Analysis of Hospital Admissions Related to Cardiovascular Disease

The overall objective of this project is to identify ways to reduce the number of hospital readmissions related to new onset cardiovascular disease(CVD).

Some of the questions we would like to answer include:

- Is there a relationship between new onset CVD and number of hospital stays in a year? Based on other reports of hospital readmissions[1,2], this should prove to be true.
- Comparing participants with and without new onset CVD:
    - Does depression score have an impact on a patient's number of hospital stays?
    - Does number of hospital stays differ between people of different ethnicities?
    - Does number of hospital stays differ between people with different levels of food security?
    - Is there a relationship between current blood lab levels, body composition, and number of hospital stays?

Number of Hospital Stays in the Last Year - Initial Exploration

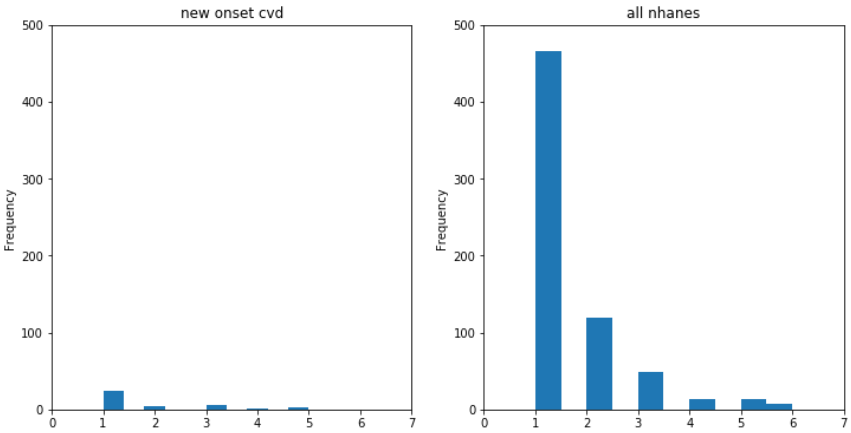
There were 670 and 38 entries for hospital stays of 1 or more night from the entire 'nhanes' dataset and the 'newcvd' data subset, respectively.

The following table illustrates overall numbers of nhanes (overall) vs newcvd (subset) number of hospital stays. Note that the newcvd subset has a very limited number of hospital stays overall (n=38).

Number or hospital stays	nhanes	newcvd
1	466	24
2	120	5
3	49	6
4	14	1
5	13	2
6 or more	8	0

Frequency of Hospitalization for New Onset CVD vs overall NHANES participants

Number of hospital stays for NHANES participants with new onset CVD vs overall NHANES (includes only participants who had 1 or more overnight hospital stay in the year of the study)



We found that the median number of hospital stays of both the new onset cvd and nhanes were both 1, as would be expected, since most people in general don't get admitted to the hospital overnight more than once per year. Therefore, to further examine the frequency data, we grouped together '2, 3, 4, 5, and 6 or more stay' selections, and compared the percent of stays and median number of stays between nhanes and newcvd:

	% of total hospital admissions that are readmissions	Median number of readmissions
newcvd	37%	3
nhanes	30%	2

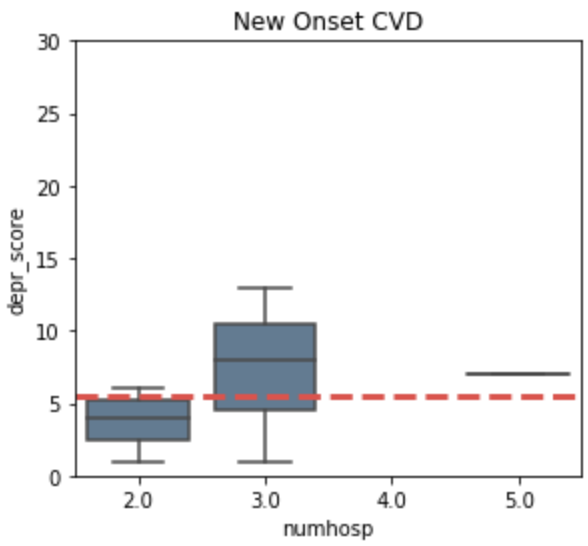
Two or more hospital admissions per year are more common with new onset CVD when compared with hospital readmissions for the general population, which is supportive of what we understand based on other reports.

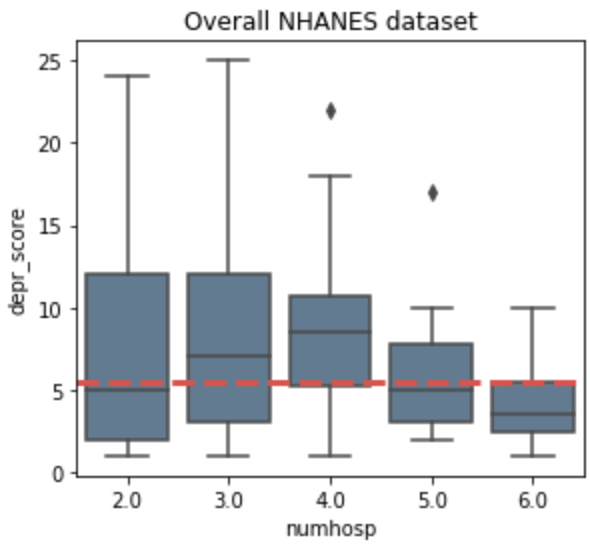
Next, we examined other factors that could affect the number of hospital readmissions.

NOTE: From here forward, we focused on participants who had two or more hospitalizations in the year of the study.

Impact of Depression Score

Depression Score by Number of of Hospital Stays





	newcvd	nhanes
Median depression score (2+ admissions) ('---' in figure above)	5.5	6.0
Median depression score (1+ admissions)	5.0	3.0

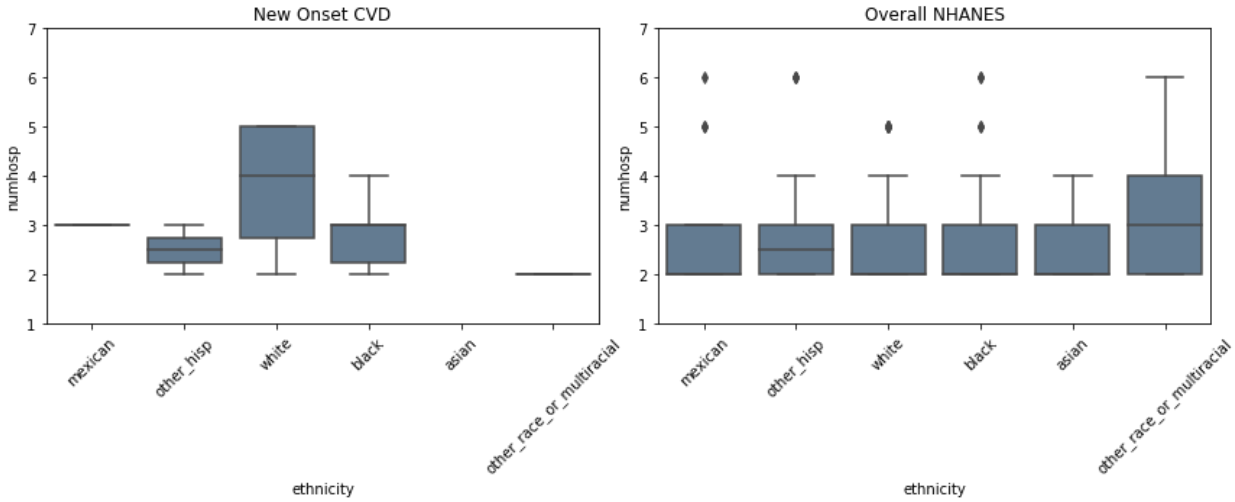
A depression score of 5-9 indicates mild depression, and from 10 to 27 indicate levels of depression from moderate to severe.

For 2 or more hospital admissions, the median depression score was not significantly different between newcvd and nhanes. However, for any number of hospital stays (i.e., 1 or more), the overall nhanes dataset seems to have a lower depression score compared to each of the other datasets.

Many of the hospital admissions in nhanes included reasons such as acute illness and emergencies, and these participants may have had a different depression score compared to those who had 2 or more hospital readmissions (which would indicate chronic illness). Therefore, it would be helpful to further examine depression score, chronic illness, and readmissions, in order to determine if there is indeed a link between chronic illness-related hospital readmissions and depression scores. Prior to discharge and at intervals recommended by mental health providers, addressing and following up on a patient's mental health status, particularly for patients with chronic disease, could be beneficial patients providing better self-care and in preventing readmissions..

Continuing to explore some of the other features of the dataset and their relationship to number of hospital readmissions, we looked at possible relationships between the number of admissions and ethnicity.

Impact of Ethnicity:



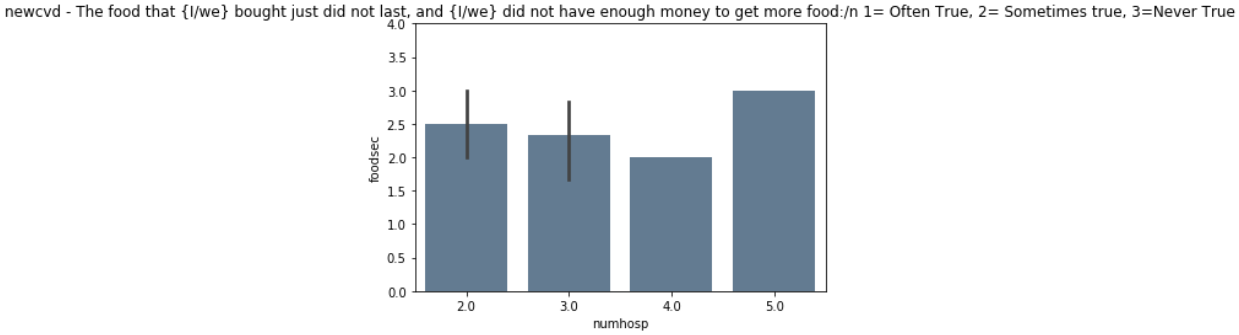
For new onset cvd, 42.9 % of participants identified as Black, and 29% identified as White, and for nhanes, 27% of participants identified as Black and 30% identified as White.

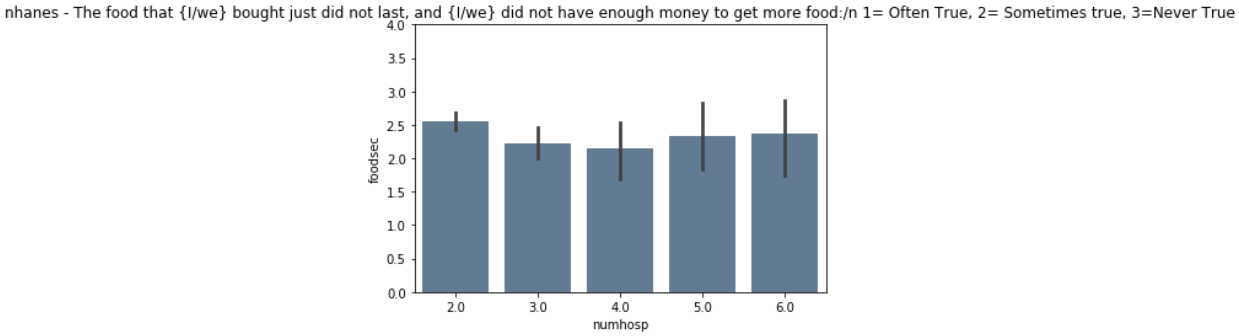
Median number of readmissions:

	Black	White
newcvd	3	4
nhanes	2	2

This suggests a correlation between White ethnicity and recurrence of hospital stays for new onset CVD. There also appears to be a slightly less strong correlation between Black ethnicity and recurrence of hospital stays for new onset CVD. Further investigation is needed as to the strength of the correlations and possible reasons this would be the case.

Impact of Food Security





Median food security scores:

newcvd	3.0
nhanes	3.0

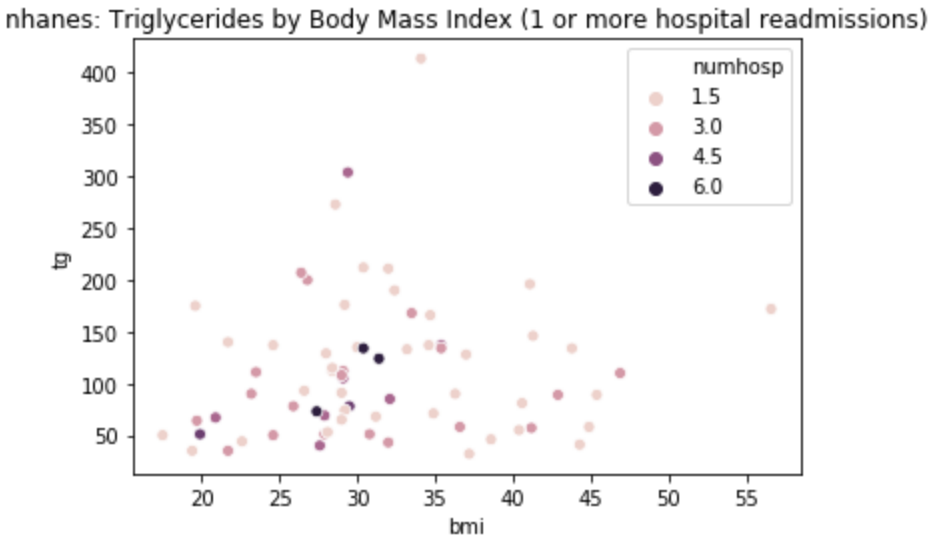
A lower foodsec score (1 or 2) would indicate food insecurity - i.e., unreliable access to food. It appears that hospital readmissions were not affected by food availability for both groups. From the figures above, it appears that 4 hospital stays per year may be associated with a lower foodsec level compared with other number of hospital stays, but this is not likely to be significant. Statistical analysis would be required to confirm or deny correlation.

Impact of Blood Laboratory Values and Body Composition

We were unable to analyze blood laboratory values for newcvd participants with hospital readmissions, due to very limited pieces of this data. However, we were able to analyze the nhanes readmission dataset.

We viewed several of the blood laboratory values (above of which is just one example), and have not yet found any apparent correlations between number of hospital stays, blood laboratory values,

and body composition. Further exploration is planned.



Summary:

We examined several features of the dataset and their relationship with the number of hospital readmissions. Unfortunately, the newcvd dataset is very limited, particularly when we focus on those participants with greater than one hospitalization (n=14). Aside from this, the following are our conclusions and recommendations:

- Two or more hospital admissions per year are more common with new onset CVD when compared with hospital readmissions for the general population

- For any number of hospital stays (i.e., 1 or more), the overall nhanes dataset has a lower (better) depression score compared to each of the other datasets. It would be helpful to further examine depression score, chronic illness, and readmissions, in order to determine if there is indeed a link between hospital readmissions and depression scores.

- There appears to be an association between White ethnicity and greater recurrence of hospital stays for new onset CVD. There also appears to be a slightly less strong association between Black ethnicity and recurrence of hospital stays. Further investigation is needed as to the strength of the associations and possible reasons this would be the case.

- Hospital readmissions are not affected by food availability for both groups. It appeared that 4 hospital stays per year may be associated with a lower foodsec (worse) level compared with other number of hospital stays, but was not likely to be significant.

- We plan to further explore trends in blood laboratory values, body composition and hospital readmissions. For this, we will likely need to focus on the overall nhanes dataset, since there is not sufficient data to examine only new onset CVD participants.

References:

1. Go AS, et al. Heart disease and stroke statistics—2015 update: a report from the American Heart Association. Circulation. 2014;129:29–323.

2. Ziaeian B, Fonarow GC. The Prevention of Hospital Readmissions in Heart Failure. Prog Cardiovasc Dis. 2016;58(4):379-85.