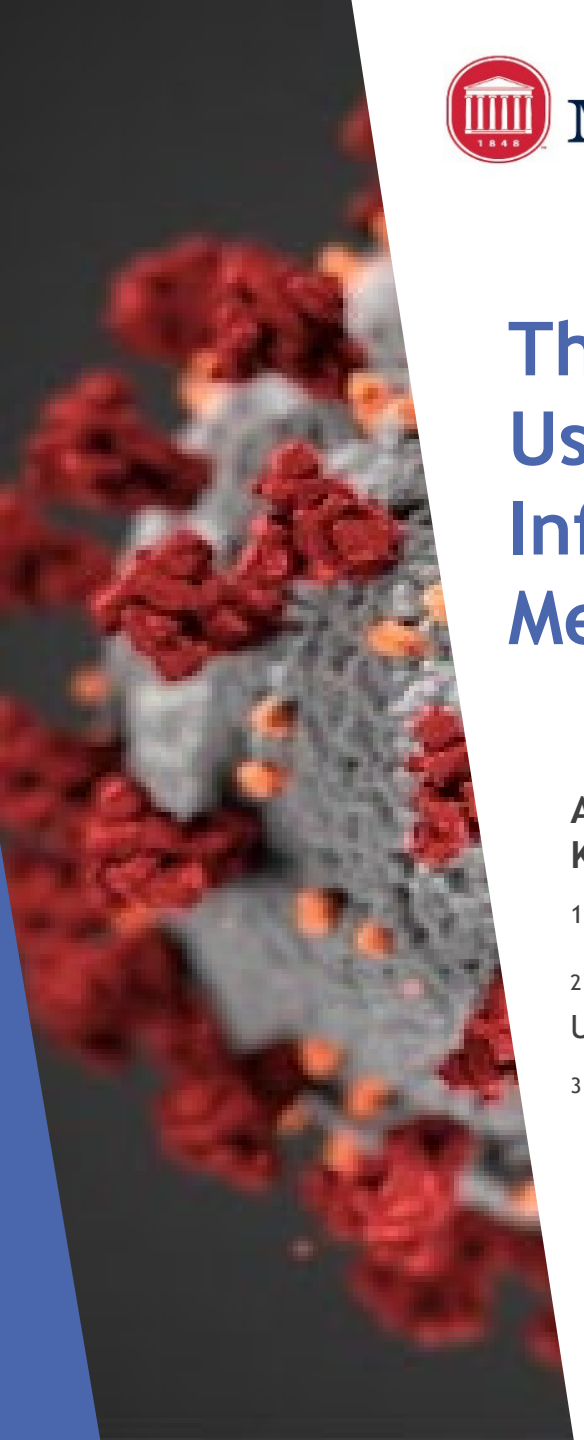
# Conflict of Interest Disclosure

The authors do not have any financial relationships related to the topic of this presentation

Disclaimer: The work reported was conducted by the MS-DUR program in the Center for Pharmaceutical Marketing and Management as part of the retrospective drug use analysis activities conducted under contract with the Mississippi Division of Medicaid. The views expressed are those of the authors and do not necessarily reflect those of Mississippi Division of Medicaid or the University of Mississippi



# The Association between Antecedent Statin Use and Severe Outcomes in COVID-19 Infected Beneficiaries Enrolled in Mississippi Medicaid

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# Background

As of today, ~ 80 million COVID-19 cases in the US, leading to ~ 979 thousand deaths.

Statins are a commonly prescribed medication among patients with comorbidities.

Statins appear to be associated with decreased COVID complexity and mortality.

However,

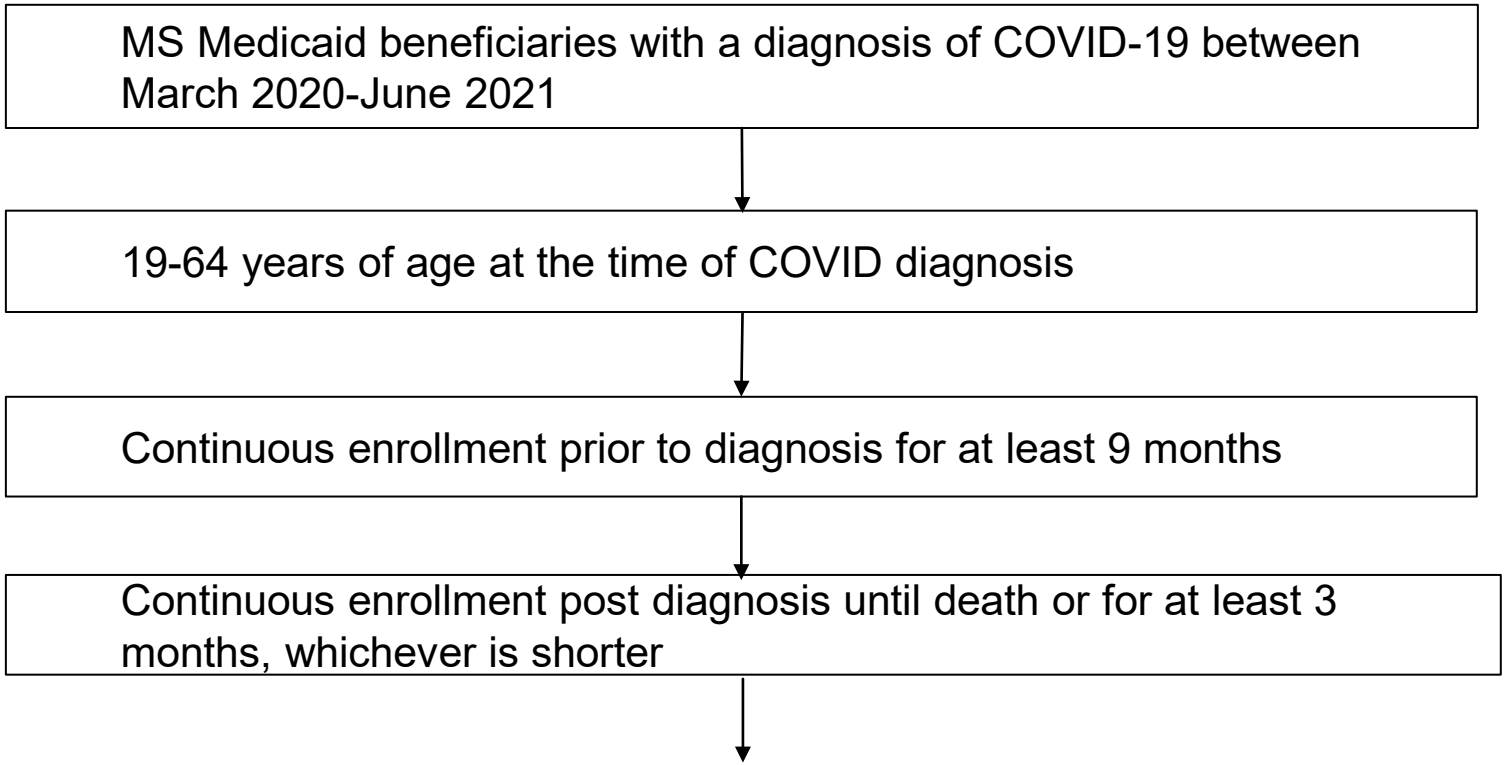
- Previous research yields inconsistent evidence
- Most studies used EMR as a data source
- The relationship has not been evaluated in a low-income Medicaid population

# Study Objectives

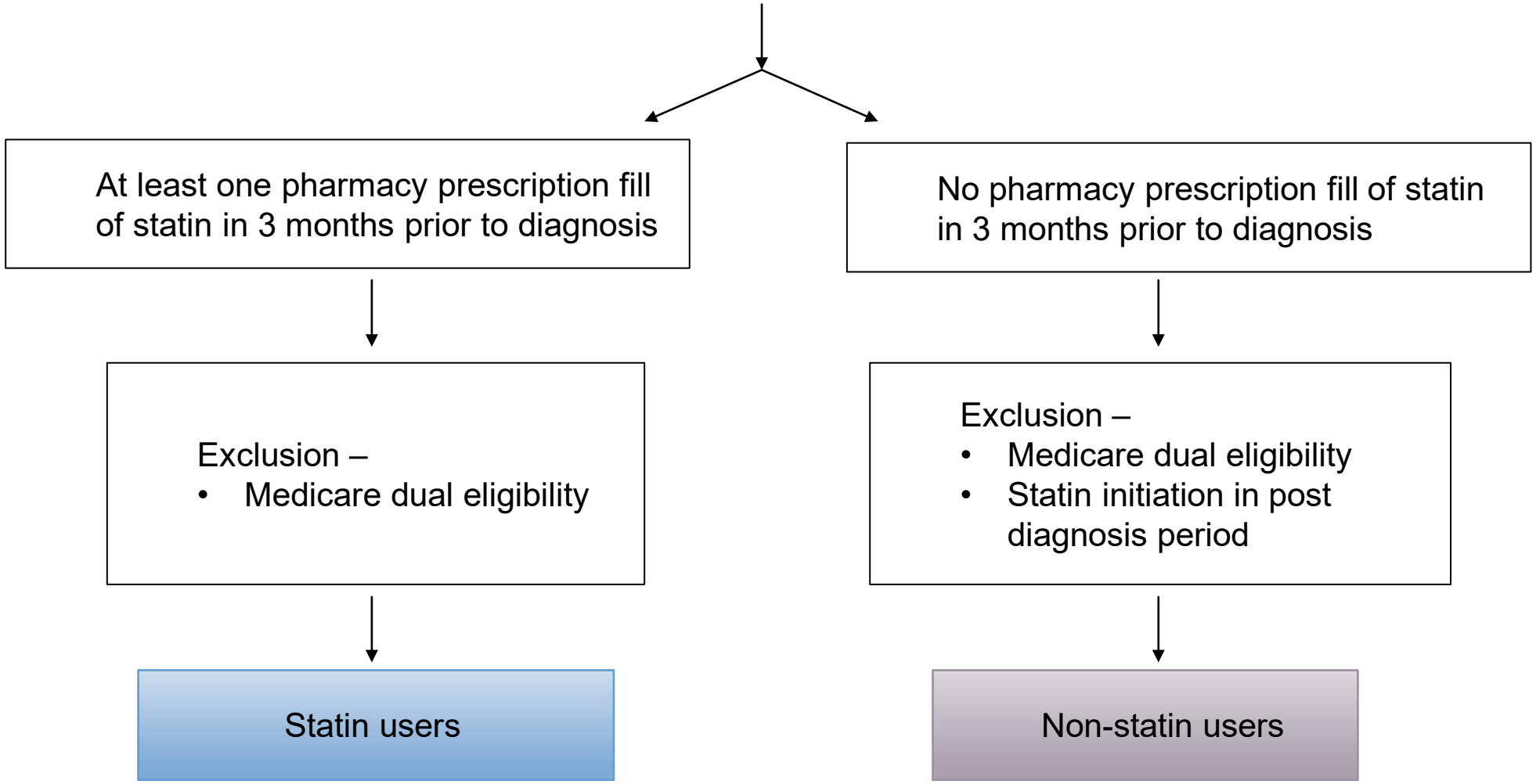
- To assess the association between antecedent statin use and COVID-related hospitalization and all-cause death in a cohort of patients diagnosed with COVID-19 and enrolled in Mississippi Medicaid.
- To assess the association between intensity of statin use and COVID-related hospitalization and all-cause death.

# Study Methods

# Study Sample



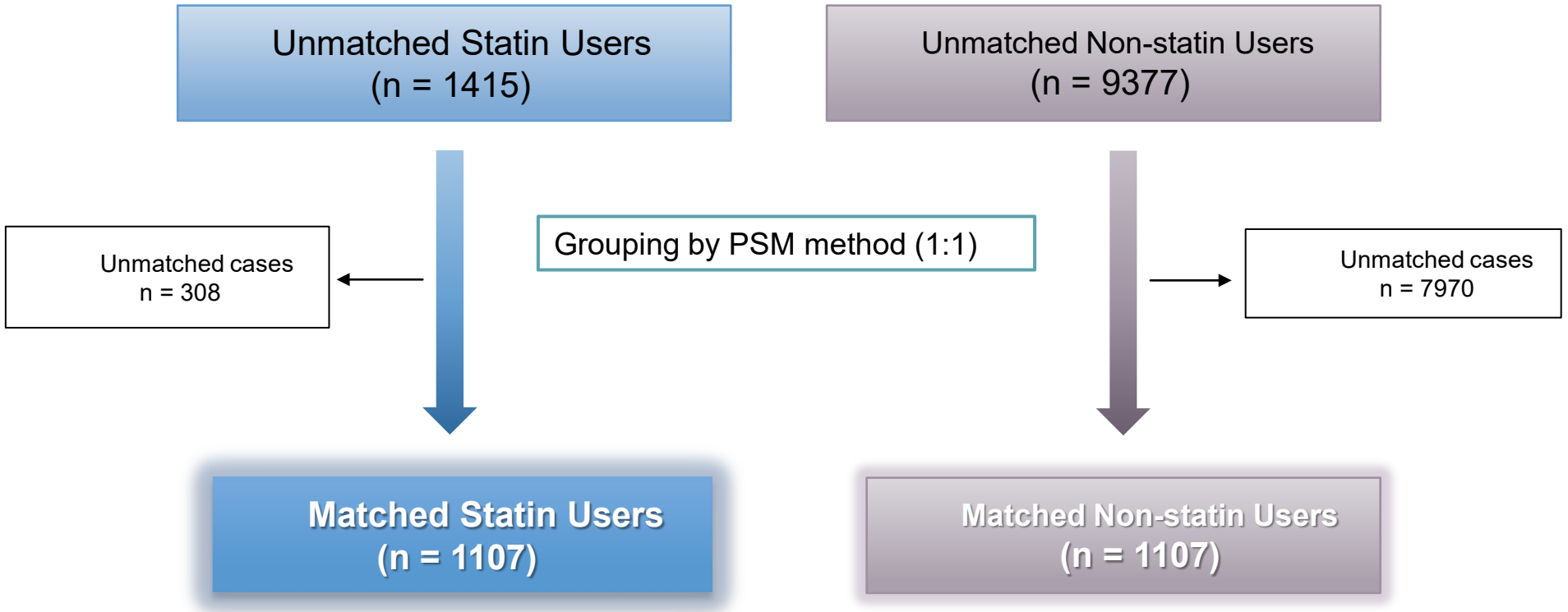
# Study Sample – Cont'd



# Matching Statin users and Non-statin users

- Statin users and non-statin users matched on propensity of antecedent statin administration
  - A multivariable logistic regression model, adjusted for
    - Demographic variables
      - age, gender, race
    - Comorbidities
      - Hypertension, diabetes, acute myocardial infarction, hyperlipidemia, heart failure, stroke, ischemic heart diseases, atrial fibrillation, chronic lung disease, chronic kidney disease, and liver disease
    - History of prescription drug use
      - Beta-blockers, ACE inhibitors, ARBs, oral anticoagulants, and P2Y12 receptor inhibitors
  - A 1:1 propensity-score matching was implemented with the use of a nearest-neighbor strategy
    - Caliper width equal to 0.2 of the SD of the logit of propensity score
    - Standardized mean differences were used to evaluate balance of the matched groups

# Matching Statin users and Non-statin users



# Study Measures

- The outcome variable of interest were
  - 30-, 60-, and 90-day COVID-related hospitalization
  - 30-, 60-, and 90-day all-cause death

- Covariates
  - History of cancer
  - Month of COVID diagnosis
  - Long-term care residency

# Data Analysis

McNemar’s tests for unadjusted comparisons between statin user and matched non-statin uses on COVID-related hospitalization and death outcomes

Conditional logistic regression to estimate the effect of antecedent statin use on COVID-related hospitalization and death outcomes, adjusted for covariates

Sensitivity analysis

Subgroup of patients with cardiovascular diseases

Logistic regression, adjusted for all variables

# Study Results

# Table 1. Clinical and Sociodemographic Characteristics of Statin Users vs Matched Non-Statin Users Enrolled in MS Medicaid (diagnosed with COVID-19 between March 2020 - June 2021)

| Demographic and Clinical Characteristics | Category | Statin Users | Non-statin Users | Standardized difference |
|---|---|---|---|---|
| | | n=1107 | n=1107 | |
| Age, No. (%) | Less than 45 | 305 (27.55) | 280 (25.29) | -0.08 |
| | 45-55 | 295 (26.65) | 273 (24.66) | |
| | 55+ | 507 (45.80) | 554 (50.05) | |
| Gender, No. (%) | Male | 368 (33.24) | 371 (33.51) | -0.08 |
| | Female | 739 (66.76) | 736 (66.49) | |
| Race, No. (%) | Caucasian | 314 (28.36) | 313 (28.27) | 0.03 |
| | African American | 672 (60.70) | 687 (62.06) | |
| | Others | 121 (10.93) | 107 (9.67) | |
| Hypertension, No. (%) | Yes | 820 (74.07) | 860 (77.69) | -0.08 |
| | No | 287 (25.93) | 247 (22.31) | |
| Hyperlipidemia, No. (%) | Yes | 545 (49.23) | 509 (45.98) | 0.07 |
| | No | 562 (50.77) | 598 (54.02) | |
| Diabetes, No. (%) | Yes | 538 (48.60) | 551 (49.77) | -0.02 |
| | No | 569 (51.40) | 556 (50.23) | |
| Chronic Kidney Disease, No. (%) | Yes | 335 (30.26) | 332 (29.99) | 0.01 |
| | No | 772 (69.74) | 332 (70.01) | |

# Table 1. Clinical and Sociodemographic Characteristics of Statin Users vs Matched Non-Statin Users Enrolled in MS Medicaid (diagnosed with COVID-19 between March 2020 - June 2021) – Cont'd

| Demographic and Clinical Characteristics | Category | Statin Users | Non-statin Users | Standardized difference |
|---|---|---|---|---|
| | | n=1107 | n=1107 | |
| Ischemic Heart Disease, No. (%) | Yes<br>No | 160 (14.45)<br>947 (85.55) | 150 (13.55)<br>957 (86.45) | 0.03 |
| Heart Failure, No. (%) | Yes<br>No | 156 (14.09)<br>951 (85.91) | 156 (14.09)<br>951 (85.91) | 0.00 |
| COPD, No. (%) | Yes<br>No | 155 (14.00)<br>952 (86.00) | 161 (14.54)<br>946 (85.46) | -0.02 |
| Asthma, No. (%) | Yes<br>No | 103 (9.30)<br>1004 (90.70) | 112 (10.12)<br>995 (89.88) | -0.03 |
| Stroke, No. (%) | Yes<br>No | 102 (9.21)<br>1005 (90.79) | 84 (7.59)<br>1023 (92.41) | 0.06 |
| Atrial Fibrillation, No. (%) | Yes<br>No | 23 (2.08)<br>1084 (97.92) | 19 (1.72)<br>1088 (98.28) | 0.03 |
| Acute Myocardial Infarction, No. (%) | Yes<br>No | 14 (1.26)<br>1093 (98.74) | 9 (0.81)<br>1098 (99.19) | 0.04 |
| Liver Disease, No. (%) | Yes<br>No | 13 (1.17)<br>1092 (98.64) | 19 (1.72)<br>1088 (98.28) | -0.05 |

# Table 2. Unadjusted Comparison between Statin Users and Non-statin Users on COVID-19 Outcomes

| Outcome type | Statin Users | Non-statin Users | *p* - value |
|---|---|---|---|
| 30-day Hospitalization, No. (%) | 238 (21.50) | 231 (20.87) | 0.716 |
| 60-day Hospitalization, No. (%) | 240 (21.68) | 237 (21.41) | 0.877 |
| 90-day Hospitalization, No. (%) | 242 (21.86) | 238 (21.50) | 0.837 |
| 30-day Death, No. (%) | 39 (3.52) | 60 (5.42) | 0.031* |
| 60-day Death, No. (%) | 49 (4.43) | 73 (6.59) | 0.025* |
| 90-day Death, No. (%) | 53 (4.79) | 82 (7.41) | 0.010* |

# Table 3. Multivariable Analysis between Statin Users and Non-statin Users on COVID-Related Hospitalization (diagnosed with COVID-19 between March 2020 - June 2021)

| Outcome | 30-day Hospitalization | | 60-day Hospitalization | | 90-day Hospitalization | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value |
| Statin Use | 1.038 (0.843, 1.278) | 0.726 | 1.015 (0.825, 1.48) | 0.890 | 1.019 (0.830, 1.251) | 0.859 |
| Cancer | 0.979 (0.553, 1.734) | 0.941 | 0.973 (0.549, 1.724) | 0.925 | 0.978 (0.553, 1.731) | 0.941 |
| Long-term Care | 0.644 (0.342, 1.214) | 0.174 | 0.680 (0.364, 1.267) | 0.224 | 0.694 (0.379, 1.274) | 0.239 |
| Month of COVID diagnosis | 0.930 (0.890, 0.971) | 0.001* | 0.928 (0.889, 0.969) | 0.001* | 0.933 (0.894, 0.974) | 0.001* |

# Table 4. Multivariable Analysis between Statin Users and Non-statin Users on All-Cause Death (diagnosed with COVID-19 between March 2020 - June 2021)

| Outcome | 30-day death | | 60-day death | | 90-day death | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value |
| Statin Use | 0.510 (0.314, 0.829) | 0.007* | 0.558 (0.366, 0.849) | 0.007* | 0.553 (0.371, 0.823) | 0.004* |
| Cancer | 0.240 (0.066, 0.864) | 0.029* | 0.286 (0.101, 0.816) | 0.019* | 0.388 (0.150, 1.005) | 0.051 |
| Long-term Care | 6.858 (0.786, 59.865) | 0.082 | 1.588 (0.442, 5.707) | 0.478 | 1.830 (0.529, 6.337) | 0.340 |
| Month of COVID diagnosis | 0.920 (0.837, 1.011) | 0.082 | 0.914 (0.841, 0.993) | 0.033* | 0.913 (0.843, 0.988) | 0.023* |

# Table 5. Multivariable Analysis between Statin Users and Non-statin Users on COVID-Related Hospitalization Based on Statin Intensity (diagnosed with COVID-19 between March 2020 - June 2021)

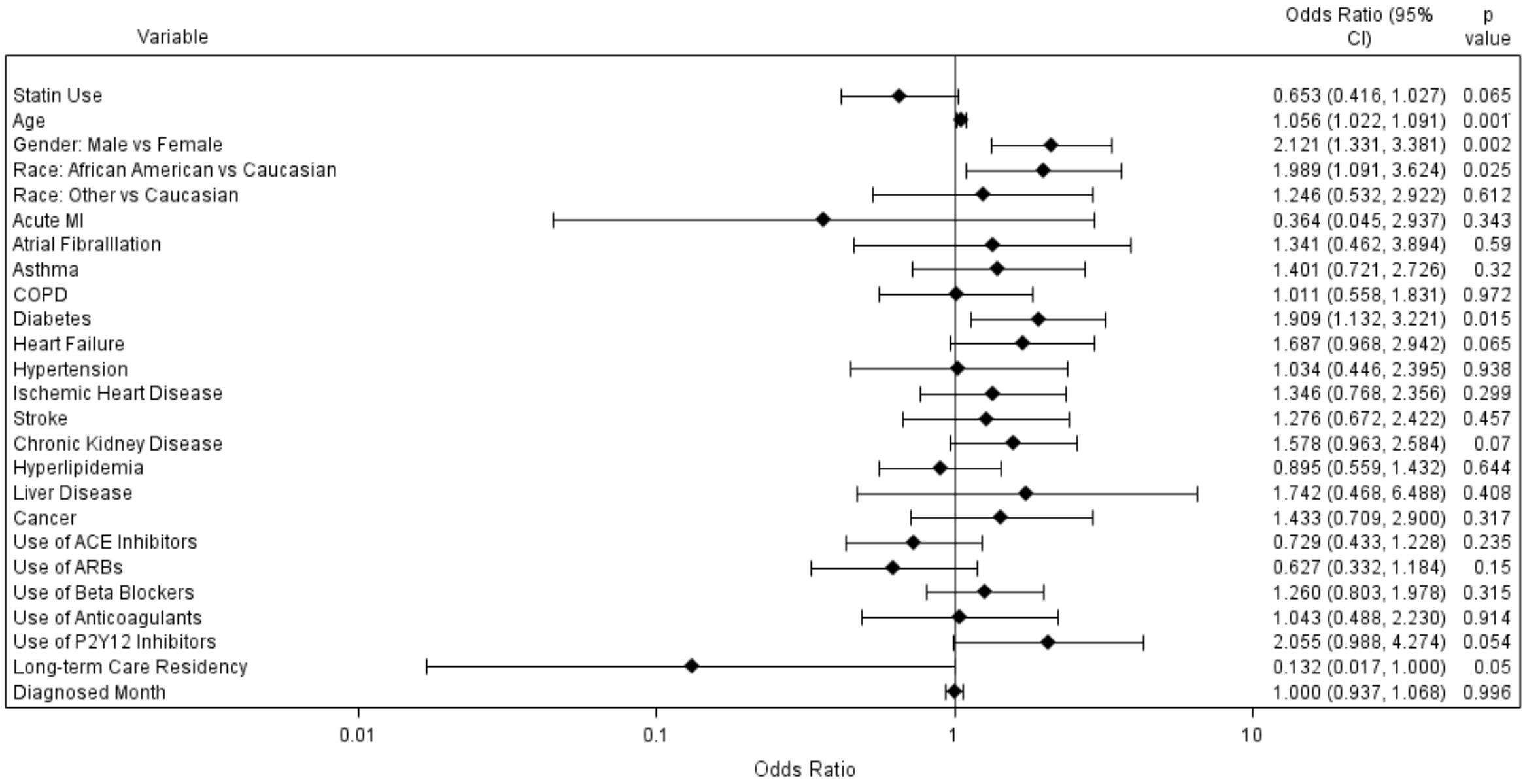
| Outcome | 30-day hospitalization | | 60-day hospitalization | | 90-day hospitalization | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value |
| Statin Use | | | | | | |
| Low/Moderate Intensity vs No | 1.070 (0.819, 1.399) | 0.619 | 1.024 (0.785, 1.337) | 0.860 | 1.023 (0.785, 1.333) | 0.866 |
| High Intensity vs No | 0.990 (0.711, 1.378) | 0.954 | 1.000 (0.719, 1.391) | 0.999 | 1.012 (0.730, 1.405) | 0.941 |
| Cancer | 1.017 (0.574, 1.803) | 0.953 | 1.026 (0.579, 1.819) | 0.929 | 1.022 (0.577, 1.808) | 0.942 |
| Long-term Care | 1.538 (0.815, 2.901) | 0.184 | 1.467 (0.785, 2.741) | 0.229 | 1.439 (0.783, 2.642) | 0.241 |
| Month of COVID Diagnosis | 0.930 (0.890, 0.971) | <0.001* | 0.928 (0.889, 0.969) | <0.001* | 0.933 (0.894, 0.974) | <0.001* |

# Table 6. Multivariable Analysis between Statin Users and Non-statin Users on All-Cause Death Based on Statin Intensity (diagnosed with COVID-19 between March 2020 - June 2021)

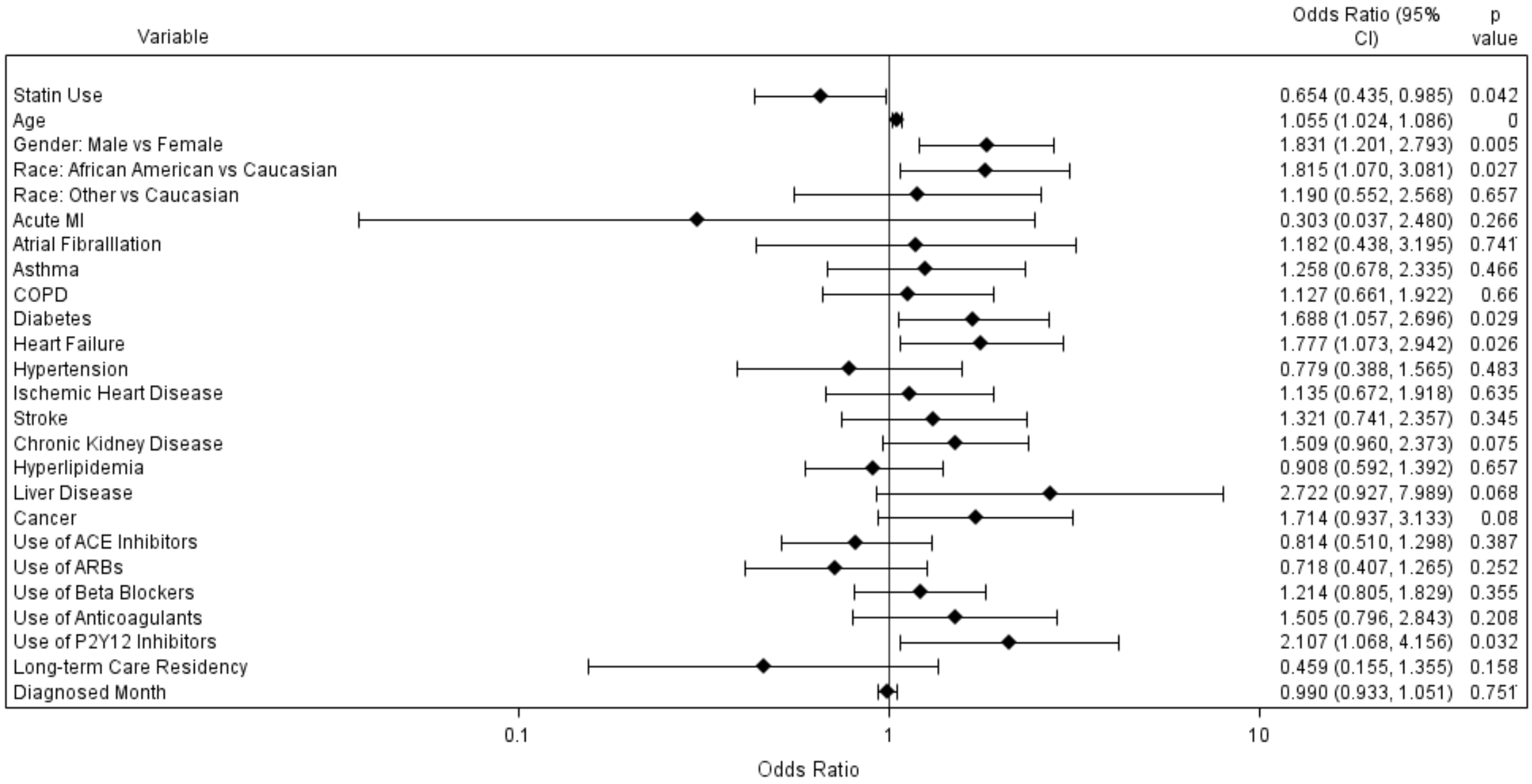
| Outcome | 30-day death | | 60-day death | | 90-day death | |
|---|---|---|---|---|---|---|
| | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value | OR (95% CI) | *p* - value |
| Statin Use | | | | | | |
| Low/Moderate Intensity vs No | 0.553 (0.304, 1.006) | 0.052 | 0.558 (0.328, 0.948) | 0.031* | 0.509 (0.306, 0.847) | 0.001* |
| High Intensity vs No | 0.446 (0.205, 0.970) | 0.042* | 0.558 (0.288, 1.081) | 0.084 | 0.627 (0.336, 1.171) | 0.143 |
| Cancer | 0.234 (0.064, 0.852) | 0.028* | 0.286 (0.100, 0.819) | 0.020* | 0.392 (0.151, 1.017) | 0.054 |
| Long-term Care | 6.511 (0.733, 57.816) | 0.093 | 1.588 (0.435, 5.803) | 0.484 | 1.946 (0.549, 6.892) | 0.302 |
| Month of COVID Diagnosis | 0.921 (0.838, 1.013) | 0.090 | 0.914 (0.841, 0.993) | 0.034* | 0.912 (0.842, 0.987) | 0.022* |

# Sensitivity Analyses

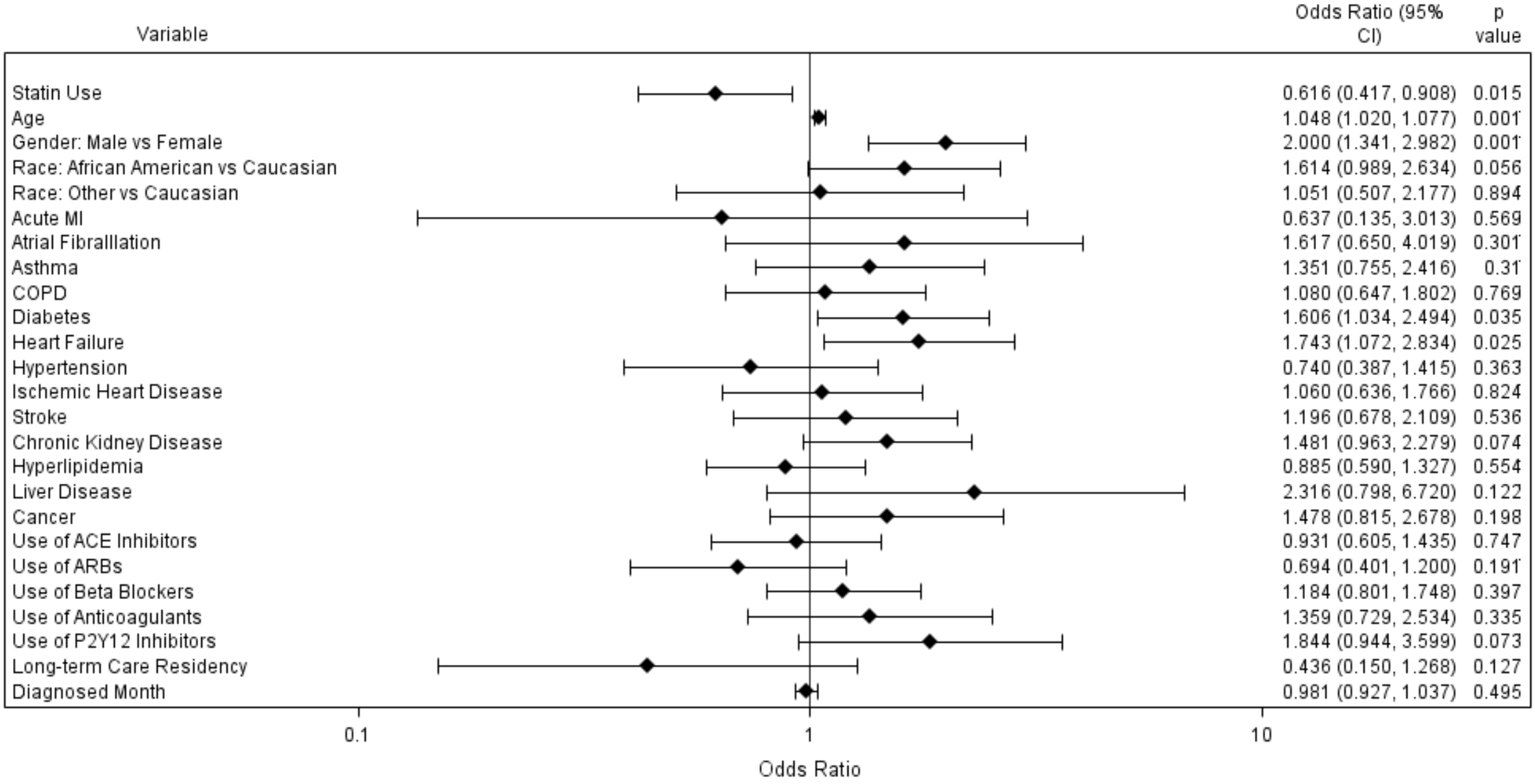
## Association of statin use with 30-day death after COVID diagnosis adjusting for sociodemographic and clinical covariates



## Association of statin use with 60-day death after COVID diagnosis adjusting for sociodemographic and clinical covariates



## Association of statin use with 90-day death after COVID diagnosis adjusting for sociodemographic and clinical covariates



# Discussion

# Discussion

- Antecedent statin use was associated with a significant decrease in all-cause mortality among COVID-19 patients enrolled in MS Medicaid.
- Study findings are consistent in patients with cardiovascular diseases.
- Inconsistent results for association of intensity of statin use on all-cause mortality
  - Artifact of sample size
  - Suboptimal statin adherence
- This provides further evidence for the need to ensure care continuation among individuals diagnosed with COVID-19
  - Future studies should evaluate the impact of telehealth on long-term health outcomes

# Study Strengths and Limitations

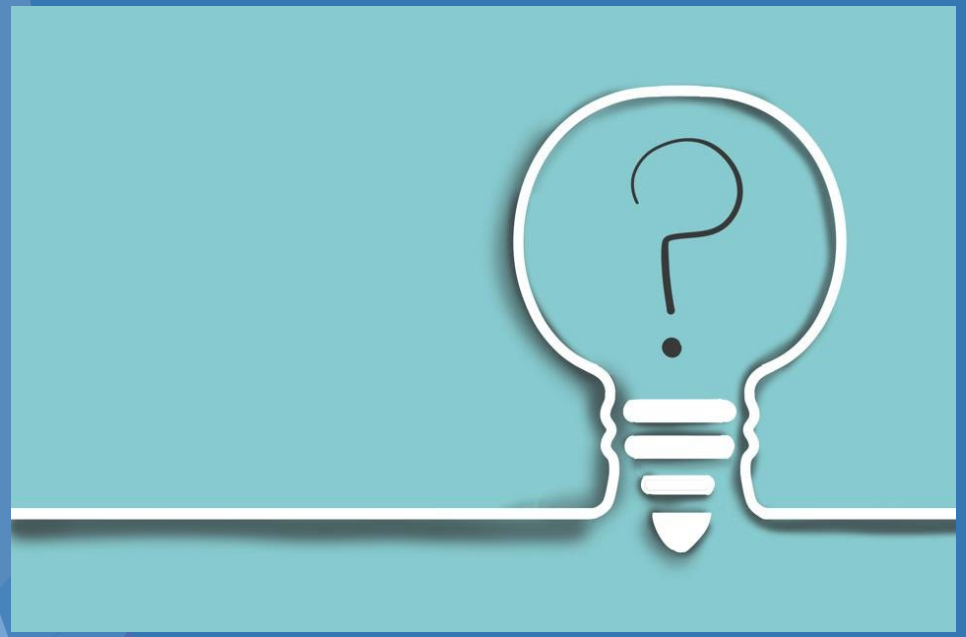
**Strengths**

- Administrative claims data allows for longitudinal assessment of health outcomes over time.
- Medicaid beneficiaries are younger and under low-income status.
- Findings from our study can add evidence to the literature gap, and aid informing clinical decisions.

**Limitations**

- Claims billing code can cause misclassification.
- Limited to COVID patients enrolled in Mississippi Medicaid.
- Lacked information of potential covariates, such as smoking status, BMI etc.

**Key takeaway:** Statins have the potential to prevent mortality among individuals diagnosed with COVID-19, especially those with high-risk comorbidities. Findings support the further exploration of the possible clinical benefits of statins on COVID-19 outcomes.

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