

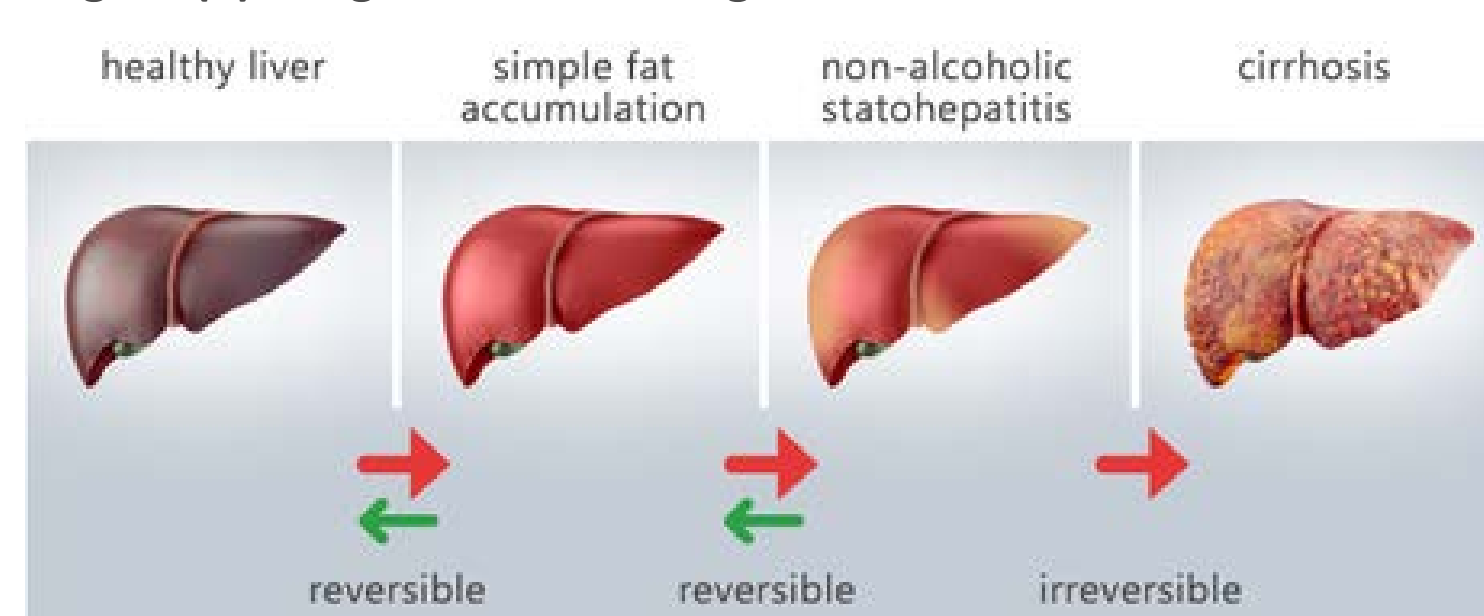
## Using Nationally Representative Dataset to Understand Trends & Risk Factors for Non Alcoholic Fatty Liver Disease in the US

Hanan Al-Awadhi, Paawan Singh, Luke Bruski, Wesley Marrero Colon, Seungho Woo, Mariel Lavieri\*, Neehar Parikh\*\*, David Hutton\*,\*\*\*

### Problem Statement

- M** Non alcoholic fatty liver disease (NAFLD) is an umbrella term for a range of liver conditions affecting people who drink little to no alcohol. Recently, it has become the most common liver disease in the Western countries.<sup>1,2</sup>
- M** NAFLD includes non alcoholic steatohepatitis (NASH) which could at a later stage progress into cirrhosis and hepatocarcinogenesis (liver cancer).<sup>1,2</sup>
- M** The treatment options for cirrhosis, liver cancer and liver failure are currently limited to liver transplantation.<sup>3</sup>
- M** As of September 2018, more than 14,000 patients are actively listed on the United Network for Organ Sharing (UNOS) waiting list for liver transplantation.<sup>4</sup>
- M** The rising prevalence in NAFLD and NASH among the US population could further impact the supply of donor livers.
- M** Predictive modeling of NAFLD and NASH, could help in devising disease management programs, mitigation strategies and related policies for healthier population and adequate supply of donor livers.

Figure (1): Stages of liver damage due to NAFLD.<sup>5</sup>



### Modeling Approach

- M** Mathematical modeling and analysis of the continuous National Health and Nutrition Examination Survey (NHANES) public data between 2005 and 2016 were performed in SAS 9.4 (SAS Institute Inc.) to further understand the NAFLD trends and risk factors among adult US population.
- M** Dataset included 14,864 adult participants (> 18 years).
- M** US Fatty Liver Index (USFLI) was used as a noninvasive, validated estimate on the US population for hepatic steatosis.<sup>6</sup>
- M** NAFLD was defined as having a USFLI > 30 in the absence of heavy alcohol use and other known liver diseases.
- M** NAFLD Fibrosis Score (NFS) was defined as the probability of low/high risk of having advanced fibrosis. NFS > 0.676 is a positive predictor value of advanced fibrosis.
- M** Significant alcohol intake (heavy drinking) was defined as having > 2 drinks per day for men or > 1 drink per day for women.

### Results

#### Prevalence of NAFLD & NFS

Figure (2): Prevalence of USFLI among US adult population between 2005 and 2016. In absence of heavy alcohol drinking, a value of USFLI > 30 indicates presence of NAFLD.

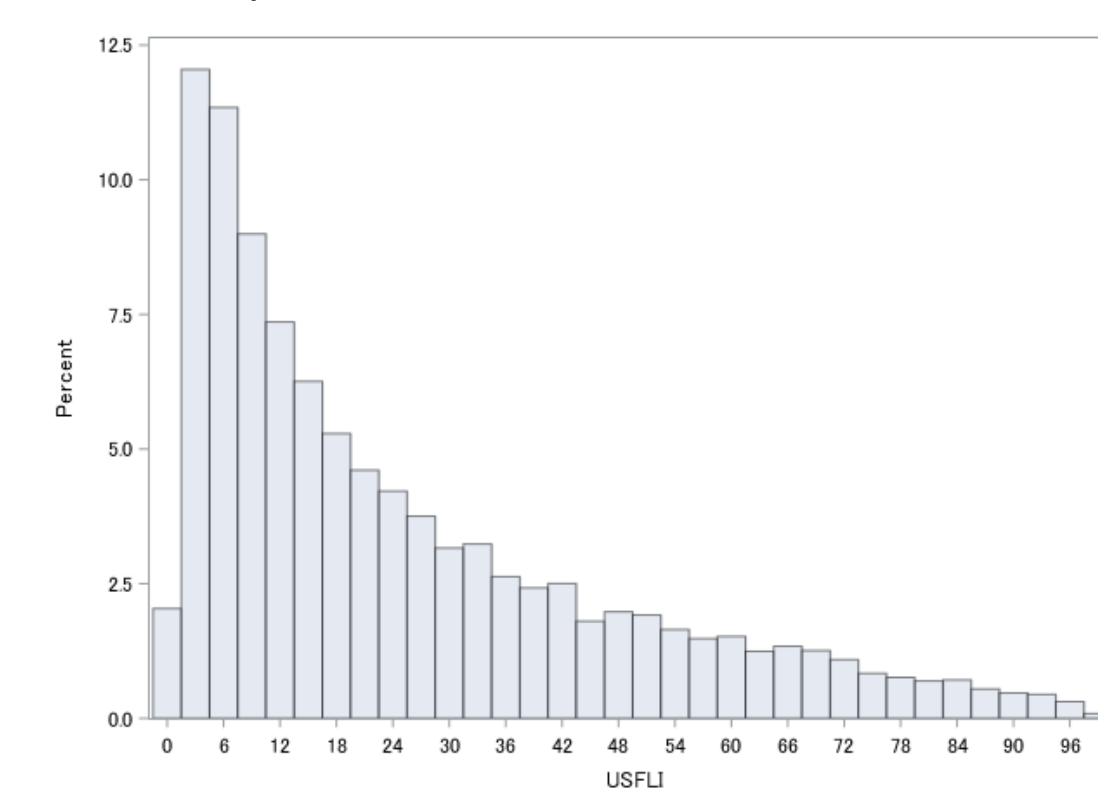


Figure (3): Prevalence of NAFLD among US adult population between 2005 and 2016.

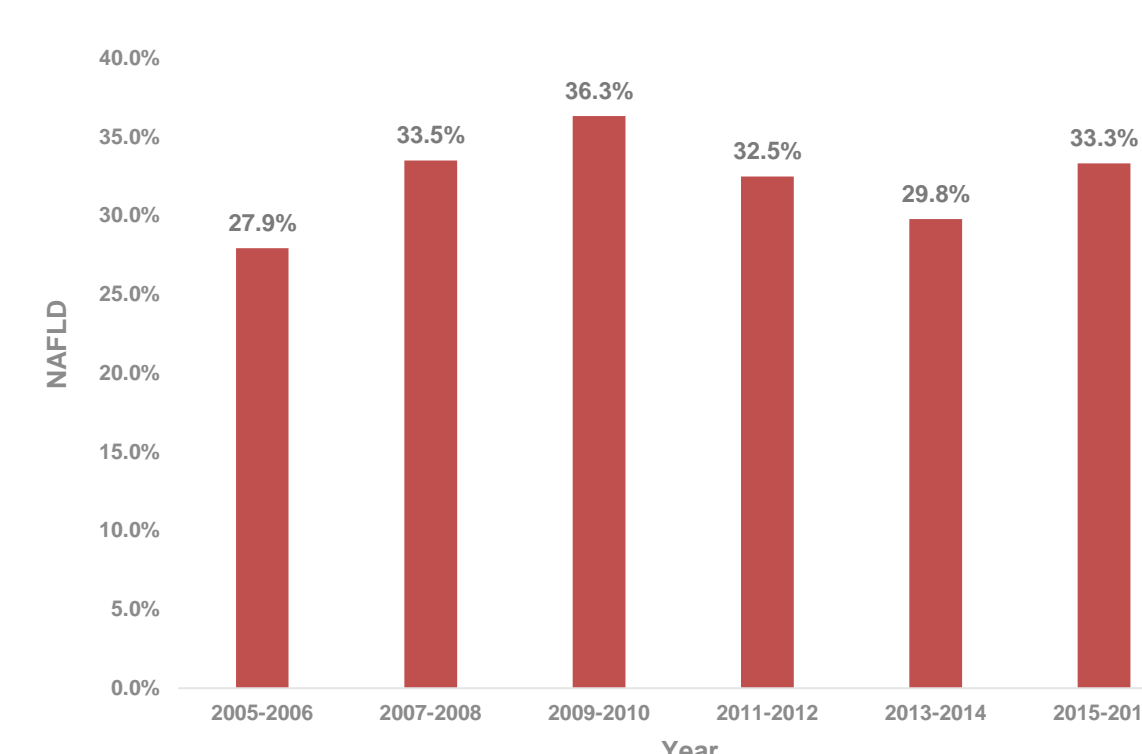


Figure (4): Prevalence of NFS among NAFLD patients between 2005 and 2016 in the US. NFS > 0.676 indicates presence of advanced fibrosis.

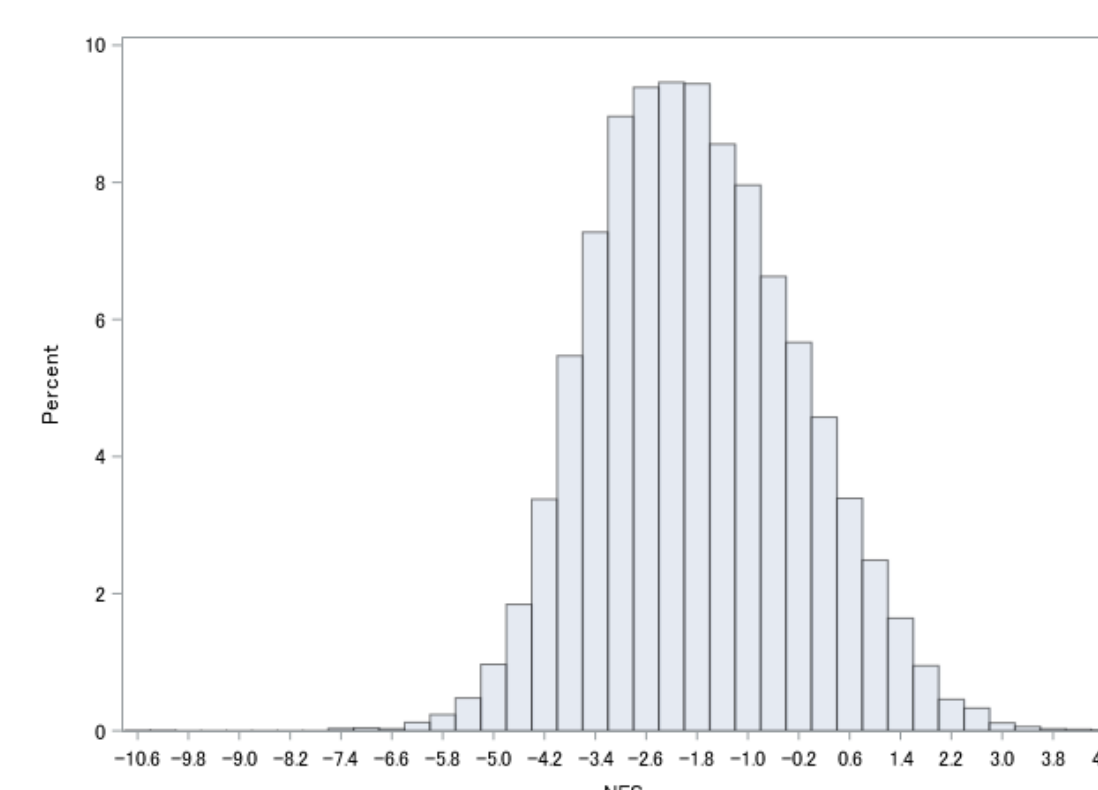
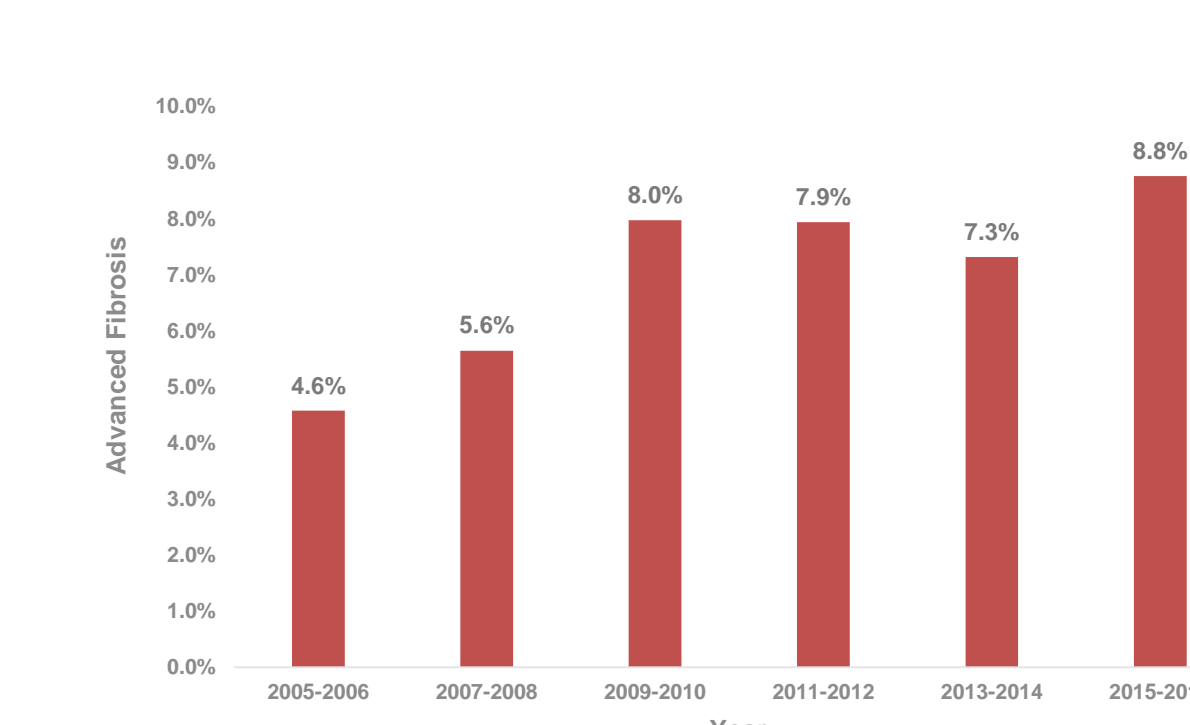


Figure (5): Prevalence of advanced fibrosis among NAFLD patients between 2005 and 2016 in the US.



#### What could impact NAFLD?

Figure (6): Prevalence of NAFLD among US Adult Population relative to their BMIs between 2005 and 2016.

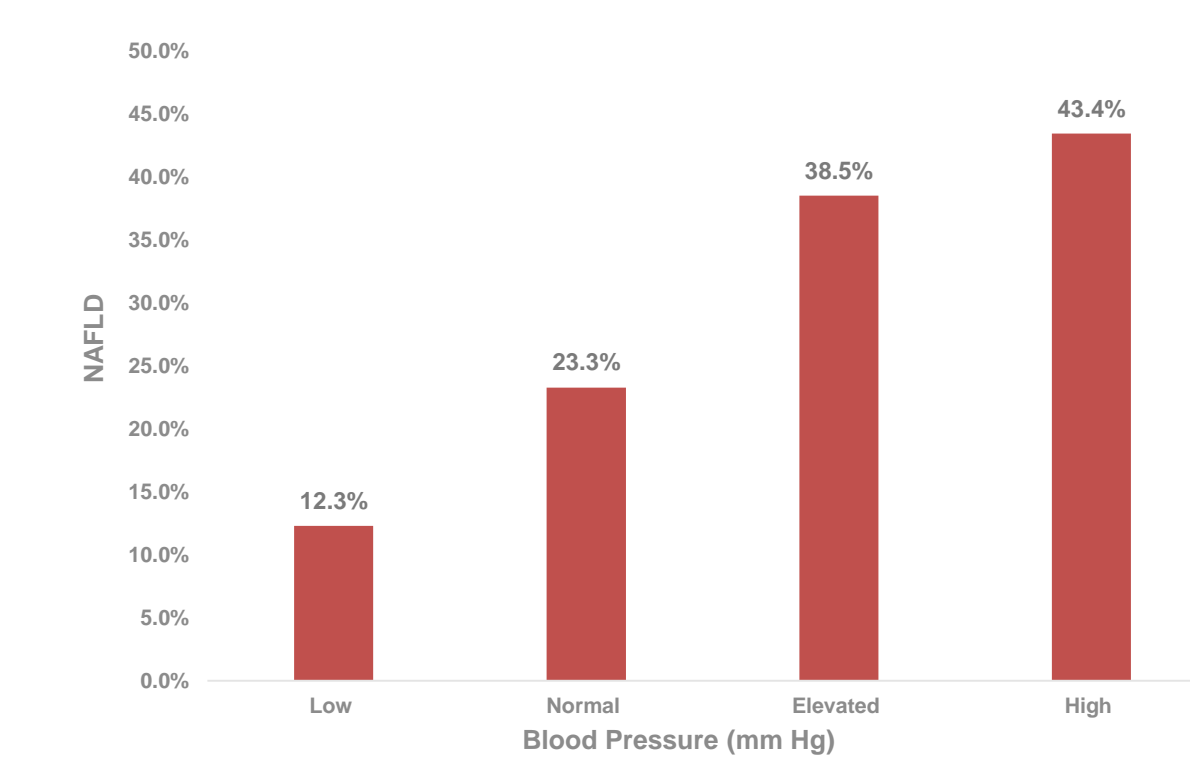


Figure (7): Prevalence of NAFLD among US Adult Population relative to their blood pressure between 2005 and 2016.

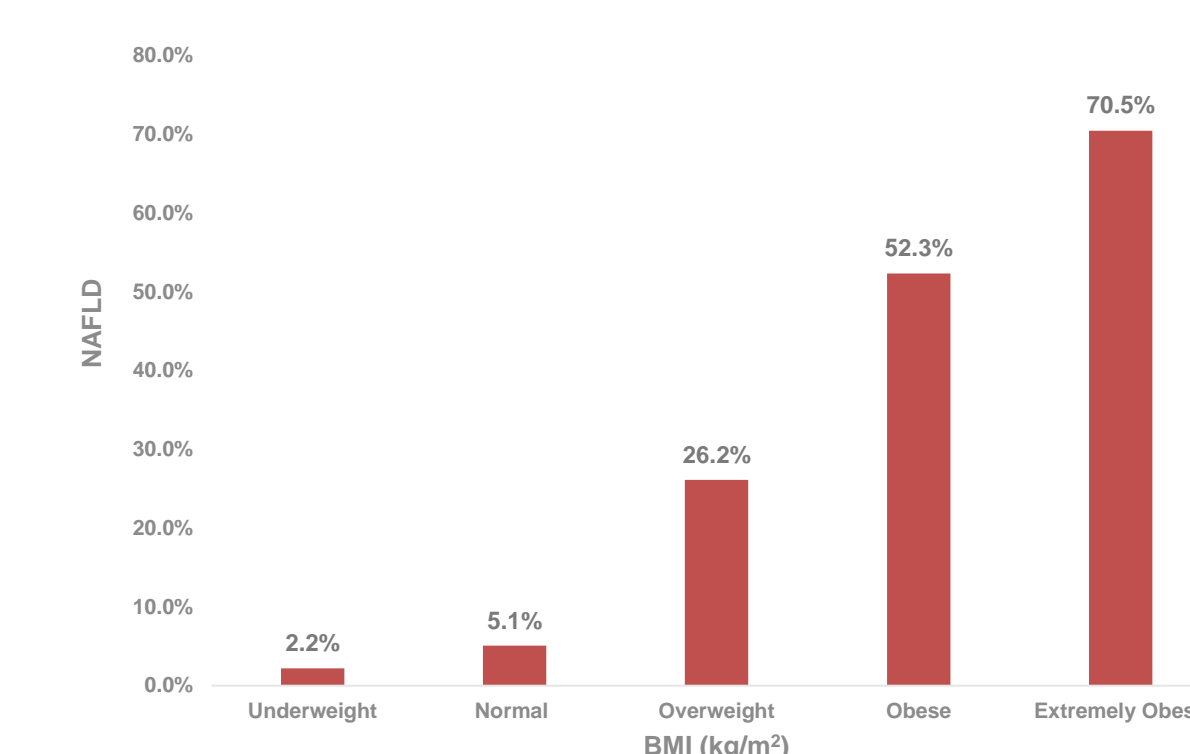


Figure (8): Prevalence of NAFLD among US Adult Population relative to their highest educational level between 2005 and 2016.

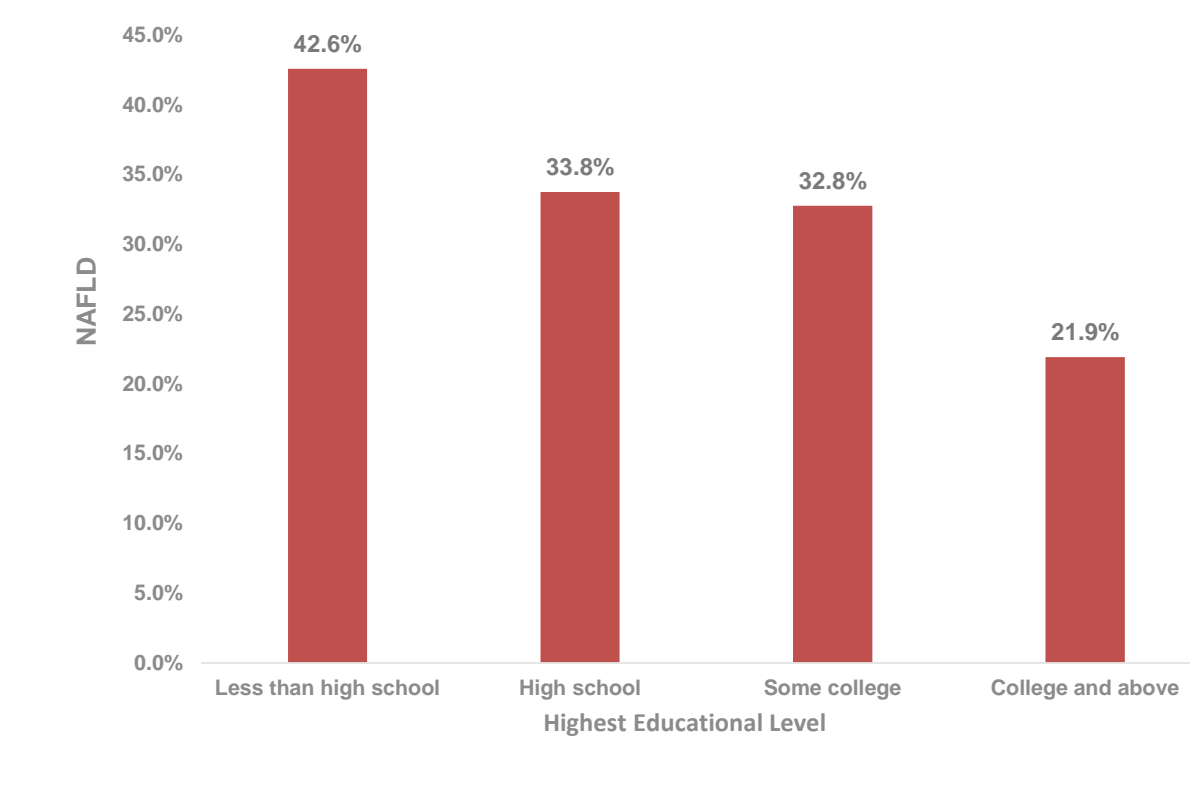
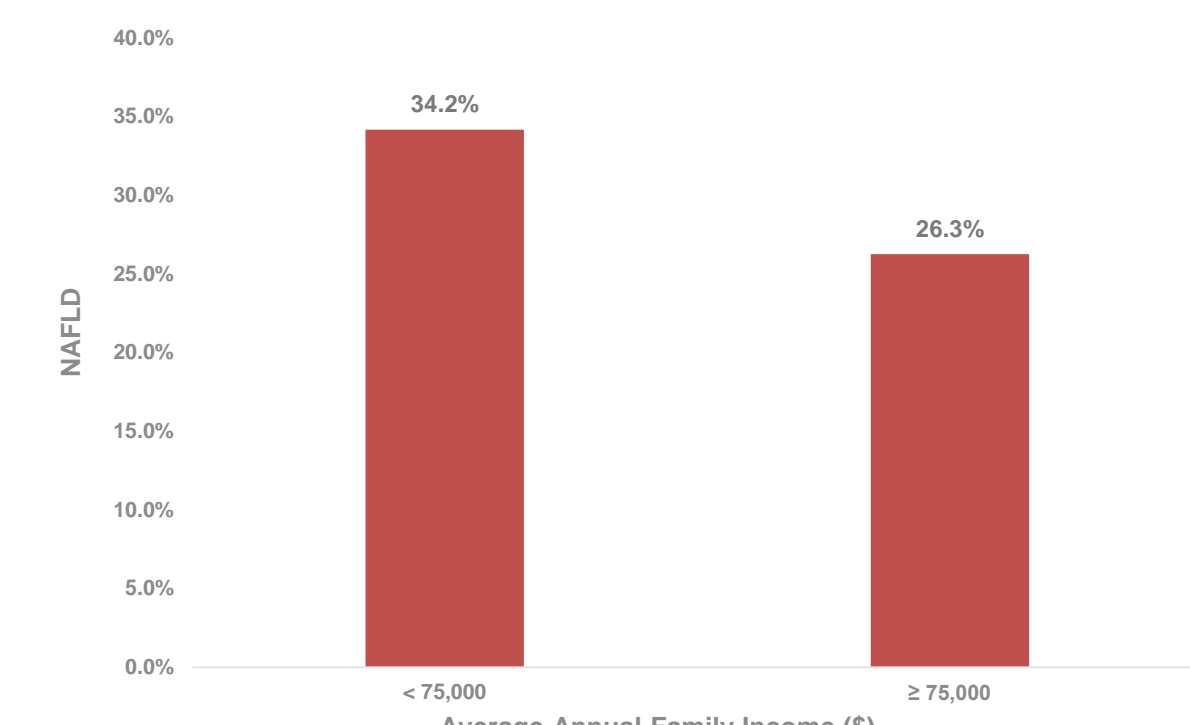


Figure (9): Prevalence of NAFLD among US Adult Population relative to their family income between 2005 and 2016.



### Future Steps

- M** Analyze possible correlations between NAFLD and unexamined social determinants of health through regression modeling.
- M** Propose recommendations for NAFLD disease management programs and mitigation strategies based on study findings.
- M** Develop predictive model(s) for donor livers supply in the US, and then propose policies to ensure adequate supply of donor livers.

### Study Limitations

- M** In recent years, the Centers for Diseases Control & Prevention (CDC) reported declining response rates among the NHANES participants.<sup>7</sup>
- M** NHANES data are demographically representative of the US but not geographically.
- M** NHANES is a cross-sectional study, not a longitudinal study, and is subject to social desirability bias.

### References

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### Affiliations

- \* Department of Industrial & Operations Engineering, College of Engineering, University of Michigan
- \*\* Department of Internal Medicine, University of Michigan
- \*\*\* Department of Health Management & Policy, School of Public Health, University of Michigan

### Acknowledgements