

Household displacement after recent disasters in the United States

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Introduction

According to recent data from the US Census Bureau's Household Pulse Survey (HPS), roughly 1.2% of households have been displaced due to disasters since December 2021 (Fig 1). Most of these households returned quickly: 44% within a week and 24% within a month. However, 19% of displaced households took over one month to return (Fig 2) and 13% never returned (Fig 3).

Consequences of protracted displacement

Protracted displacement is associated with profound negative consequences for affected households (Fig 4). Yet few disaster risk models incorporate the multitude of factors known to influence household return beyond housing damage.



Fig 4. The consequences of protracted displacement for affected households

Exploring trends with displacement durations

Household-level responses from the HPS are publicly available, allowing us to explore trends between displacement durations and factors such as: property damage, lifeline disruption, socioeconomic factors, and area-based statistics. An interactive dashboard to visualize these trends is available online (Fig 5).

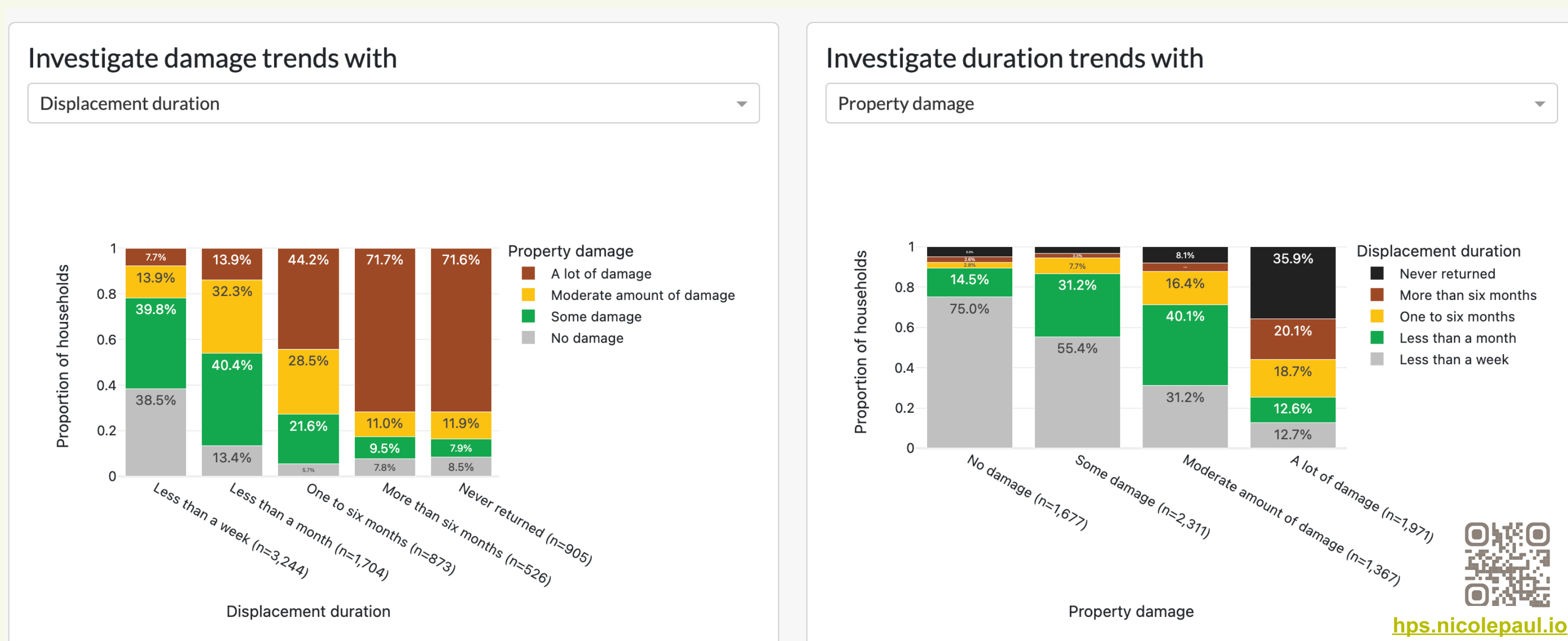


Fig 5. Screenshot of the online dashboard to visualize trends from the Household Pulse Survey

Fitting predictive models for displacement duration

Alternate predictive models for household displacement duration are proposed for integration within disaster risk analyses, ranging in complexity and predictive power. A classification tree model is proposed to predict return outcomes with a minimum number of predictors: property damage, housing tenure, dwelling type, and the 10-year population growth trend in the respective metro area or state. A random forest model is also proposed, improving the model's predictive power but adding complexity. Techniques in explainable artificial intelligence can help us draw inferences from these more complex models, allowing us to draw inferences on which factors drive predictions of different household displacement durations.

Across all displacement durations, property damage was the number one predictor. However, property damage only explained approximately 40% of outcomes for households that returned. For households that did not return, property damage explained less than 30% of outcomes. For households that returned within a month, the top five predictors were all related to physical damage to the built environment. In contrast, socioeconomic factors such as housing tenure and income were in the top five predictors for households that took beyond one month to return or never returned.

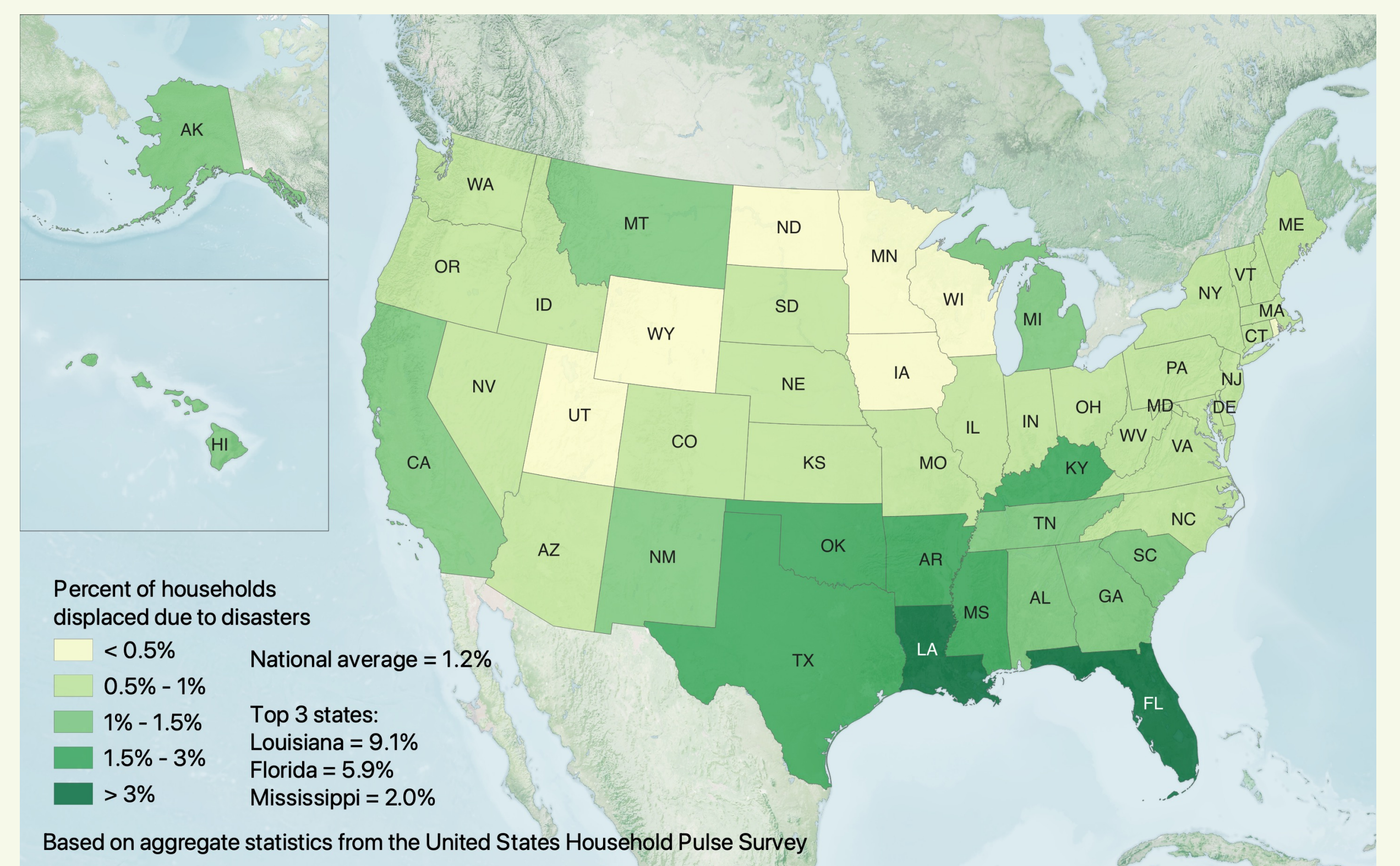


Fig 1. The proportion of households that reported any displacement due to disasters

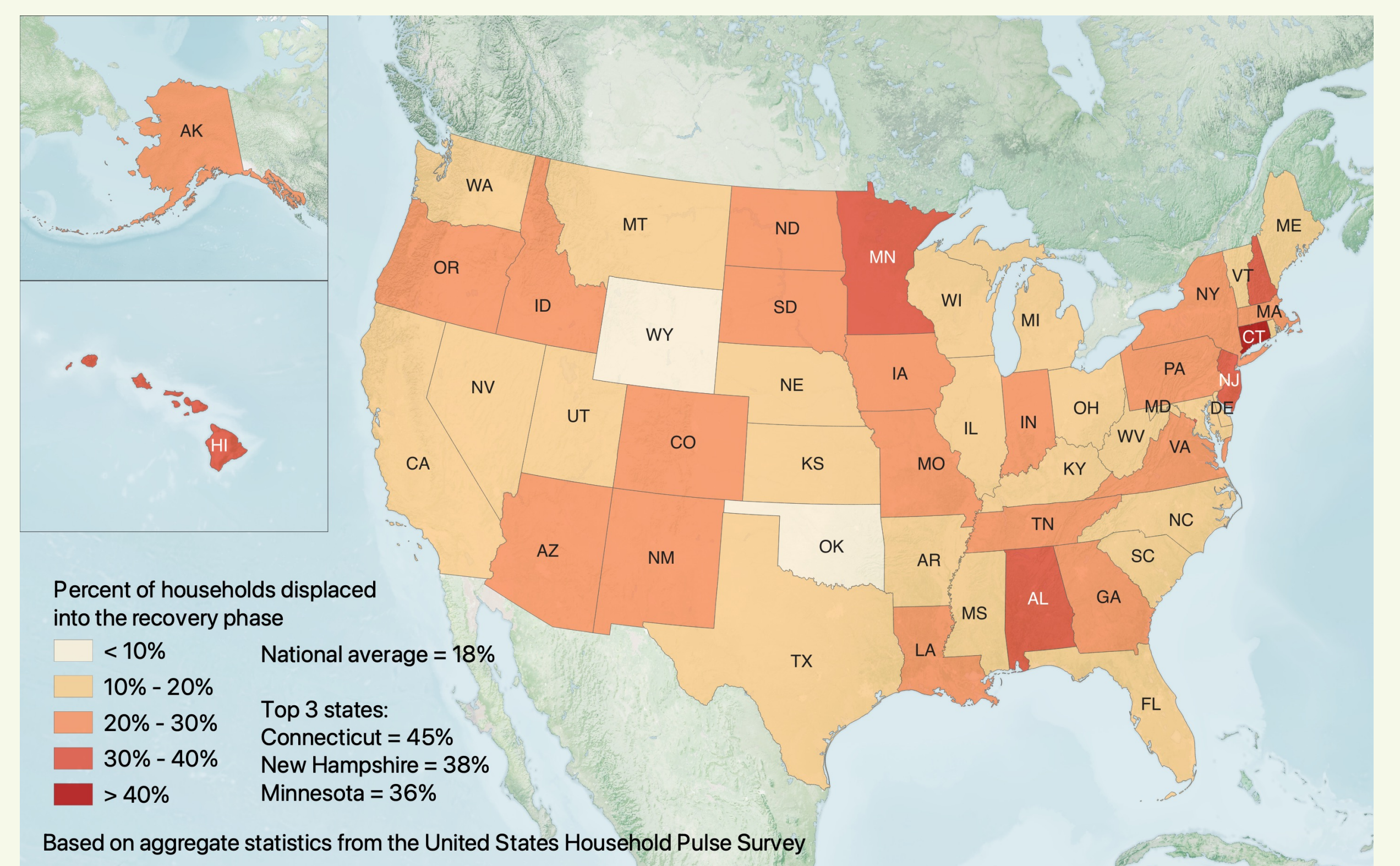


Fig 2. The proportion of displaced households that took over one month to return

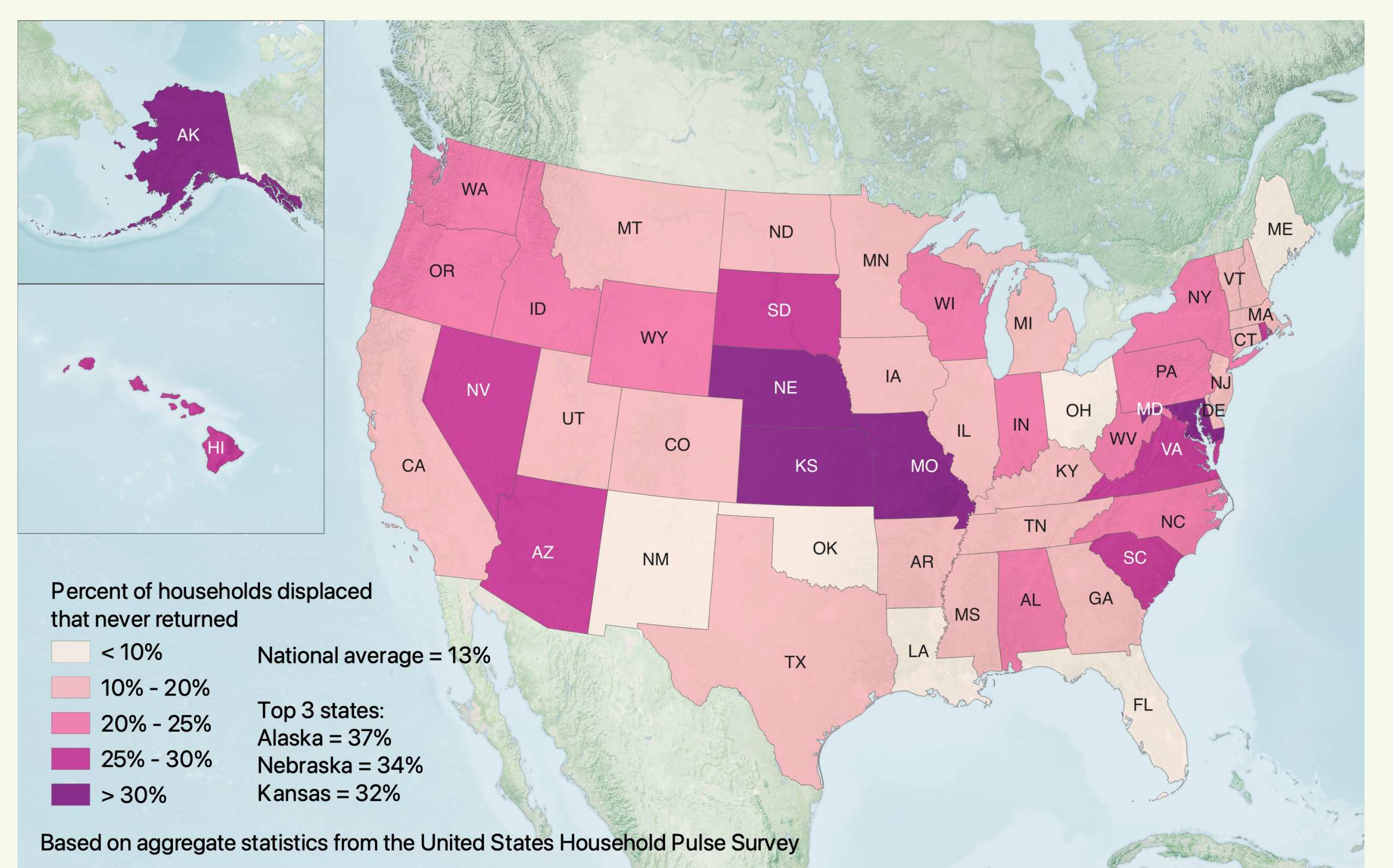


Fig 3. The proportion of displaced households that never returned