Supplemental Online Content

Graetz N, Hepburn P, Gershenson C, et al. Examining excess mortality associated with the COVID-19 pandemic for renters threatened with eviction. *JAMA*. doi:10.1001/jama.2023.27005

This supplemental material has been provided by the authors to give readers additional information about their work.

eAppendix 1. Linked Eviction-Mortality Records

The Census Numident file contains all interactions related to social security numbers (SSNs) that individuals have had with the Social Security Administration (SSA) since 1972, including death information. The SSA collects death information for the purposes of administering the Old-Age, Survivors, and Disability Insurance program, often referred to as "Social Security." This death information is obtained from many different sources, including first-party reports of death from family members and representatives as well as verified third-party reports from friends, state government offices, the Centers for Medicare and Medicaid Services, the Department of Veterans Affairs, and the Internal Revenue Service. The Numident file is now the single system of record for death information in the SSA.[1]

The Census Bureau, through the Personal Identification Validation System (PVS), assigns a unique, anonymous internal identifier called a Protected Identification Key (PIK) to individuals based on social security number, name, date of birth, address, and sex as available.[2] PIKs are used to link records at the person-level over time and across survey and administrative records to improve Census Bureau survey and decennial census data, to develop innovative data products, and to conduct research.[3]

Roughly 58 million eviction records from 2000-2016 and 483,408 eviction records from 2020-2021 (eTable 1) were processed through PVS using first name, last name, and address reported in the eviction filings. Roughly 38 million PIKs were assigned to the baseline data (65% PIK rate) and 282,000 PIKs were assigned to the pandemic data (58% PIK rate; we discuss these rates and potential bias below). Once eviction records went through PVS, virtually all PIKs were matched to birth and (if applicable) death records in the Census Numident file, where we observe individuals through August 31, 2021. Our final sample of locations with matched filing records covers roughly one in ten renter households nationally (10.7%).

The gap in eviction records between 2016 and 2020 is due to a gap in eviction data collection and data linkage; nationwide data from the Eviction Lab database is linked to PIKs from 2000-2016 and the Eviction Tracking System only began collecting eviction data in 2020 in response to the COVID-19 pandemic.

eAppendix 2. Model Estimation

We estimate monthly all-cause, age-specific mortality rates in the population threatened with eviction from 2020-2021. The denominator is all renters alive at the start of the given month and previously threatened with eviction (i.e., between January 1, 2020, and the given month). Note that the at-risk population is shifting over time. For example, the denominator in June 2020 is all individuals filed against between January 2020 and June 2020; this will include individuals filed against five months prior, a group that is not included in the denominator for April 2020. This slight lack of precision in the at-risk definition is a tradeoff we make to maximize sample size (though see below for a comparison of exposure lags). The numerator is deaths among these renters in the given month.

We fit the following negative binomial model using the 2010-2016 baseline data:

$$D_{y,m,a} = NB\left(m_{y,m,a} \times P_{y,m,a}, \theta\right) \quad (1)$$

$$\log(m_{y,m,a}) = \beta_0 + \beta_1 Y_y + \boldsymbol{\beta_2 M_m} + \boldsymbol{\beta_3 A}_a \quad (2)$$

Where y, m, a are indices for year, calendar month, and five-year age group, respectively; $D_{y,m,a}$ and $P_{y,m,a}$ are the counts of deaths and population at risk, respectively; θ is the overdispersion parameter; $m_{y,m,a}$ is the underlying mortality rate; β_0 is the intercept; Y_y is continuous calendar year; and $\boldsymbol{M_m}, \boldsymbol{A}_a$ are vectors of indicators for calendar month and five-year age group, respectively. We define the population at risk in a given month ($P_{y,m,a}$) as all individuals filed against within the past two years.

We further examine whether our results are robust to assumptions of linearity in mortality trends and exposure lags (i.e., months since eviction filing) in eFigure 2, which displays three mortality time series: 1) observed mortality, 2) expected mortality based on the negative binomial model above, and 3) expected mortality based on an autoregressive integrated moving average (ARIMA) model. We use predictions from the generalized linear model for our primary comparison because this count model considers sample size and is the most common specification in previous studies of excess mortality.[4] We use the ARIMA model to test for possible non-linearity and higher order interactions in the temporal trends. Specifically, we fit an ARIMA model using the Hyndman-Khandakar algorithm implemented in the auto.arima function in the R package.[5] This algorithm fits the three ARIMA parameters (i.e., the number of lag observations in the model, the number of times the raw observations are differenced, and the size of the moving average window) by minimizing AIC.

In the ARIMA models fit across various definitions of our exposure, we do not find evidence of non-linear trends. We also find that results are not sensitive to various lags in our primary exposure definition (filed against within the past 24 months).

eAppendix 3. Causal Assumptions

In this section we discuss causal assumptions related to interpreting our findings of both high excess mortality among threatened renters and higher excess mortality among this group relative to our comparison groups. Specifically, our interpretation rests on the following hypotheses about the underlying causal mechanisms:

1. Threatened renters had higher mortality during the pandemic period than in the baseline period because of the increased risk of excess mortality associated with the COVID-19 pandemic.
2. The difference in excess mortality between threatened renters and comparison groups represents a causal effect of filing on risk of excess mortality.

Comparing Pre-Pandemic and Pandemic Mortality among the Population Filed Against

In estimating excess mortality for those filed against, our baseline and pandemic samples may not be comparable. Rather than increasing risk of COVID-19 mortality, higher mortality in the pandemic period for threatened renters may instead be driven by two other changes induced by the pandemic: selection of who is filed against and the type of filing activity (see directed acyclic graph in eFigure 3).

First, threatened renters during the pandemic may have a different underlying mortality risk profile than threatened renters before the pandemic due to pandemic-induced selection into filing; indeed, filings were 44.7% lower than historical averages in our study area during this period of the pandemic (eFigure 8). It is possible that those filed against during this pandemic period, especially when various programs were in place to reduce eviction filings (e.g., eviction moratoria), may represent an especially vulnerable group in terms of mortality risk. In Table 1, we compare these two populations on characteristics that are correlated with mortality risk, including demographic characteristics we observe for all individuals (e.g., age, race, sex) and socioeconomic characteristics we observe for the subset of individuals we are able to merge to the ACS in the year immediately prior to filing (e.g., income, education). We do not find substantive differences between the pre-pandemic and pandemic populations filed against; for example, median household income for those filed against prior to the pandemic was $32,080 (interquartile range, $16,000–57,030) compared to $38,000 ($22,160–$63,750) for those filed against during the pandemic.

Second, filing activity may have changed during the pandemic. For example, it is possible that the reduced sample of filings during the pandemic represents filings that were particularly likely to result in forced displacement. Higher mortality in the pandemic sample may then simply be due to selecting for a sample of threatened renters that includes more eviction judgments—which are associated with a variety of detrimental health outcomes—rather than due to increased risk of excess mortality associated with COVID-19. We draw on three sources of information about filing details to investigate this possibility; unfortunately, all three sources are only available for a small subset of ETS sites, only some of which are included in our study sample. First, we examine whether *plaintiff claim amounts* (i.e., money damages sought by the landlord) on filings changed during the pandemic. This information is only available from filings

in Dallas, TX, New Orleans, LA, New York City, NY, and Philadelphia, PA; only Philadelphia, PA is included in our study area. Across these sites, median claim amounts were very stable between 2016-2020 and then increased during 2020-2021 (eFigure 4). Second, we examine changes in *serial filing* (i.e., repeat filings against the same household at the same address within one year). Serial filing often reflects landlord business models that are not necessarily intended to displace tenants; for examples, where the filing process is fast and cheap, landlords will often file against tenants repeatedly as a method of rent collection.[6,7] We find a strong correlation between the pre-pandemic and pandemic proportion of filings that were serial filings (eFigure 5). There were slightly fewer serial filings during the pandemic. Third, we examine *judgment rates* for pre-pandemic and pandemic filings in Minnesota and Philadelphia; only Philadelphia, PA is included in our study area. We find that judgment rates were slightly lower during the pandemic (eFigure 6).

In summary, in terms of possible differences in underlying mortality risk profiles, the pre-pandemic and pandemic populations filed against are similar on observed characteristics such as age, race, sex, income, and education. In terms of possible differences in the type of filings, filings during the pandemic were associated with higher claim amounts, slightly lower serial filing, and slightly lower judgment rates. Taken together, these findings do not suggest that our excess mortality results are the product of selection bias from shifting mortality risk profiles in the population filed against or changing types of eviction activity during the pandemic. Still, our tests of these selection mechanisms are limited. We only observe basic demographic and socioeconomic correlates of mortality risk and detailed information on filings is only available for a small subset of ETS locations. The pre-pandemic and pandemic population filed against may differ on unobserved characteristics which affect their underlying mortality risk profile or may have experienced different types of filings in ways we do not observe in our limited court data.

Interpreting Excess Mortality Differences across Comparison Groups

The difference in excess mortality between the population filed against and the comparison groups does not necessarily represent a causal effect of filing on excess mortality (see directed acyclic graph in eFigure 7). Rather, these differences suggest two underlying dynamics at work.

First, we take eviction filings as a proxy measure for forced displacement. Displacement is difficult to measure in court records and can occur at any point in the eviction process, often without a judgment against the tenant. In order to estimate how many eviction filings actually result in displacement, we use PIKs to merge eviction filings in the pre-pandemic period to the Residence Candidate File (RCF). The RCF uses administrative sources to provide an annual estimate of residence for every unique PIK, representing uncertainty in location as a probability distribution.[10] The RCF provides person-year location estimates from 2012-2019. In our pre-pandemic sample of eviction filings from 2012-2016, we use the top-ranked annual residence for each individual to estimate movement rates based on whether we observe individuals at a different address in the year following filing than the address at which they were filed. We find that 52.35% of individuals filed against between 2012-2016 moved within the year after filing. The background movement rate for renters in these locations was 22.90%. Results are similar

when restricting to only individuals where the probability of the top-ranked location is greater than 95% in all years. The relatively large gap between observing an eviction during the pandemic and seeing that renter displaced a year later in the RCF prevents us from directly estimating excess mortality among displaced renters, especially due to survivor bias. Still, the high movement rate post-filing and the high excess mortality we observed among renters whose landlords took steps to evict them suggests that filing is a suitable proxy for forced displacement, which we suspect is the primary mechanism linking eviction filing to increased risk of excess mortality during the pandemic. Further, as suggested by quasi-experimental work on the impact of eviction moratoria on aggregate mortality rates[8,9], there may indeed be a causal effect of eviction filing on mortality risk during the pandemic driven by mechanisms such as the increased infection risk associated with loss of stable housing. While eviction filings alone are associated with many detrimental consequences related to accessing stable housing in the future, the discrete event of displacement would likely be the primary mechanism underlying this potential effect. This would suggest that our estimates of increased excess mortality based only on filings are a conservative estimate of the effect of executed eviction judgments during the pandemic.

Second, there may be no causal effect of eviction filing, and differences in excess mortality estimates between those filed against and those never filed against are instead driven by selection: eviction filings are concentrated in highly disadvantaged renter populations that were already at high risk of COVID-19 infection and mortality for other reasons (e.g., very constrained power in limiting workplace exposure to COVID-19, overcrowded housing). Further, renters who experience COVID-19 infection may be disproportionately exposed to filing in part because they are more likely to fall behind on rent following infection, for example due to job loss.

Still, the potential for selection effects rather than causal effects does not diminish the devastating role of eviction within this punitive cycle: filings are heavily concentrated in a structurally disadvantaged renter population who have experienced significant excess mortality throughout the pandemic, and this likely would have been worse if not for unprecedented federal investment in emergency rental assistance and eviction moratoria. Our results highlight that eviction court filings, which can be linked to a wide variety of Census and administrative records, can be used to highlight a population that is difficult to measure at a time when they are in crisis. Whether the consequences of this condition are caused by the eviction filing itself is separate from the fact that individuals in housing court required urgent assistance, and housing court represents a critical point for intervention.

eAppendix 4. Additional Excess Mortality Comparison

As an additional comparison to excess mortality for threatened renters, we created a sample of the total population across ETS locations that we could directly observe in a renting household below the poverty threshold in an American Community Survey (ACS) within the previous five years. For the baseline population we used the 2010-2014 ACS and for the pandemic population we used the 2015-2019 ACS. The benefit of this sample is that we directly observe individual characteristics (e.g., poor, renter) rather than inferring this from tract-level data. Still, even pooling five years of ACS data to maximize our potential sample size, this sample is smaller than the high-filing, high-poverty sample above. Point estimates for excess mortality in this smaller sample were similar to those estimated using the high-filing, high-poverty sample, but confidence intervals were much wider. Therefore, we report excess mortality in the high-filing, high-poverty population as our primary comparison to the filed against population, alongside excess mortality in the general population.

eAppendix 5. Counterfactual Estimates of Total Deaths Averted

In a secondary analysis, we use the estimated monthly mortality rates to simulate deaths that (a) were averted by reducing filings 44.7% below historical averages in our study area and (b) that might have been prevented had eviction filings been fully halted during this period. We simulate these different levels of monthly filings through our monthly age-standardized mortality rates among those filed against during the pandemic to calculate monthly deaths under both scenarios. We use our mortality rate among the population not filed against living in high-poverty, high-filing tracts during the pandemic to simulate deaths among these populations had those filings not occurred. In each subsequent month, we calculate an updated at-risk population by adding new monthly filings from the ETS and subtracting estimated deaths in the previous month. These estimates of deaths averted are highly dependent on causal assumptions related to the effect of eviction filing on risk of excess mortality associated with COVID-19 (see Section e5 in Supplement 1 for a discussion of assumptions).

Within the population that likely would have been filed against under pre-pandemic conditions in our study area but was not, preventing eviction filing was associated with 3,207 (2,944–3,490) fewer deaths, a 39% reduction compared to expected deaths. We similarly estimate additional deaths associated with observed filings compared to if there had been zero filings. Within the population that was filed against in our study area, eliminating filings altogether would have resulted in 5,858 (5,376–6,393) fewer deaths, a 39% reduction compared to expected deaths.

Assumptions Underlying Counterfactual Estimates of Total Deaths Associated with Filings

The total eviction filing scenarios correspond to two distinct counterfactual comparisons. The first scenario compares deaths within the population filed against during this pandemic period (*observed*) to deaths that would have occurred had this population instead experienced the same mortality rates as the population not filed against living in high-poverty, high-filing tracts (*counterfactual*). We interpret this difference as the total deaths associated with eliminating filings within the population filed against. The second scenario compares deaths within the population that would have been filed against had filings followed historical averages (*counterfactual*) to deaths that likely did occur in this population based on mortality rates observed in the population not filed against living in high-poverty, high-filing tracts (*counterfactual*). We interpret this difference as the total deaths associated with eliminating filings within the additional population that would have been filed against under historical filing trends.

These estimates are based on the following assumptions:

1. Had they not been filed against, the population filed against during the pandemic would have experienced the same mortality rates as the population not filed against living in high-poverty, high-filing tracts during the pandemic.
2. The population that would have been filed against during the pandemic if filings had followed historical averages experienced the same mortality rates as the population not filed against living in high-poverty, high-filing tracts. Had this population been filed

against, they would have experienced the same mortality rates as those actually filed against.

3. Each new filing from January 2020 to August 2021 corresponds to roughly one unique individual being added to the exposed group (i.e., filed against since January 2020). This is an approximation based on the offsetting patterns that roughly 22% of our matched filings are serial filings (i.e., we observe that individual in a previous matched filing since January 2020) and there are roughly 1.2 adults listed on each filing.
4. A causal interpretation requires treating the difference between mortality rates in the population filed against and the population not filed against living in high-poverty, high-filing tracts as due to the causal effect of filing on mortality (see Appendix C).

For all estimates, we bootstrap confidence intervals for total deaths using the estimated confidence intervals of exposed and unexposed mortality rates.

eReferences

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eTable 1. Filings by Sample Location

Locations and total filings observed over the period January 1, 2020, to August 31, 2021. Source: Eviction Tracking System (https://evictionlab.org/eviction-tracking/).

Site	Filings observed
Indiana	107,421
Houston, TX	77,518
Missouri	49,990
Fort Worth and Denton, TX	44,896
Memphis, TN	36,316
Tampa, FL	28,640
Greenville, SC	22,618
Cincinnati, OH	18,450
Delaware	18,071
Milwaukee, WI	17,697
Jacksonville, FL	16,685
Philadelphia, PA	15,155
Charleston, SC	14,817
Cleveland, OH[a]	8,891
Boston, MA[b]	6,243
Total filings	**483,408**

[a] The Cleveland site covers cases in the Cleveland municipal area, which does not fully cover Cuyahoga County, OH.

[b] The Boston site covers cases in Brookline District Court, Cambridge District Court, Chelsea District Court, Eastern Housing Court, Newton District Court, Somerville District Court, and Boston Municipal Court. This covers Arlington, Boston, Brookline, Belmont, Cambridge, Chelsea, Medford, Newton, Revere, Somerville, and Winthrop Town.

eTable 2. Cumulative Age-Specific All-Cause Mortality

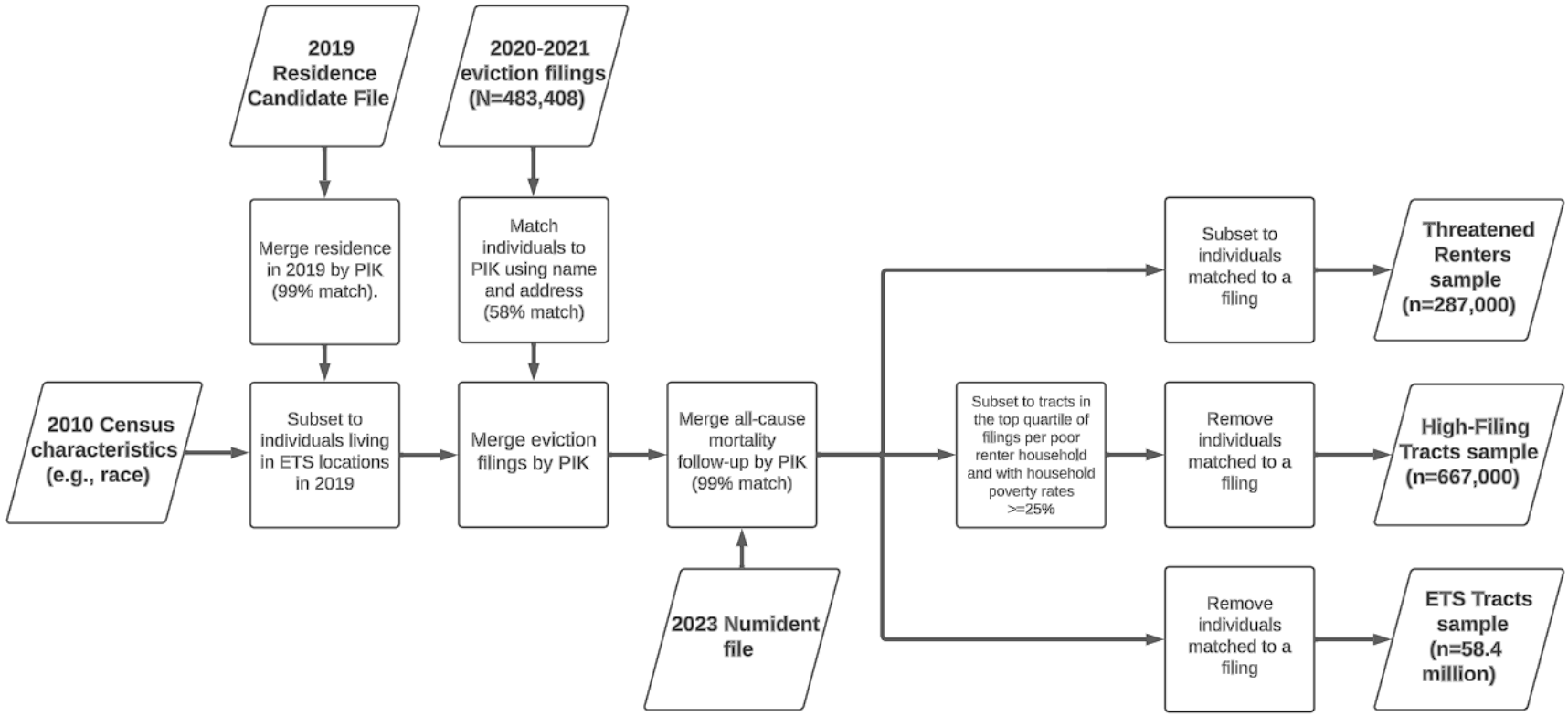
Cumulative age-specific all-cause mortality (April 1, 2020, to August 31, 2021) compared to expected mortality by exposure group. 95% uncertainty intervals are reported from the model of expected mortality based on historical trends. Census Disclosure Review Board Approval Number: CBDRB-FY23-CES004-013. Sources: 2015/2019 Resident Candidate File and 2021 Numident file linked to eviction records.

Population	5-year age group	Mortality rate per 100,000 person-months (expected)	Mortality rate per 100,000 person-months (observed)	Mortality rate ratio
Never threatened with filing	20-24	8.07 (7.84 - 8.30)	9.15 (8.93 - 9.36)	1.13 (1.09 - 1.18)
	25-29	8.88 (8.64 - 9.10)	11.68 (11.43 - 11.92)	1.32 (1.27 - 1.36)
	30-34	9.25 (9.01 - 9.50)	13.25 (12.97 - 13.53)	1.43 (1.38 - 1.48)
	35-39	10.66 (10.37 - 10.94)	14.65 (14.35 - 14.95)	1.37 (1.33 - 1.42)
	40-44	13.46 (13.14 - 13.79)	17.76 (17.42 - 18.10)	1.32 (1.28 - 1.36)
	45-49	19.69 (19.31 - 20.08)	24.41 (24.02 - 24.80)	1.24 (1.21 - 1.27)
	50-54	32.13 (31.59 - 32.66)	34.94 (34.49 - 35.39)	1.09 (1.07 - 1.11)
	55-59	50.44 (49.75 - 51.11)	53.96 (53.43 - 54.50)	1.07 (1.05 - 1.09)
	60-64	76.32 (75.37 - 77.22)	85.32 (84.64 - 86.00)	1.12 (1.10 - 1.13)
	65-69	116.00 (114.70 - 117.20)	130.00 (129.10 - 130.90)	1.12 (1.11 - 1.13)
	70-74	186.00 (184.10 - 188.00)	200.70 (199.40 - 201.90)	1.08 (1.07 - 1.09)
	75-79	298.30 (295.10 - 301.40)	331.90 (330.00 - 333.90)	1.11 (1.10 - 1.13)
	80+	866.30 (858.80 - 874.10)	957.90 (955.00 - 960.70)	1.11 (1.10 - 1.12)
Never threatened with filing (high-poverty and high-filing tracts)	20-24	14.08 (12.01 - 16.26)	20.04 (17.37 - 22.71)	1.43 (1.16 - 1.75)
	25-29	14.22 (12.11 - 16.52)	22.80 (20.02 - 25.58)	1.61 (1.31 - 1.98)
	30-34	15.25 (12.55 - 18.04)	29.15 (25.49 - 32.81)	1.93 (1.54 - 2.41)
	35-39	21.99 (18.55 - 25.75)	35.99 (31.28 - 40.69)	1.65 (1.33 - 2.04)
	40-44	28.88 (24.56 - 33.35)	42.49 (37.08 - 47.90)	1.48 (1.21 - 1.82)
	45-49	36.84 (31.99 - 42.09)	58.55 (52.06 - 65.04)	1.60 (1.32 - 1.92)
	50-54	60.07 (53.95 - 66.41)	79.90 (72.66 - 87.14)	1.33 (1.16 - 1.53)
	55-59	93.52 (86.49 - 101.00)	115.50 (107.40 - 123.50)	1.24 (1.11 - 1.37)
	60-64	141.10 (131.40 - 150.10)	163.70 (154.30 - 173.10)	1.16 (1.06 - 1.26)
	65-69	198.20 (186.90 - 210.20)	239.10 (227.00 - 251.20)	1.21 (1.11 - 1.31)
	70-74	297.20 (281.50 - 313.10)	346.90 (330.00 - 363.70)	1.17 (1.09 - 1.26)
	75-79	409.60 (386.40 - 432.70)	492.40 (467.30 - 517.50)	1.20 (1.11 - 1.30)
	80+	924.40 (890.20 - 957.90)	1106.00 (1073.00 - 1139.00)	1.20 (1.14 - 1.25)
Threatened with filing	20-24	8.60 (4.33 - 13.62)	21.67 (14.49 - 28.85)	2.72 (1.35 - 6.20)
	25-29	10.88 (6.83 - 15.26)	18.87 (13.48 - 24.27)	1.82 (1.08 - 3.05)
	30-34	13.28 (8.67 - 18.21)	28.18 (21.33 - 35.03)	2.20 (1.37 - 3.50)
	35-39	19.47 (13.71 - 24.88)	45.19 (35.80 - 54.58)	2.37 (1.64 - 3.37)
	40-44	25.85 (18.08 - 34.42)	64.75 (52.70 - 76.80)	2.58 (1.76 - 3.88)
	45-49	41.84 (32.42 - 52.77)	85.94 (70.16 - 101.70)	2.09 (1.51 - 2.91)
	50-54	67.94 (53.31 - 83.23)	118.80 (98.12 - 139.40)	1.77 (1.32 - 2.36)
	55-59	105.50 (83.90 - 127.60)	211.50 (180.50 - 242.50)	2.03 (1.57 - 2.62)
	60-64	166.40 (134.80 - 203.10)	358.90 (309.80 - 408.10)	2.19 (1.68 - 2.86)
	65-69	260.20 (208.50 - 320.70)	474.70 (398.20 - 551.20)	1.84 (1.39 - 2.46)
	70-74	384.00 (281.70 - 478.20)	687.80 (556.30 - 819.40)	1.82 (1.32 - 2.48)

Population	5-year age group	Mortality rate per 100,000 person-months (expected)	Mortality rate per 100,000 person-months (observed)	Mortality rate ratio
	75-79	522.50 (361.20 - 682.20)	989.80 (764.30 - 1215.00)	1.95 (1.31 - 2.90)
	80+	682.60 (456.00 - 912.00)	1463.00 (1136.00 - 1790.00)	2.22 (1.47 - 3.39)

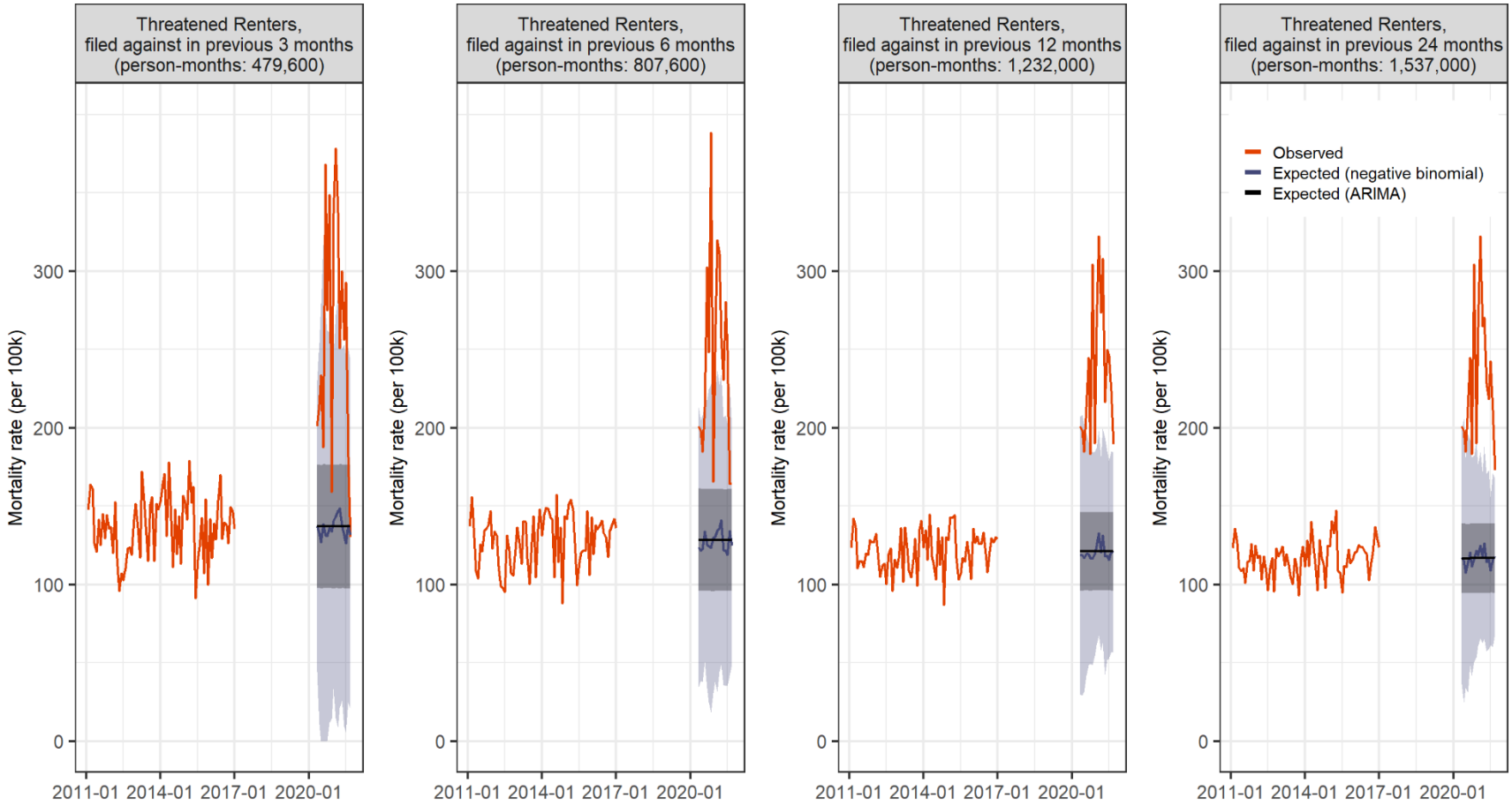
eFigure 1. Data Linkage Flowchart

In constructing the baseline comparison samples for each group, we follow the same process following individuals living in ETS locations prior to the pandemic and using 2010-2016 eviction filings



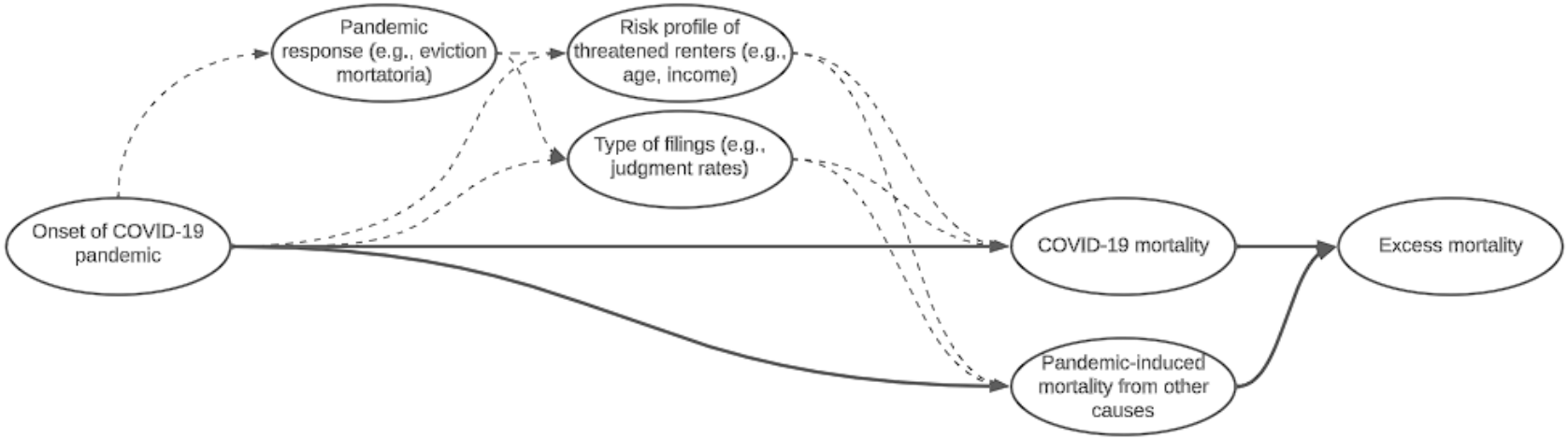
eFigure 2. Comparison of Projected Mortality Models

Monthly trends in observed age-standardized all-cause mortality (January 1, 2011, to December 31, 2016, and April 1, 2020, to August 31, 2021) compared to expected mortality based on two models: 1) a negative binomial model adjusted for age, calendar month, and year; 2) an ARIMA model with parameters selected by minimizing AIC (see eSection 2). Census Disclosure Review Board Approval Numbers: CBDRB-FY23-CES004-013 and CBDRB-FY23-CES004-031. Sources: 2021 Numident file linked to eviction records.



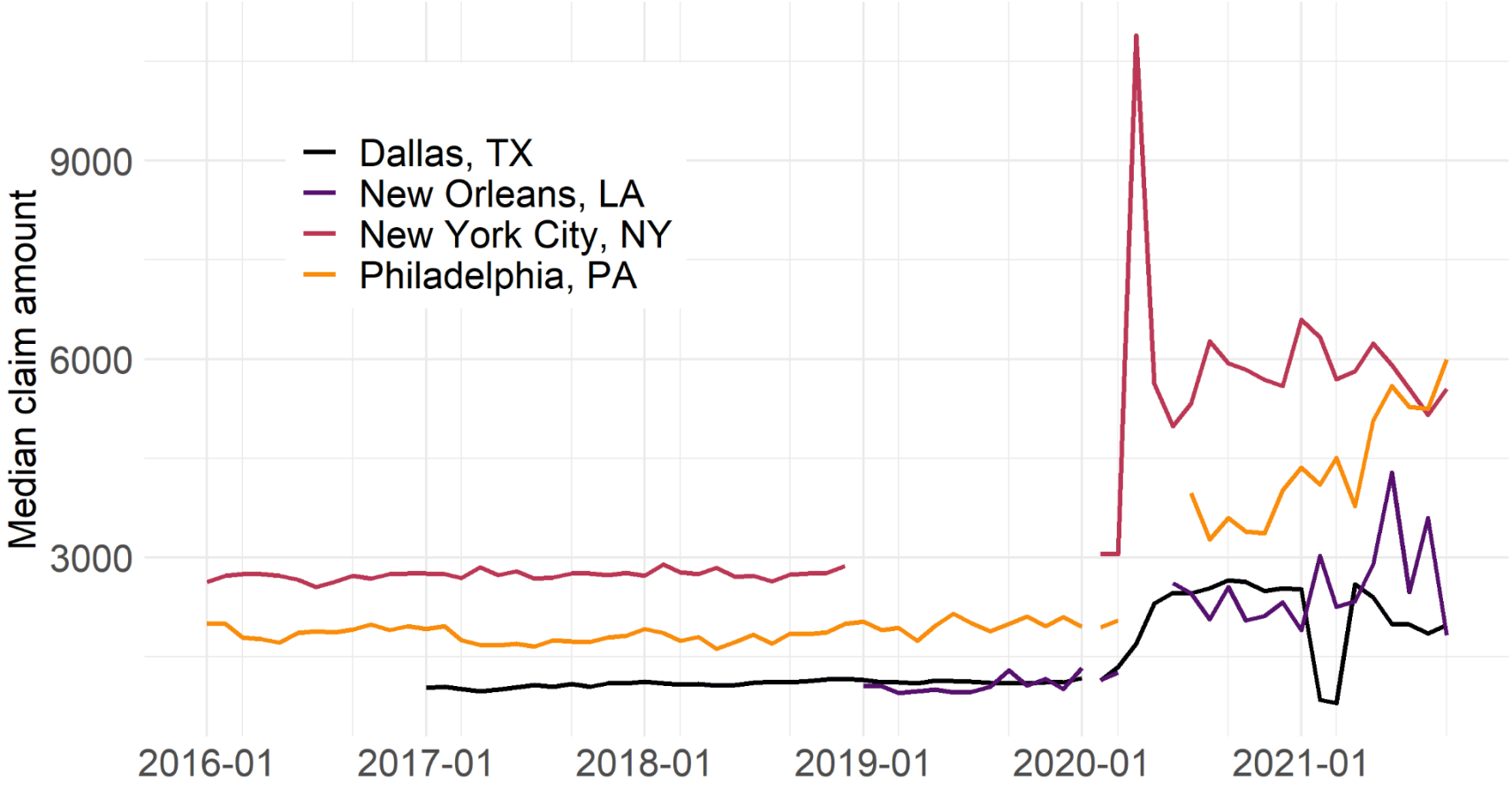
eFigure 3. Directed Acyclic Graph for Excess Mortality Among Threatened Renters

Directed acyclic graph describing the theorized relationship between the onset of the COVID-19 pandemic and increased excess mortality among threatened renters. In comparing excess mortality among threatened renters before and during the pandemic, our goal is to describe age-standardized excess mortality among threatened renters that is due to changing mortality conditions associated with the pandemic (i.e., the sum of the solid lines) rather than pandemic-induced changes in the mortality risk profile of threatened renters or pandemic-induced changes in the type of filings.



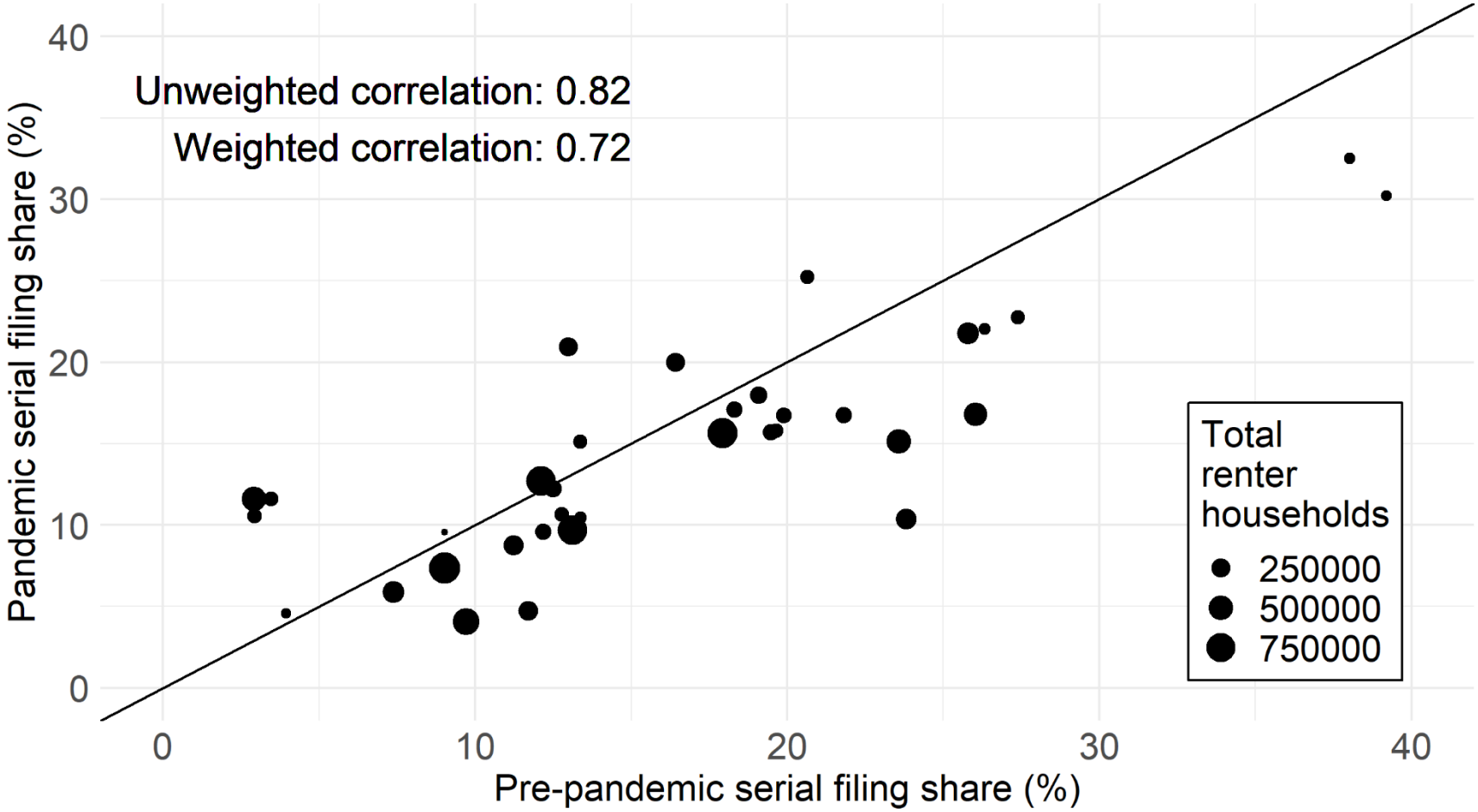
eFigure 4. Trends in Filing Claim Amounts

Monthly median claim amounts for eviction filings in Eviction Tracking System (ETS) sites where data are available; only one of these sites, Philadelphia, is included in our study area due to limitations in which data we were able to upload and match to Census data.



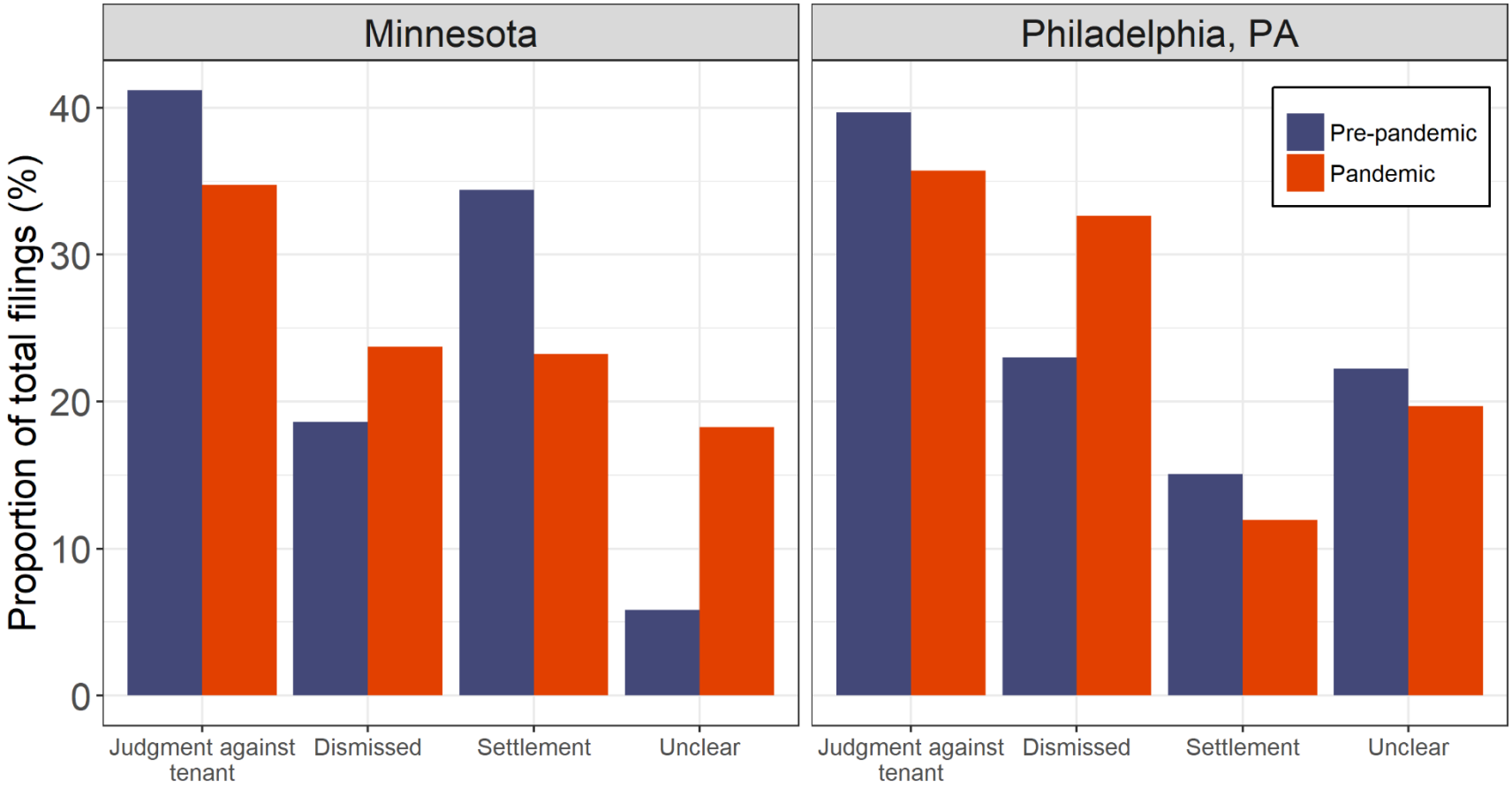
eFigure 5. Comparison of Serial Filings

Correlation across all sites included in our study area of the pre-pandemic and pandemic proportions of total filings that were serial filings (i.e., repeat filings against the same household at the same address within one year).



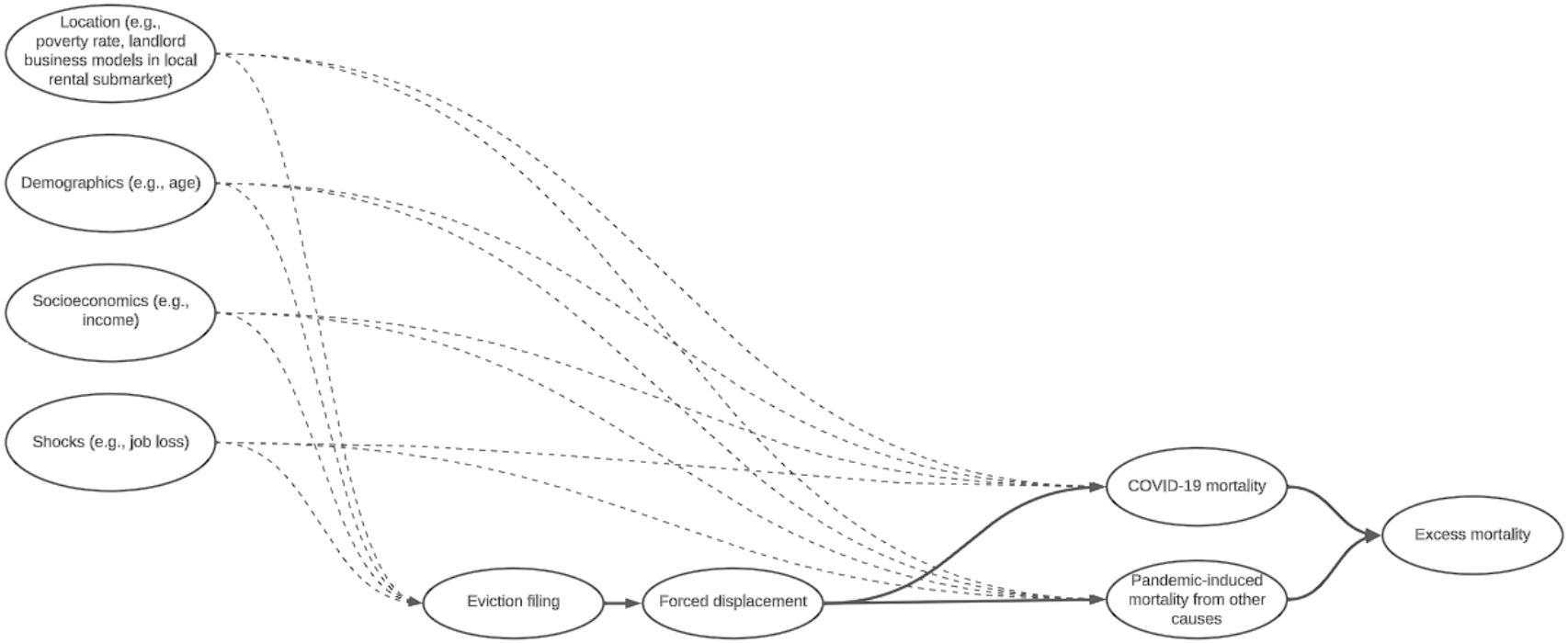
eFigure 6. Comparison of Filing Outcomes

Outcomes of pre-pandemic and pandemic eviction filings in Minnesota and Philadelphia, PA. Only Philadelphia, PA is included in our study area due to limitations in which data we were able to upload and match to Census data.

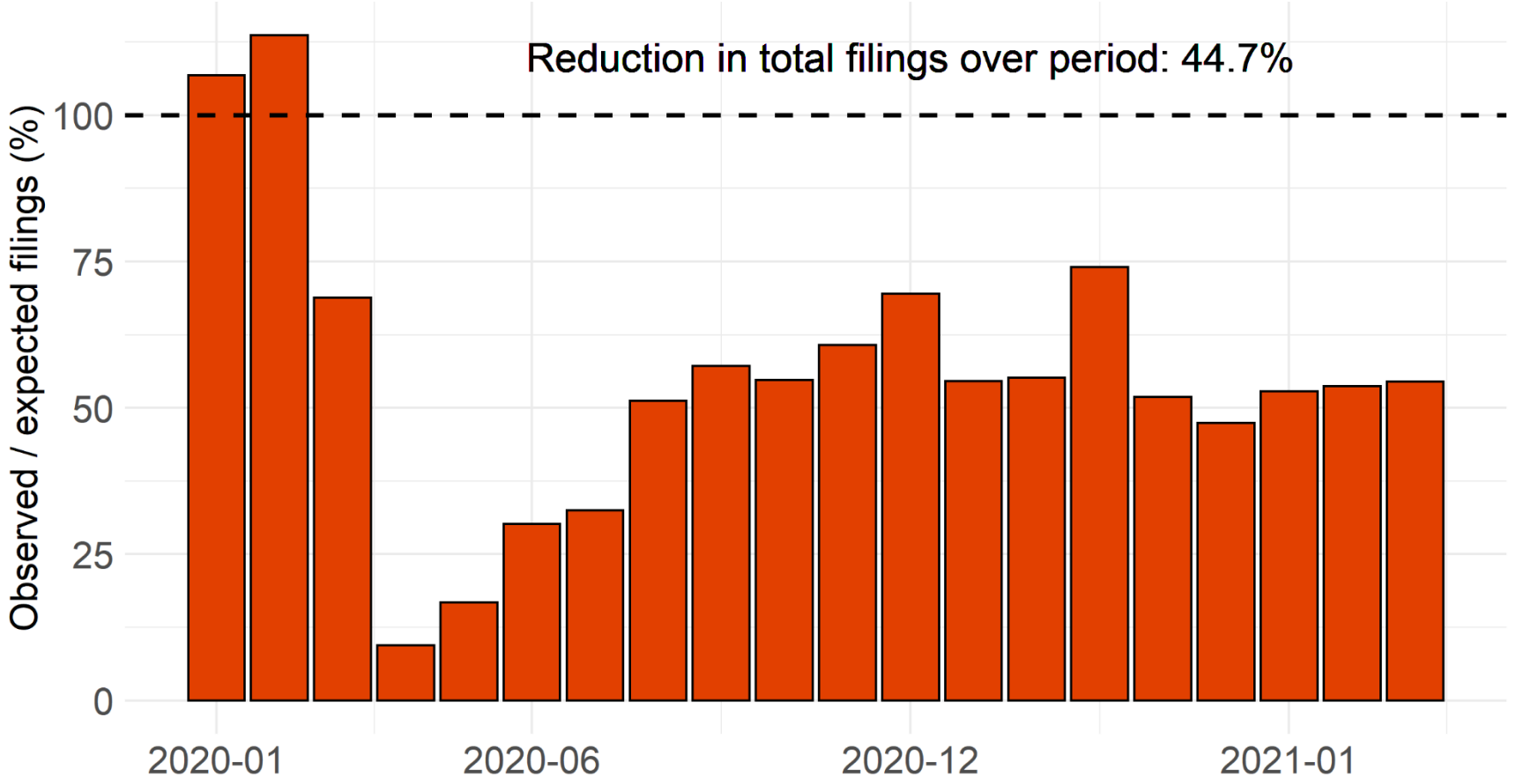


eFigure 7. Directed Acyclic Graph for Excess Mortality Due to Forced Displacement

Directed acyclic graph describing the theorized relationship between eviction filing and excess mortality caused by the COVID-19 pandemic. In comparing excess mortality among threatened renters to excess mortality in High-Filing Tracts, our goal is to describe age-standardized excess mortality differences due to forced displacement induced by eviction filing (i.e., the sum of the solid lines) rather than driven by confounding due to differences in location, demographics, socioeconomics, and shocks.

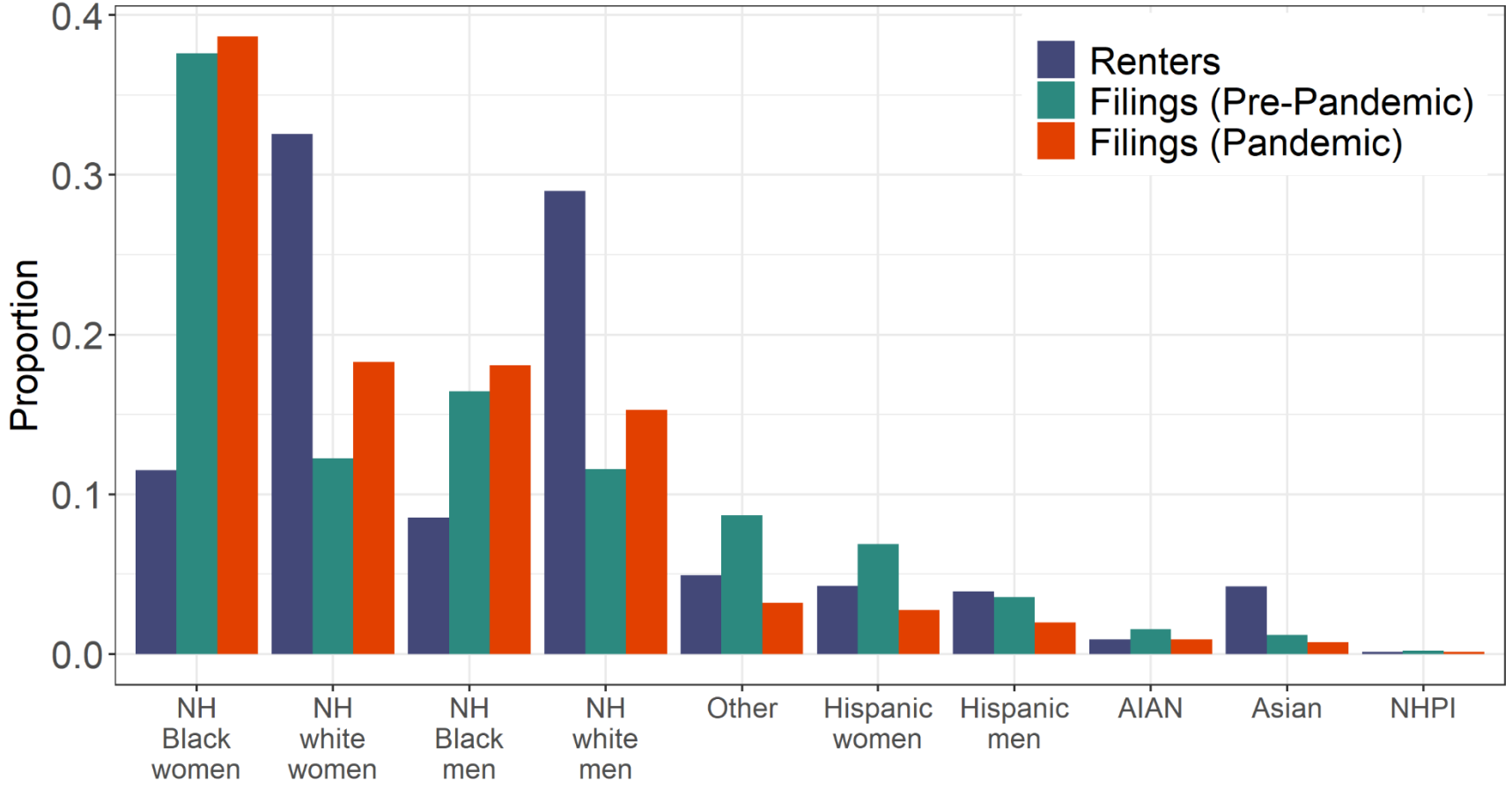


eFigure 8. Total Monthly Filings During Pandemic Period as a Proportion of Historical Averages.
Monthly historical averages are calculated using the average number of filings in a baseline period, which varies slightly by ETS site around 2016-2019 but can go as far back as 2012 depending on years of data available. Source: Eviction Tracking System (https://evictionlab.org/eviction-tracking/).



eFigure 9. Proportions of Renters and Filings by Race-Ethnicity and Sex

Distribution of eviction filings in ETS locations by race-ethnicity and sex during the baseline period (aggregated over 2010-2016) and during the COVID-19 pandemic (aggregated over January 1, 2020, to August 31, 2021). The "Other" category includes those who report "Some other race" or "Two or more races." Census Disclosure Review Board Approval Number: CBDRB-FY23-CES004-013, CBDRB-FY23-CES004-035. Sources: 2010 Census linked to eviction records.



eFigure 10. Excess Mortality Ratios by Race-Ethnicity

Excess mortality ratios of cumulative age-standardized mortality (April 1, 2020, to August 31, 2021) and expected mortality. 95% uncertainty intervals are reported from the model of expected mortality based on historical trends (note these are very narrow for the population never threatened with filing). Census Disclosure Review Board Approval Number: CBDRB-FY23-CES004-013. Sources: 2015/2019 Resident Candidate File and 2021 Numident file linked to eviction records.