



Evaluating Substitution as a Strategy for Handling Drop Points in Self-Administered Address-Based Sampling Frame Surveys

Joint Statistical Meetings

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- I. Background
 - Address-based sampling (ABS) frames
 - Drop points and drop point units

- II. Methods for Handling Drop Points
 - Previous approaches
 - New method: substitution

- III. Results from Healthy Chicago Survey Application

- IV. Summary and Ideas for Further Research

Background on ABS Frames

- Derived from the United States Postal Service's (USPS) Computerized Delivery Sequence (CDS) file
- Addresses serve as a proxy for households
- First documented use: 2000 Dallas Heart Study (Iannacchione, Staab, and Redden 2003)
- Increasingly adopted in household surveys (AAPOR, 2016), especially as a way to transition surveys traditionally conducted by interviewers over phone into self-administered web and/or paper formats (e.g., Olson et al., 2021; Unangst et al., 2022)

Background on Drop Points and Drop Point Units

- Vast majority of addresses on CDS have a one-to-one correspondence with a household
- A small portion of addresses are referred to as *drop points* (DPs) (Amaya, 2017), and the households therein referred to as *drop point units* (DPU)s
- A DP is a single delivery point or receptacle where postal carrier delivers mail for *all* corresponding DPU)s; no identifying household information (e.g., unit number) is available, so no way to sent targeted correspondence

Two-Unit DP Location	Two-Unit Non-DP Location
123 Main St. Chicago, IL 60018	151 Main St. Unit A Chicago, IL 60018
123 Main St. Chicago, IL 60018	151 Main St. Unit B Chicago, IL 60018

Approaches for Handling DPUs

- Nationwide, only 1.5% of households are DPUs, but they are concentrated in certain areas, such as New York, New Jersey, Massachusetts, and Illinois
- If DPU rate is low in study area, one strategy is to simply remove them from the sampling frame and accept risk of coverage bias
- Other strategies used in practice:
 1. Send one survey to the DP
 2. Send surveys to all DPUs
- Key disadvantages to the two strategies above:
 1. Researcher has no control over the within-DP selection process
 2. Unclear how to handle follow-up mailings

New Approach for Handling DPUs

- Harter et al. (forthcoming) proposed a *substitution* method for handling DPUs
- Basic idea: when a DPU is sampled, substitute it with the nearest non-DPU on the frame from a building of the same size
- Harter et al. implemented this method in the nationwide 2020 Residential Energy Consumption Survey (RECS), and provide descriptive statistics and qualitative comparisons of DPUs and their substitutes
- While analyses in Harter et al. are promising, no information to date on distributional comparisons of survey outcomes between DPUs and substitutes
- Current talk discusses an evaluation aimed to fill that research gap

Background on the Healthy Chicago Survey

- The Healthy Chicago Survey (HCS) was first launched in 2014 by the Chicago Department of Public Health
- Data used to shape policy and develop/support a variety of public health interventions
- Initially launched as a telephone survey; transitioned to a self-administered mail contact survey using ABS frame in 2020 (Unangst et al., 2022)
- 1.2M Chicago addresses stratified into 77 community areas (CAs); next birthday method used to have an adult complete survey (Olson et al., 2014)
- Annually targets 4,200 completes, with at least 35 in each CA

Application of Substitution in HCS

- Frame of 1.2M addresses includes roughly 150,000 (~12%) DPUs from DPs consisting of 2–4 units (5+ DPs excluded from frame)
- Harter et al.'s substitution method applied in both 2020 and 2021 HCS administrations
- In 2021, 2,196 DPUs sampled initially → substituted with nearest non-DPU using GEODIST function in SAS® based on the addresses' latitude/longitude coordinates
- Substitute always found within a CA, typically within a block or two, but a small number of substitutes identified (35) were either previously sampled or selected as a substitute twice
- The non-DPU substitute inherits the base weight(s) of the unit(s) it replaces

Application of Substitution in HCS (2)

- Example of two very similar DP (left) and substitute (right) addresses:



Application of Substitution in HCS (3)

- Example of two less similar DP (left) and substitute (right) addresses:

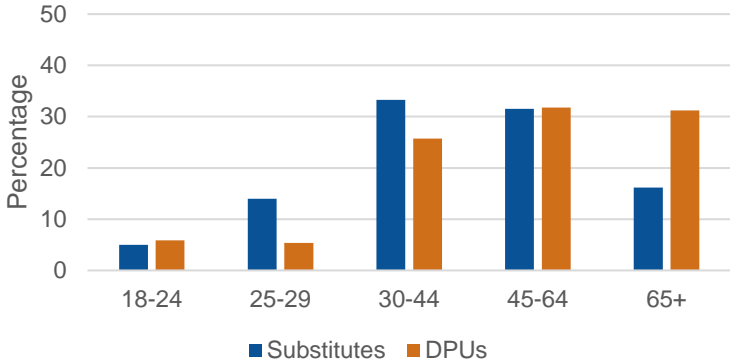


2021 HCS Application of Substitution

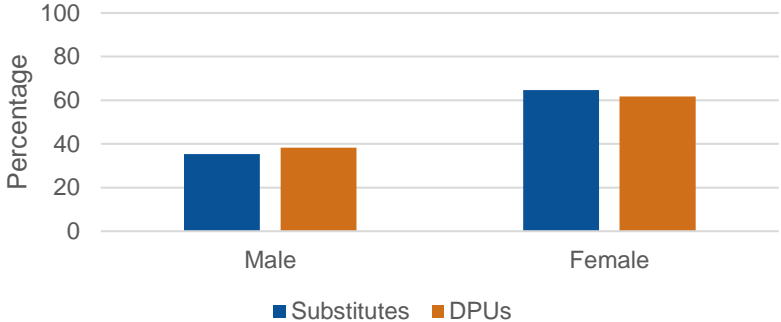
- In 2021, we conducted a *concurrent* HCS of DPUs substituted out
- Data collection proceeded as follows:
 1. Non-DPU substitutes → received standard Choice+ (Biemer et al., 2018) HCS mail contact protocol (\$20 offered for web and \$10 offered for paper response)
 2. DPUs → received a single survey packet mailing with web instructions and a paper version of the instrument (same differential incentives, but without the 3 follow-up attempts in “standard” HCS mail contact protocol)
- Obtained completes for 399 DPUs and for 401 substitutes
- Objective: compare base-weighted distributions of demographics and key survey outcomes to gain insight into how “similar” the non-DPU substitutes are with the original DPUs

2021 HCS Application Results - Sociodemographics

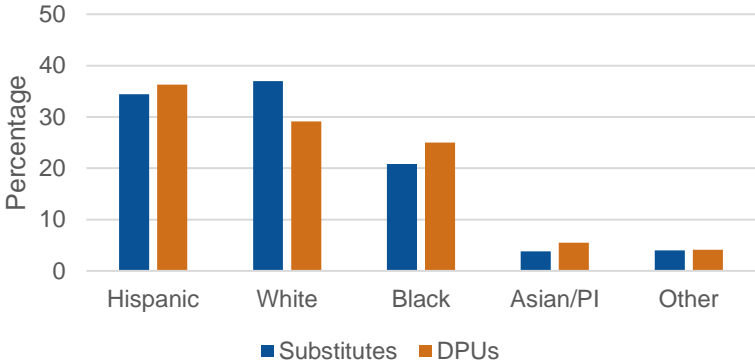
Respondent Age
($p < 0.01$)



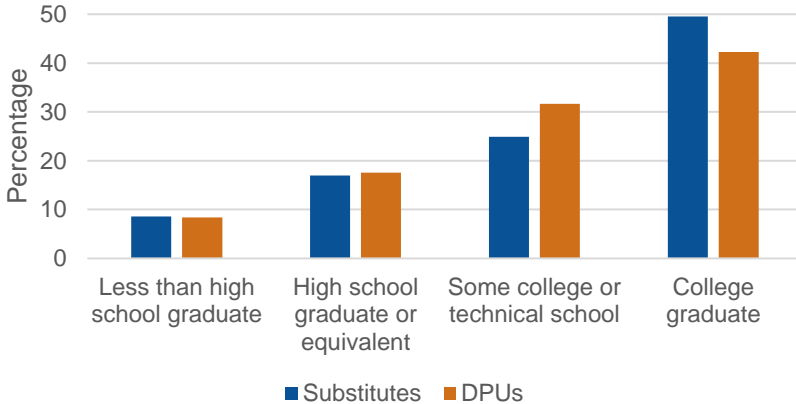
Respondent Gender
($p < 0.44$)



Respondent Race/Ethnicity
($p = 0.21$)

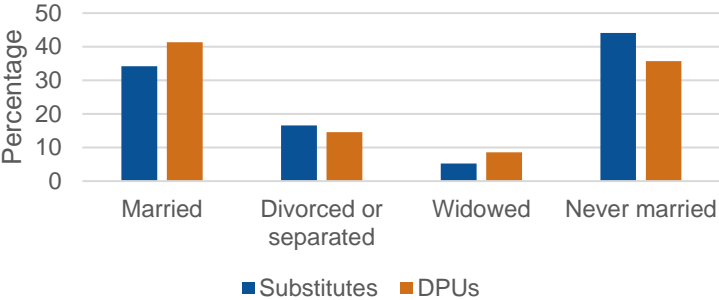


Respondent Education Level
($p = 0.20$)

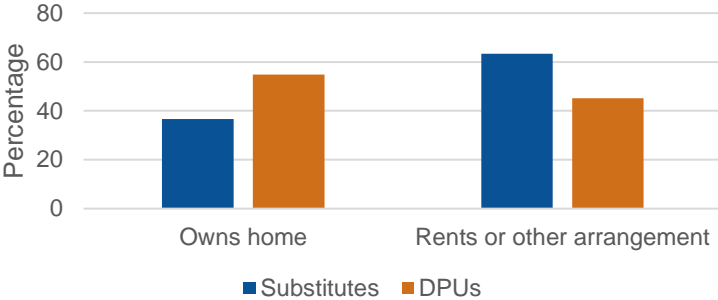


2021 HCS Application Results – Sociodemographics (2)

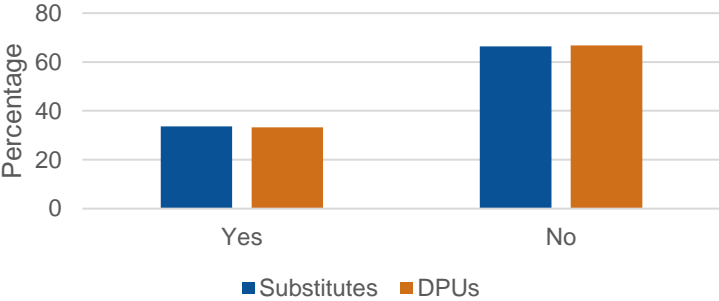
Respondent Marital Status ($p = 0.04$)



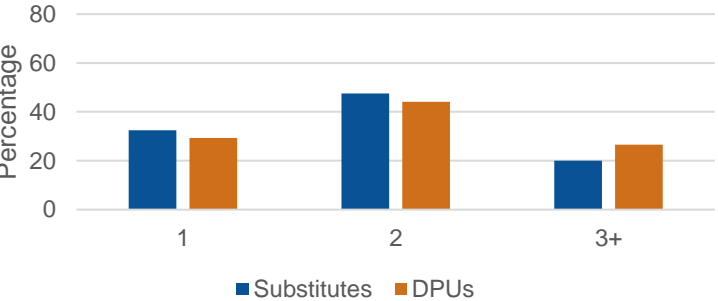
Respondent Housing Tenure ($p < 0.01$)



Presence of Kids in Household ($p = 0.92$)

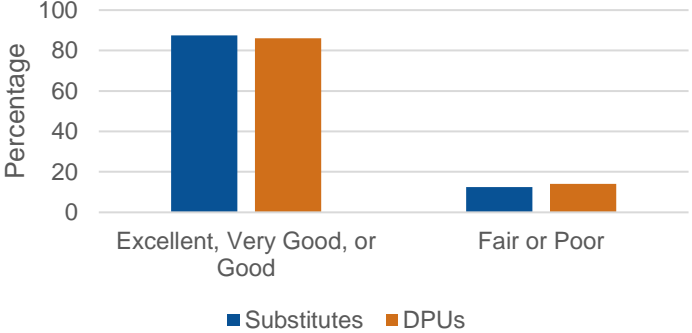


Number of Adults in Household ($p = 0.15$)

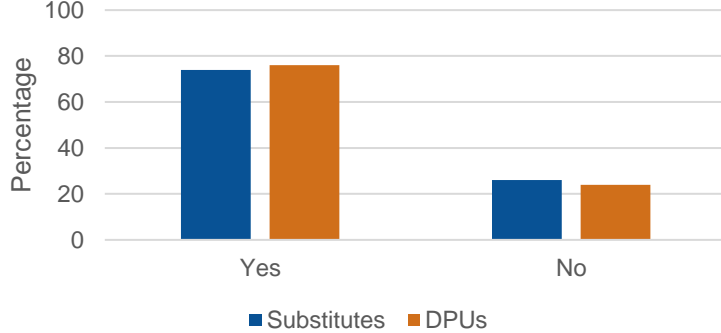


2021 HCS Application Results – Key Health Outcomes

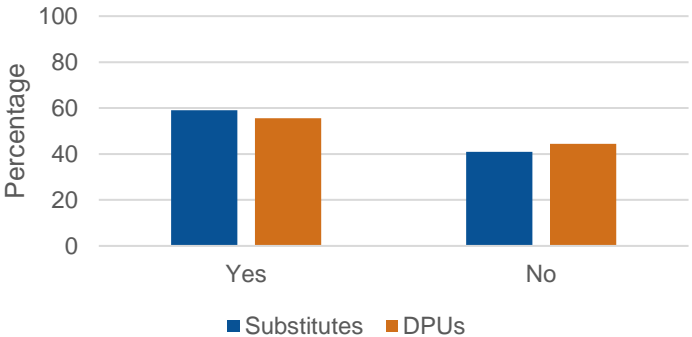
Overall Health Status
($p = 0.58$)



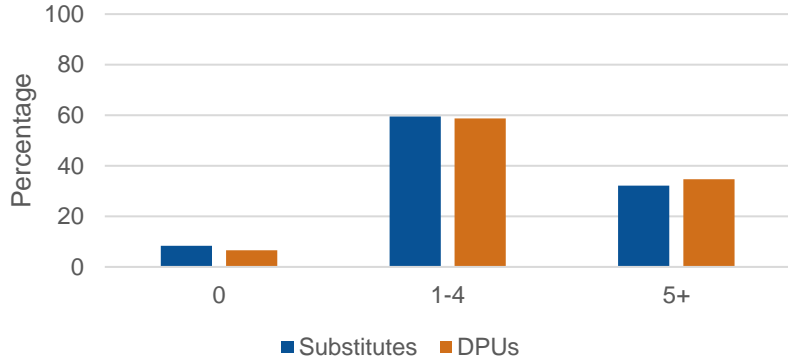
Routine Checkup in Last Year
($p = 0.53$)



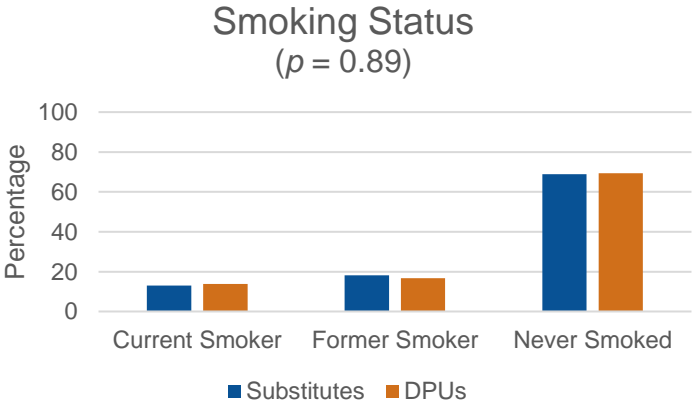
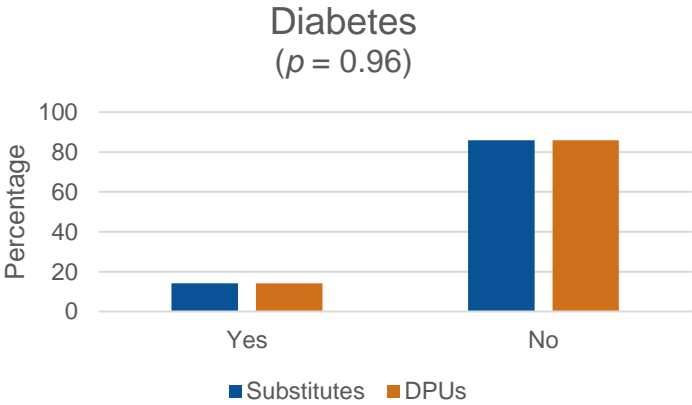
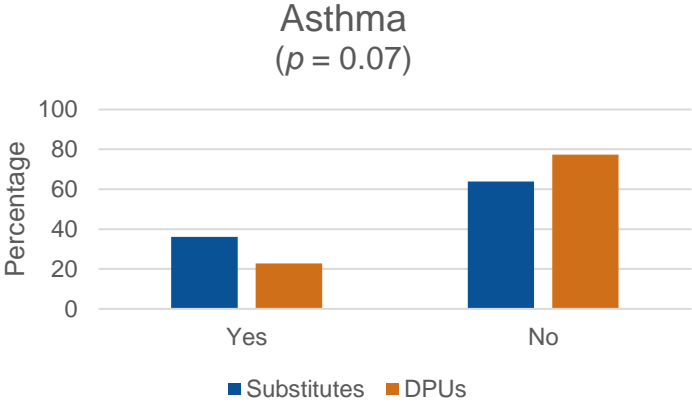
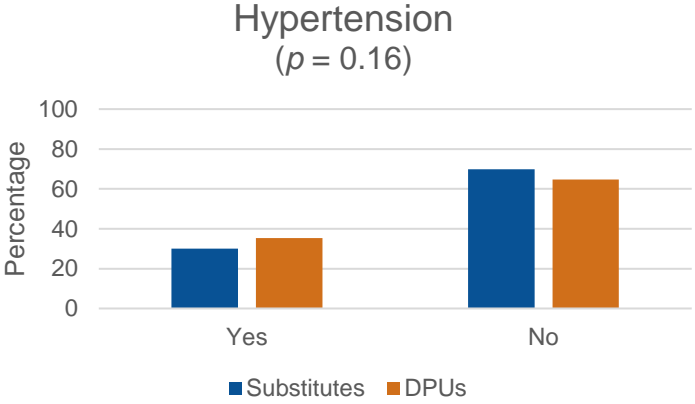
Teeth Cleaning in Last Year
($p = 0.37$)



Servings of Fruits/Vegetables Yesterday
($p = 0.61$)



2021 HCS Application Results – Key Health Outcomes (2)



Key Takeaways:

- DPU respondents tended to be somewhat older, more likely to be married/widowed, and more likely to own their home
- Hardly any substantive differences observed with respect to distributions of key health outcomes – none of the twelve we investigated were statistically significant at conventional levels

Limitations:

- With larger sample sizes, more statistically significant differences could have emerged
- DPUs in Chicago area may not behave in same way as DPUs in other areas of country

Ideas for Further Research

- Replicate the concurrent DPU survey idea for a nationwide and/or in other self-administered survey contexts
- Produce population-level analysis weights to simulate/evaluate following scenarios:
 1. Excluding DPUs (w/ substitution) ← current approach
 2. Including DPUs (w/o substitution)
 3. Excluding DPUs (w/o substitution)
- 2021 HCS was fielded in two releases, where we mailed to all DPUs (2, 3, or 4) in first and mailed to just one in second; future research could tease apart data by the “mail-to-one” vs. “mail-to-all” strategies

References

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Thanks!

Questions/Comments?

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