Using Propensity Score Matching Techniques to Establish Treatment/Control Groups to Assess Medicare/Medicaid Service Use

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Background

- Health service program evaluations and cost-effectiveness research often utilize observational data from administrative sources

- Unlike data from randomized controlled trials, in observational studies, the treatment group often differs in important ways from those who did not receive the treatment

- Advantages of propensity score matching include:
  - Ability to account for a large number of covariates (not possible for close/exact matching)
  - Reduced selection bias
  - Subsequent analysis of treatment effects that is less dependent on regression model assumptions

- Propensity score matching has become an accepted practice in health services and policy research

Objective

Use propensity score matching to identify appropriate comparison groups among dually eligible Medicare/Medicaid beneficiaries who received Medicaid-paid long-term services and supports (LTSS) via home and community-based (HCBS) waivers versus those who did not receive LTSS. These groups were analyzed to explore the cross-payer effects of providing Medicaid-paid LTSS on Medicare acute care resource use.

Study Population

Continuously enrolled dual eligibles in Maryland in 2006 who were not enrolled in Medicare Advantage plans. Those who died during the year were excluded from the analysis.

Potential Treatment Group

HCBS waiver recipients (n=1,861)
- Aged 50+
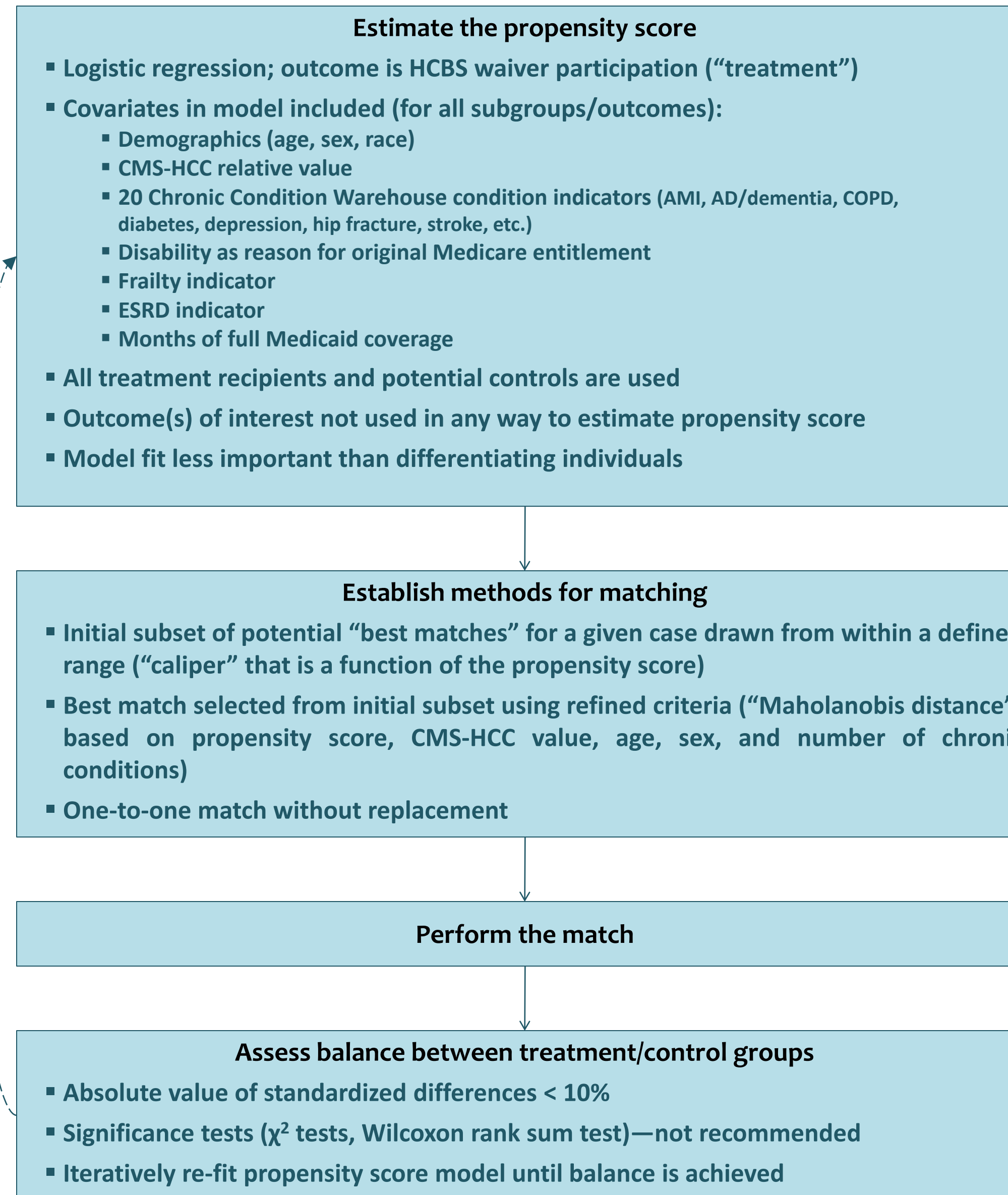- Enrolled in waiver for all of 2006

Potential Control Groups

Duals in community with no LTSS (n=19,259)
"Well duals"
- Aged 50+

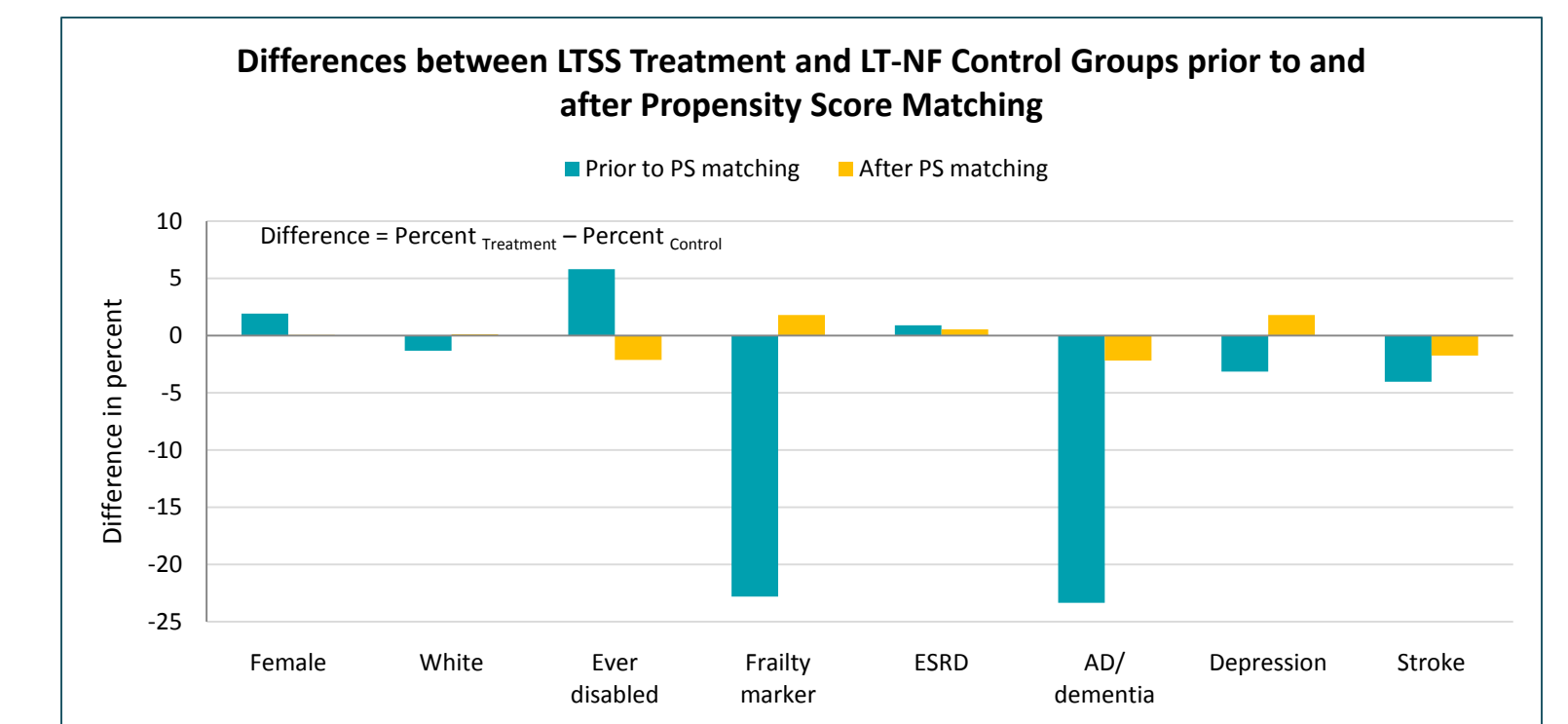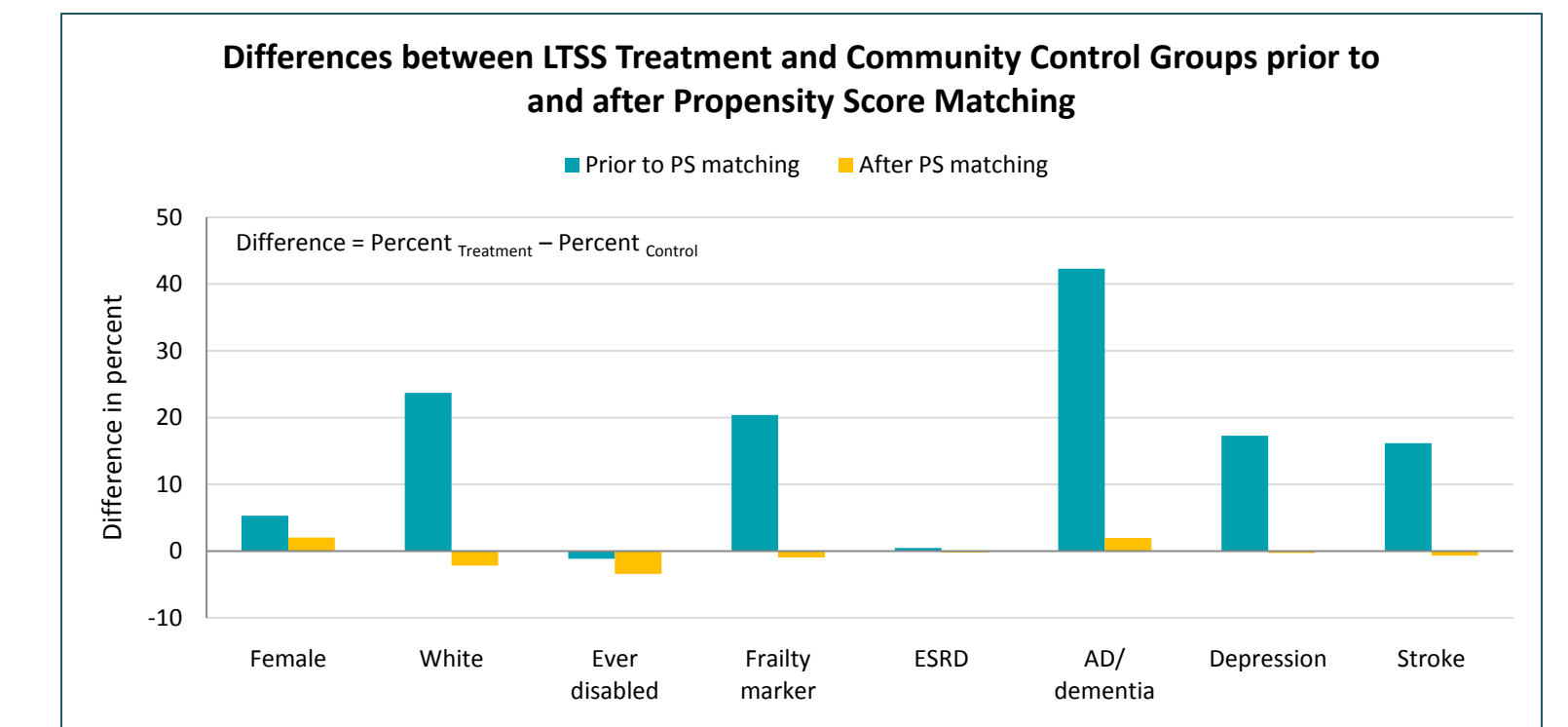**Long-term nursing facility (LT-NF) residents (n=6,418)**
- Aged 50+
- ≥30 days Medicaid-paid NF care just prior to January 1, 2006
- ≥ 10 months NF care in 2006

Methods

Estimate the propensity score

- Logistic regression; outcome is HCBS waiver participation ("treatment")
- Covariates in model included (for all subgroups/outcomes):
  - Demographics (age, sex, race)
  - CMS-HCC relative value
  - 20 Chronic Condition Warehouse condition indicators (AMI, AD/dementia, COPD, diabetes, depression, hip fracture, stroke, etc.)
  - Disability as reason for original Medicare entitlement
  - Frailty indicator
  - ESRD indicator
  - Months of full Medicaid coverage
- All treatment recipients and potential controls are used
- Outcome(s) of interest not used in any way to estimate propensity score
- Model fit less important than differentiating individuals

Establish methods for matching

- Initial subset of potential "best matches" for a given case drawn from within a defined range ("caliper" that is a function of the propensity score)
- Best match selected from initial subset using refined criteria ("Maholanobis distance": based on propensity score, CMS-HCC value, age, sex, and number of chronic conditions)
- One-to-one match without replacement

Perform the match

Assess balance between treatment/control groups

- Absolute value of standardized differences < 10%
- Significance tests (χ^2 tests, Wilcoxon rank sum test)—not recommended
- Iteratively re-fit propensity score model until balance is achieved

Principal Findings

- Adequate numbers of treatment/control pairs were identified (1,470 pairs for the community analysis and 1,831 pairs for the LT-NF analysis)

- Balance was achieved for all covariates, and thus comparable comparison groups were established

- Careful examination of outcome results can provide insight into the ultimate effectiveness of the matching process

Differences Between LTSS Treatment and Community Control Groups prior to and after Propensity Score Matching

Difference = Percent Treatment − Percent Control

Differences between LTSS Treatment and LT-NF Control Groups prior to and after Propensity Score Matching

Difference = Percent Treatment − Percent Control

Implications

- Propensity score matching techniques can strengthen policy analyses that are based on observational and/or administrative data

- Choices regarding covariates used in the propensity score calculation, the methods used to assess balance, and statistical modeling approaches used after the comparison groups have been established must be carefully considered

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Methods drawn from:
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