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PQHS 500

Project Abstract

2020-04-16

Background

Emergency General Surgery (EGS) conditions, typically comprise abdominal and soft tissue catastrophes which often, but not always, require surgical treatment.[1] Undergoing EGS has inherent risks related to the procedure, and many patients require discharge to nursing facilities after discharge. It's presently unknown whether there is long-term functional decline associated with these emergency surgeries which would make individuals who undergo EGS more likely to be transition permanently to living in a nursing facility rather than remain at home. This outcome is linked not just with a sign of health decline, but quality of life as well. Presently, it is thought that anyone could need to undergo EGS at any time, therefore suggesting this population could be comparable to the general population pre-EGS and our preliminary data would suggest this to be the case. The objective of this study is to examine the outcomes for older adults who undergo emergency general surgery (EGS). Specifically, are those individuals who undergo EGS more likely to no longer live at home (moved to a care facility) than adults who do not undergo EGS?

Methods

Using the Medicare Current Beneficiary Survey (MCBS) we identified individuals who had diagnosed and undergone emergency general surgery between 1997 and 2013. From a total of 102,383 unique individuals we identified, after restricting to those with valid residential history, those over 65, those with valid claims, and those who were community-dwelling at the start of the study and up to their EGS. From this we identified 39,052 individuals who had no history of EGS and 481 who were both diagnosed with and underwent EGS. Our outcome of interest was transitioning to a facility or a skilled nursing facility within 1-year post-EGS, or 2-years post-baseline for the controls. We conducted logistic regression on 1:3 propensity score-matched pairs (with replacement), as well as propensity-weighted (double robust) comparisons of the surgery versus a 10% sample of the no surgery groups on residence transition. The covariates to build the logistic regression included demographic variables, frailty, multimorbidity, and comorbidities.

Results

Of 481 cases, 69 (14.3%) had been in a facility, with 5,183 (13.3%) of all controls. The unadjusted analysis, using the 10% random sample of the controls, yielded an odds ratio of 1.26 (95% CI: 0.94, 1.67), for those who underwent surgery compared to those who did not undergo surgery. The same 10% random sample was used for weighting for average treatment effect on the treated (ATT) using the propensity score, the adjusted analysis yielded an odds ratio of 0.57 (95% CI: 0.42, 0.77). After doubly-robust estimation (propensity-score weighted and adjusted) the odds ratio was 0.58 (95% CI: 0.43, 0.79). Finally, the 1:3 matching was successful matching 1,385 unique controls to 481 cases (1,333 individuals matched once, 46 matched twice, 6 matched 3 times) and yielded an odds ratio of 0.87 (95% CI: 0.68, 1.10). Overall, covariate balance appeared most successful in the 1:3 matching approach as did adhere to Rubin's rules 1 and 2. Finally, stability analysis confirmed no substantial variation if choosing a 5% or 15% random sample in place of the 10% chosen.

Conclusions

While the results using an ATT and doubly-robust approach were different from the 1:3 matching, given the results of covariate balance and Rubin's rules for each, I would feel most comfortable saying the 1:3 matching is the most reliable. Given this, I would conclude that that undergoing EGS does not have any causal effect on transitioning to a facility or skilled nursing facility for older adults. This study has a number of limitations, primarily surrounding the presence of further bias that could not be accounted for in the limited covariates. Future work should expand on this work to understand what other markers of well-being and quality of life may change after someone undergoes surgery. Residential transitions are a pretty stark marker of decline in well-being and for many the effects may be more minimal. Additional work could also include other diagnoses, procedures, medication, and utilization to better understand and therefore match and adjust for, overall medical well-being.

Are Patients Who Undergo Emergency General Surgery More Likely to End Up at Care Facilities?

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2020-04-13

Introduction

- Emergency General Surgery (EGS) conditions, typically comprise abdominal and soft tissue catastrophes which often, but not always, require surgical treatment
- Undergoing EGS has inherent risks related to the procedure, and many patients require discharge to nursing facilities after discharge
- It's presently unknown whether there is long-term functional decline associated with these emergency surgeries which would make individuals who undergo EGS more likely to be transition permanently to living in a nursing facility rather than remain at home

Research Question

- The objective of this study is to examine the outcomes for older adults who undergo emergency general surgery (EGS).
- **Are those individuals who undergo EGS more likely to no longer live at home (moved to a care facility) than adults who do not undergo EGS?**

Data Source, Exposure, and Outcome

- Medicare Current Beneficiary Survey (MCBS)
  - 1997 - 2013
  - 4-year panel survey
  - Medicare claims for study period
  - Additional files including information on:
    - Residential moves
    - Health surveys
    - Health composition
- Exposure: Emergency General Surgery via 18-different procedure types
  - 481 cases
  - 39,052 controls
  - Community-dwelling at start and had both diagnosis **and** procedure code if a case
- Outcome: Facility
  - One-year after EGS (cases) or
  - 2-years after baseline measurement (controls)

Covariates

- Demographics: sex, age (at first survey), race, year of survey
- Frailty: Deficit-Accumulation Frailty Index (0-100, continuous)
- Multimorbidity (0-3, categorical)
  - Chronic conditions, geriatric syndromes, functional limitations
- Elixhauser Comorbidities (29 individual comorbidities)
  - congestive heart failure, valvular disorder, pulmonary circulation disorders, peripheral vascular disease, hypertension, paralysis, other neurological disorders, chronic lung disease, diabetes mellifluous, diabetes mellifluous with complications, hypothyroidism, renal failure, liver disease, chronic peptic ulcer disease, HIV/AIDS, lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis/collagen vascular diseases, coagulation deficiency, obesity, weight loss, electrolyte disorder, blood loss anemia, anemia deficiencies, alcohol abuse, drug abuse, other psychoses, depression

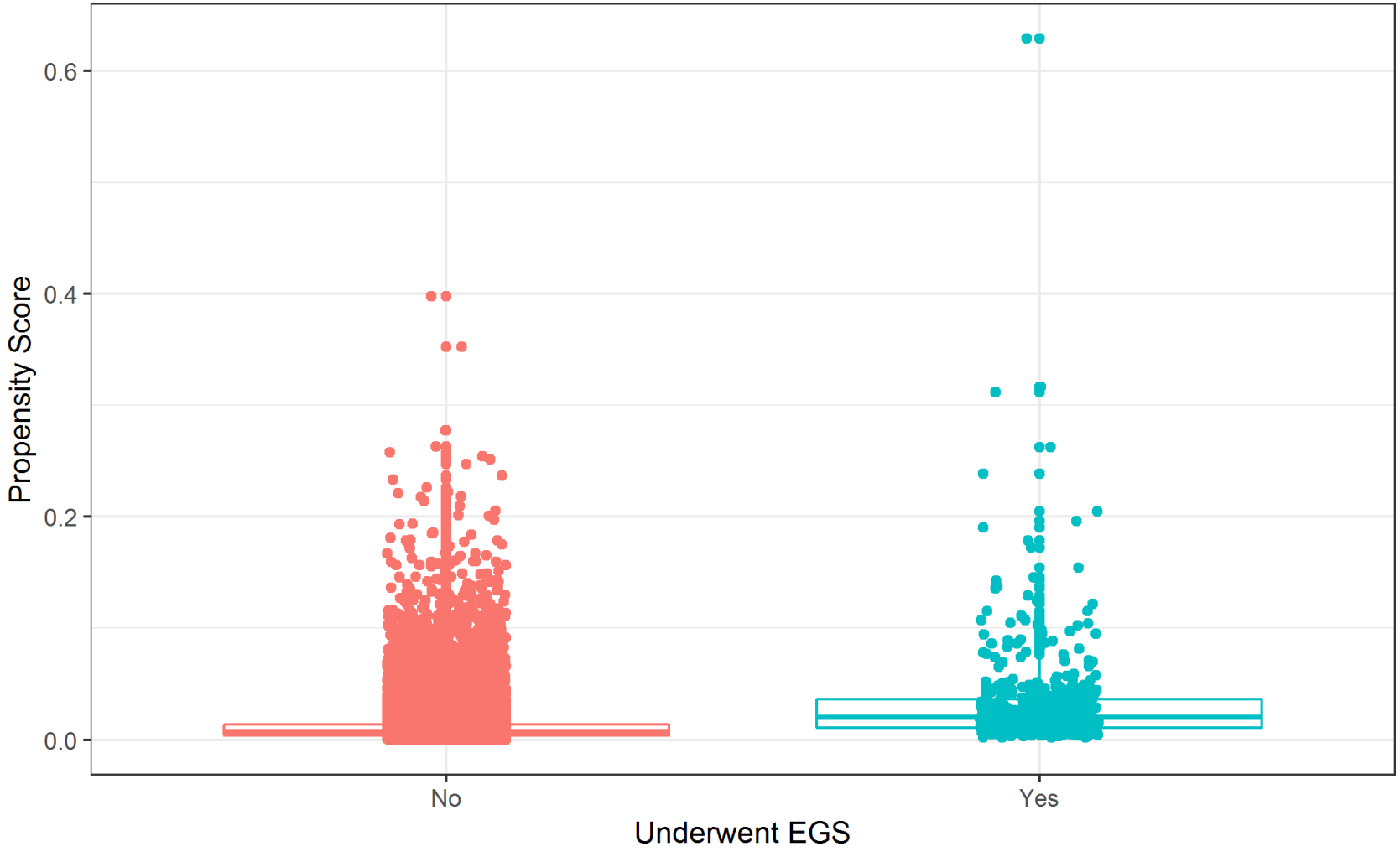
Overview of Analyses

- 1:3 Matching With Replacement
  - 481 cases matched to 1,374 distinct controls
    - 1,333 controls were used once, 46 were used twice, 6 were used 3 times
- ATT propensity-score weighted
  - 10% random sample of controls (3,905)
- Doubly-robust (ATT-weighted with additional adjustment for propensity score in regression)
- 69 (14.3%) of cases had outcome; 5,183 (13.3%) of controls

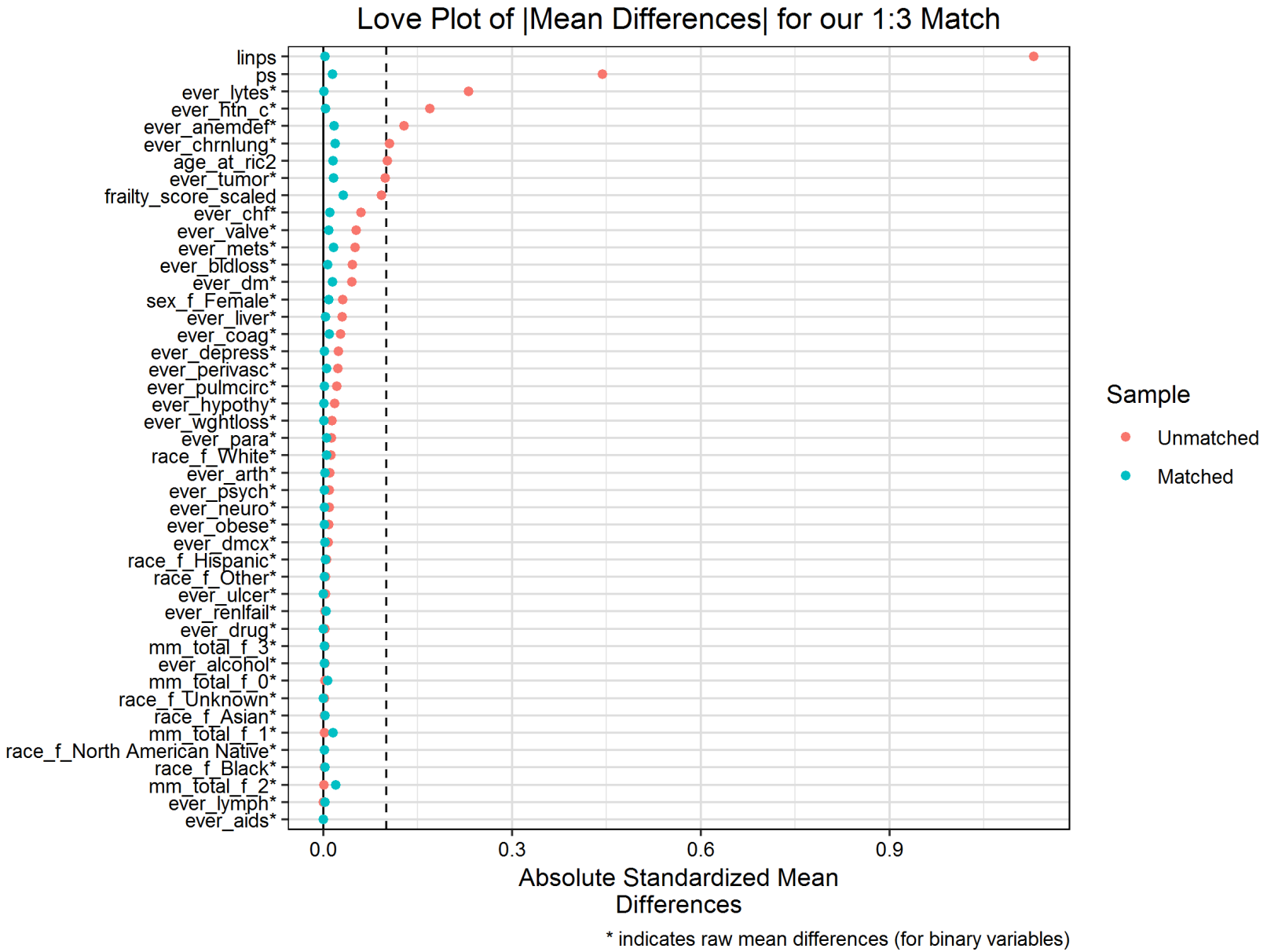
Fitting the Propensity Score

- Propensity to be exposed based on 35 covariates
  - Exposed group:
    - Min PS: 0.002
    - Max PS: 0.63
  - Control group:
    - Min PS: 0.00
    - Max PS: 0.40

Fitting the Propensity Score



Covariate Balance



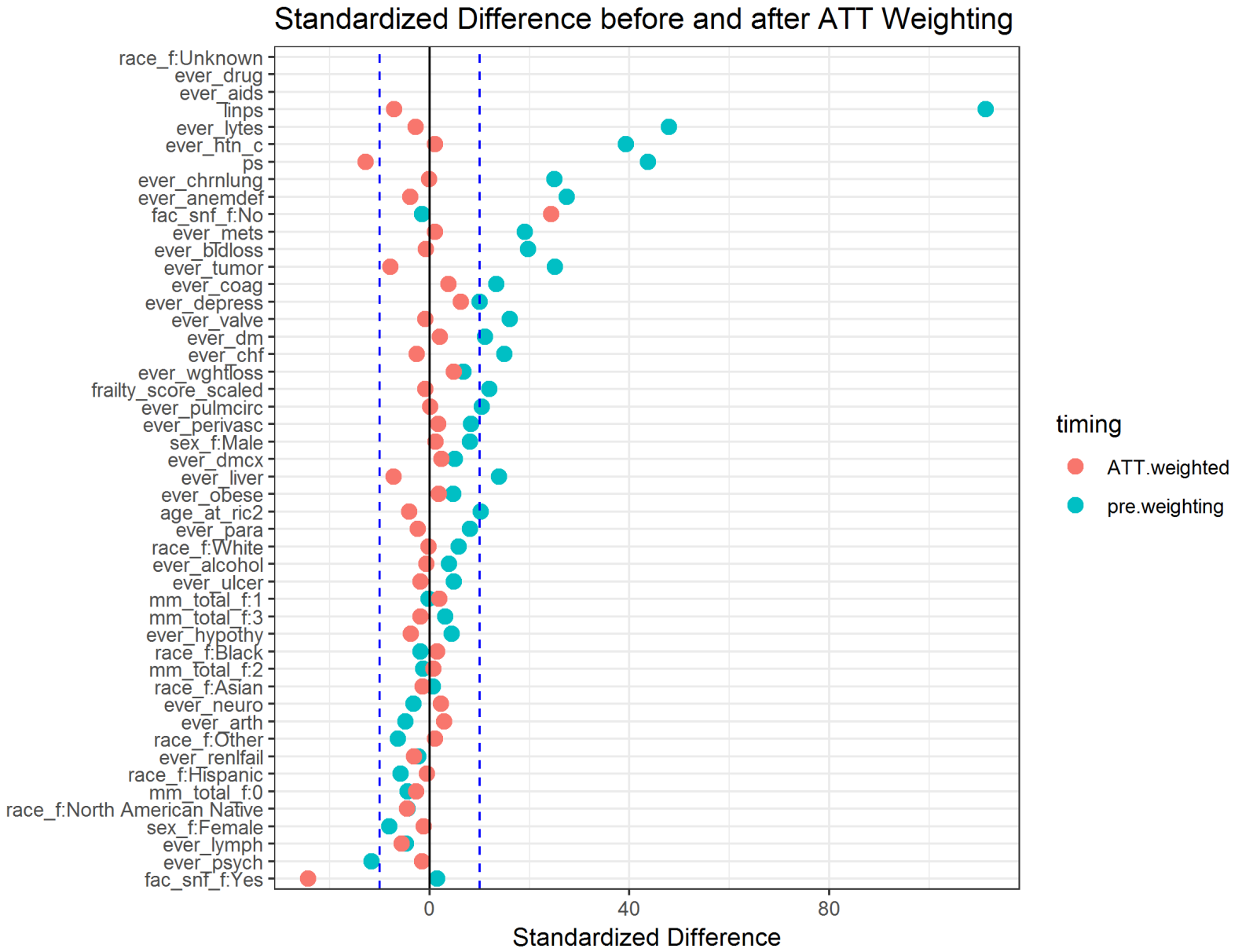
Rubin's Rules 1 and 2

- Before matching
  - Rubin's Rule 1: 0.81
  - Rubin's Rule 2: 0.52
- After matching
  - Rubin's Rule 1: 0.00
  - Rubin's Rule 2: 1.02

Result after Matching

- OR: 0.87 (95% CI: 0.68, 1.10)
  - After matching, those who underwent EGS had 0.87 the odds of being moved to a facility during the follow-up time.
- Unadjusted:
  - OR: 1.26 (95% CI: 0.94, 1.67)

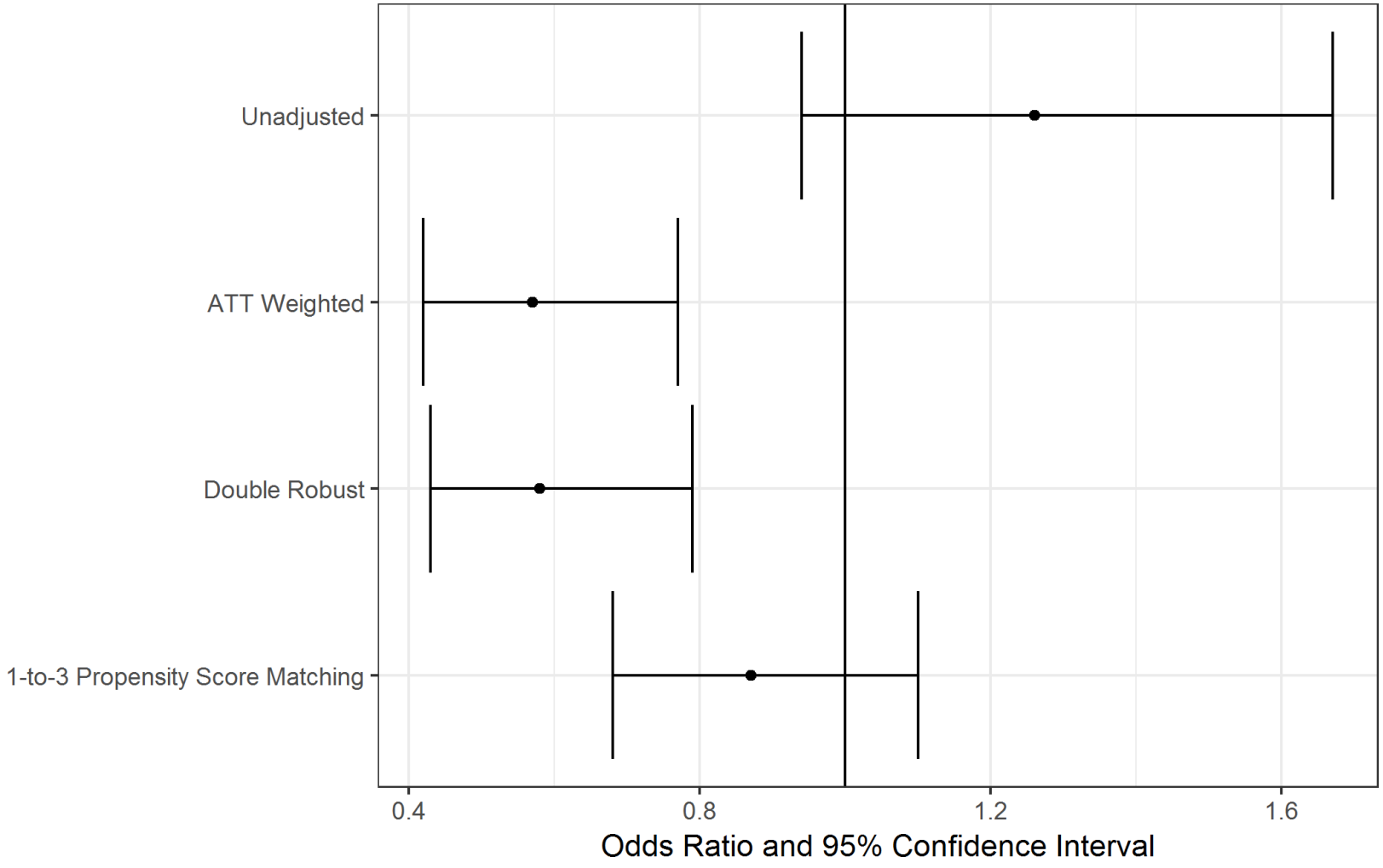
Weighted Analysis Overview (ATT weighting, 10% sample of controls)



Weighted Analysis Result

- OR: 0.57 (95% CI: 0.42, 0.77)
  - After matching, those who underwent EGS had 0.57 the odds of being moved to a facility during the follow-up time with a 95% confidence interval of (0.42, 0.77)
- Result after Doubly-Robust
  - OR: 0.58 (95% CI: 0.43, 0.79)
- Unadjusted:
  - OR: 1.26 (95% CI: 0.94, 1.67)

Overview of Results



Scientific and Clinical Conclusions

Model	OR	CI.Low	CI.High
Unadjusted	1.26	0.94	1.67
ATT Weighted	0.57	0.42	0.77
Double Robust	0.58	0.43	0.79
1-to-3 Propensity Score Matching	0.87	0.68	1.10

- In an unadjusted model EGS was not associated with moving to a facility
- After ATT-weighting, including doubly-robust estimate, people who undergo EGS have decreased odds (with a significant odds ratio) of moving to a facility
- 1:3 matching resulted in non-significant association
- Next steps: understand other health outcomes (functional limitations) that are more granular than large residential changes
  - What else may change for people who undergo EGS?

Statistical Considerations

- Propensity score was not all that great
  - Other important variables not captured due to availability?
- Stability analysis showed no difference in using 5% or 15% random sample, instead of 10%
- Think carefully about who is an appropriate control
- Difference in results via ATT and 1:3 matching

Questions?

- Thank you!