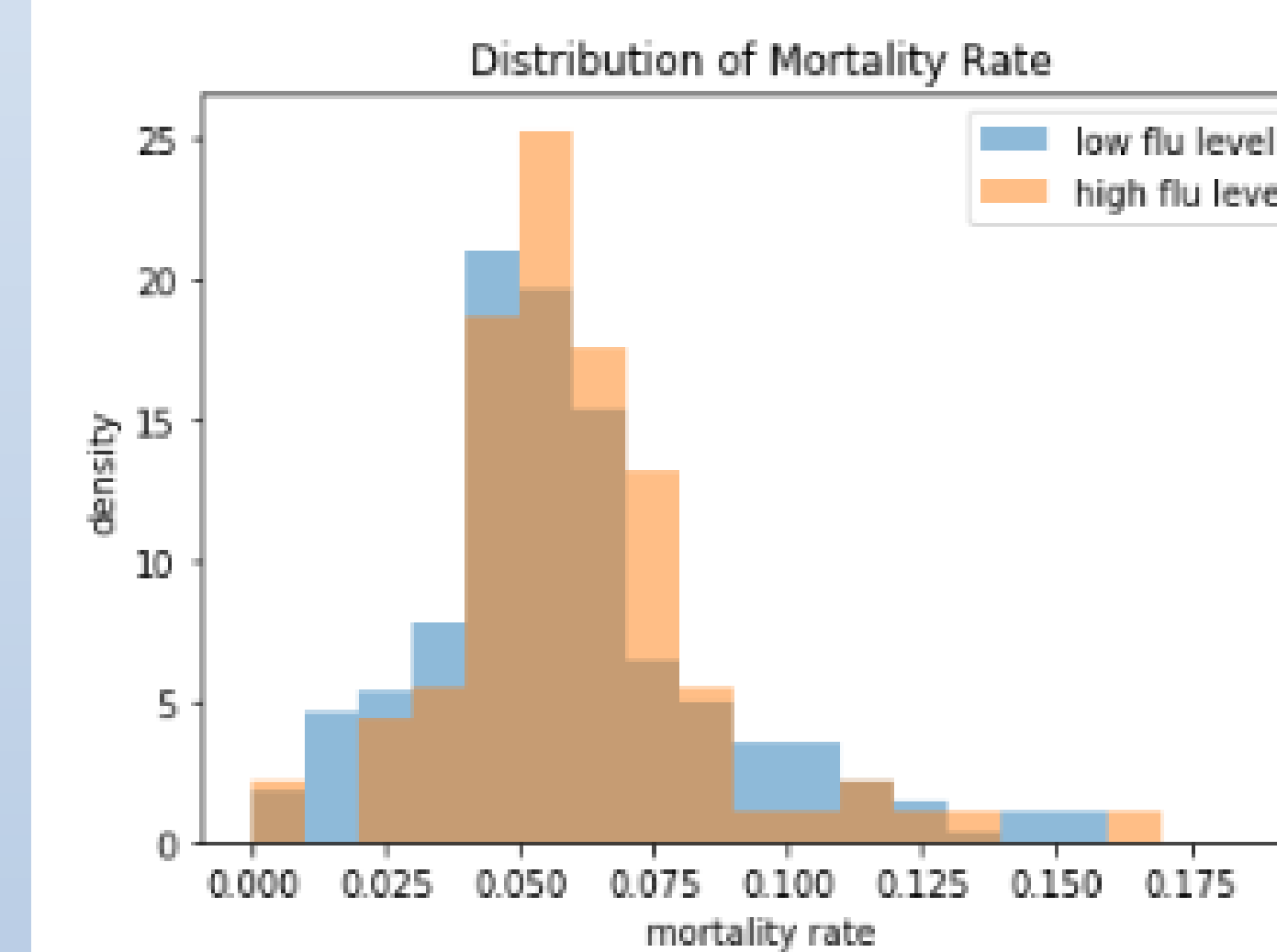


Winter Months:

Mortality Summary

Low Flu Mortality Rate: 0.0473
 High Flu Mortality Rate: 0.0527
 Difference: 0.0054

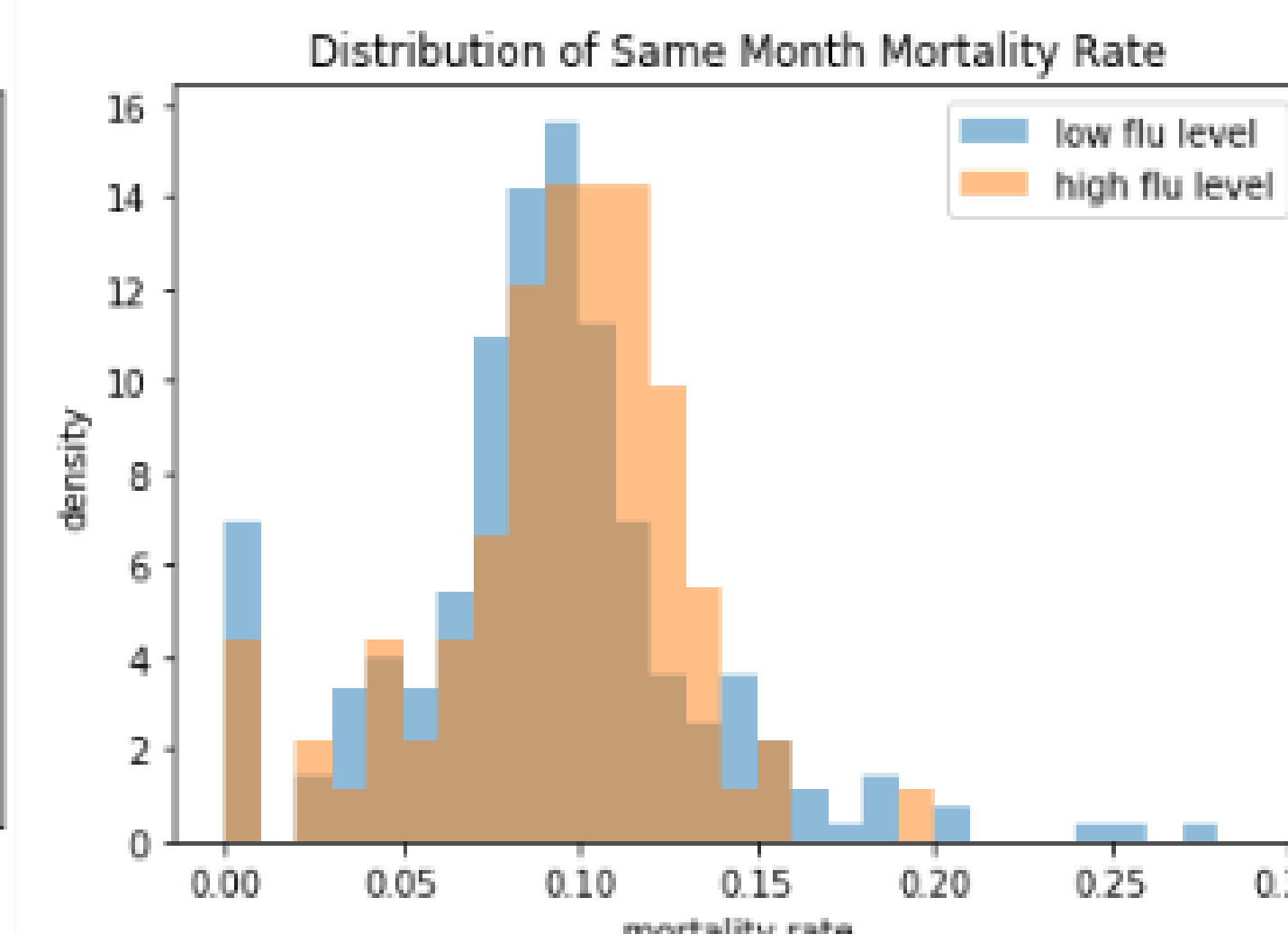
Running Permutation Test...
 p-value: 0.0206



One Month Mortality Summary

Low Flu Mortality Rate: 0.0917
 High Flu Mortality Rate: 0.0983
 Difference: 0.0066

Running Permutation Test...
 p-value: 0.0222

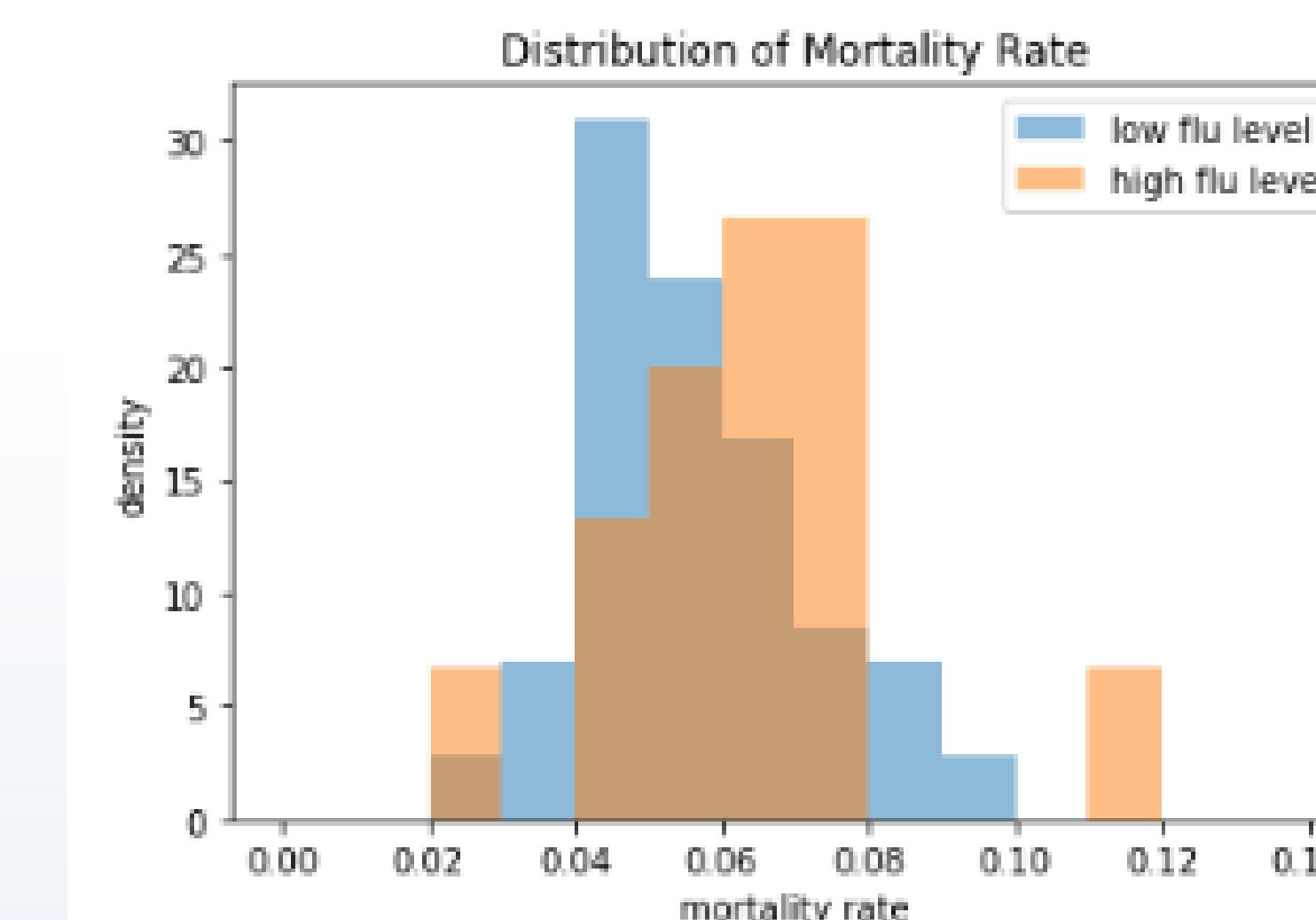


Monthly Mortality Rates by State

Mortality Summary

Low Flu Mortality Rate: 0.0502
 High Flu Mortality Rate: 0.0546
 Difference: 0.0044

Running Permutation Test...
 p-value: 0.1391



Mortality Summary

Low Flu Mortality Rate: 0.0481
 High Flu Mortality Rate: 0.0572
 Difference: 0.0091

Running Permutation Test...
 p-value: 0.0151

