

Disparate Effects of Disruptive Events on Children



FLORENCIA TORCHE, JASON FLETCHER, AND JENNIE E. BRAND 

Disruptive events such as economic recessions, natural disasters, job loss, and divorce are highly prevalent among American families. These events can have a long-lasting impact when experienced during childhood, potentially altering academic achievement, socioemotional well-being, health and development, and later life socioeconomic status. Much research has considered the overall impact of disruptive events on children's lives, but the consequences of disruption also vary across groups. The same event may have profound negative consequences for some groups, minor or no impact for others, and even be a generative or positive turning point for other groups. This issue focuses on the disparate consequences of disruptive events on children. We consider theoretical approaches accounting for effect heterogeneity and methodological challenges in identifying unequal impacts. We also review an emerging multidisciplinary literature accounting for variation in the impact of disruption across several widely studied domains that affect children's life chances, including economic, household, educational, health, and environmental events.

Keywords: Disruptive events, heterogeneity, socioeconomic disparities, social normativity, childhood, children's outcomes

Disruptive events can change the course of people's lives. These events can occur at the micro level, such as job loss, home loss, divorce or separation, incarceration, residential migra-

tion, or health shocks affecting individuals and families. Or they can occur at the macro level, such as economic recessions, pandemics, school closures, or natural disasters affecting

Florencia Torche is Dunlevie Family Professor of Sociology at Stanford University, United States. **Jason Fletcher** is Vilas Distinguished Achievement Professor of Public Affairs and Population Health Sciences, University of Wisconsin, Madison, United States, and director, Center for Demography of Health and Aging. **Jennie E. Brand** is professor of sociology and statistics at the University of California, Los Angeles, United States, and co-director of the Center for Social Statistics in Los Angeles.

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large populations. These two levels are intertwined: for example, more job loss occurs during economic recessions and more illness occurs during a pandemic. Children are particularly vulnerable to disruptive events because shocks experienced in early life could alter their developmental trajectories and result in long-term consequences on their health, attainment, and well-being. Much literature documents that the risk of experiencing disruptive events is stratified by socioeconomic conditions. People with fewer resources are usually more likely to experience different kinds of disruption, ranging from economic and family instability to incarceration and health shocks. Yet a higher likelihood of experiencing disruption does not necessarily lead to a larger effect of disruption. As we argue, variation in the effects of disruptive events depends on different, and sometimes offsetting, mechanisms.

In this introduction, we focus on the impact of disruptive events on children and how the impact varies within the population. We provide a theoretical framework to consider the mechanisms accounting for variation across different groups. We then discuss methodological approaches and challenges in capturing heterogeneity in the effect of disruption. Finally, we describe variation in the impact of micro- and macro-level disruptions along several widely studied domains relevant for children's life chances, including economic, household, educational, health, and environmental.

THEORETICAL FRAMEWORK TO UNDERSTAND VARIATION IN THE EFFECTS OF DISRUPTION

The consequences of disruptive events vary across different groups of children. The literature suggests that the same disruptive event can have profound negative consequences for some groups, minor or no impact for others, and even present a generative or positive turning point for other groups. Aggregate effects can therefore mask substantial heterogeneity and miss dissimilar, and even opposite, effects across different subpopulations. We consider two broad theoretical approaches as to how the effects of disruptive events on children vary across groups. These approaches focus, respectively, on disparities in socioeconomic re-

sources of those affected by disruption, and on variation in the normativity and predictability of shocks for different groups. These theoretical approaches systematize accumulated insights based on empirical work from several disciplines in the social sciences, including sociology, psychology, and economics. We recognize that other sources of heterogeneity exist, including differential susceptibility due to genetic or personality factors, or the age at which events occur. Even within these sources of variation, however, structural conditions governed by socioeconomic resources or social normativity account for substantial variation in the effects of disruption on children's lives (Aquino, Brand, and Torche 2022).

Structural Factors: Disparities in Socioeconomic Resources

Individuals and families with limited economic resources are often less equipped to reduce the risk of exposure and compensate for the negative consequences of disruptive events than their more advantaged peers. The limited resources of disadvantaged households, including lower levels of education, income, wealth, and other resources that could support a family safety net, render them less able to buffer negative shocks than more advantaged households. For example, the negative consequences of a recession on economic well-being are stronger for parents with fewer skills and assets not only because they are more likely to become unemployed but also because if they lose their jobs, they have a more limited ability to self-insure and take longer to return to employment (Heathcote, Perri, and Violante 2020; Krusell and Smith 1999; Mukoyama and Şahin 2006).

Research suggests that families with more resources can better compensate for the impact of early-life shocks than disadvantaged families. For example, in utero exposure to a natural disaster has a strong negative effect on children's cognitive development among disadvantaged families but no effect among more advantaged families (Torche 2018) and in utero exposure to radiation reduces educational achievement only among families of low socioeconomic status (SES) (Almond, Edlund, and Palme 2009). The consequences of disruptive

exposures when resources to cope are limited might be especially persistent if they occur in early childhood because early-life shocks can shape individual socioemotional and cognitive trajectories in ways that are increasingly difficult to modify over the life course, resulting in long-lasting effects (Cunha and Heckman 2007; Heckman 2006).

Several mechanisms might account for these socioeconomic gradients in the impact of disruption. In some cases, the lack of economic resources directly shapes the ability of families to invest in children to compensate for the influence of negative shocks. For example, more advantaged families can afford financial investments for their children in the form of lessons, tutoring, private school tuition, and enrichment activities (Schneider, Hastings, and LaBriola 2018). Socioeconomic gradients are also correlated with diverse kinds of psychological, social, and cultural resources that go beyond pecuniary assets and include time constraints, access to information, and availability of support networks (Hsin 2012; Torche 2018). The association between economic advantage and diverse resources is at least partially causal, as when financial scarcity imposes a cognitive load that reduces mental bandwidth (Mullainathan and Shafir 2013) or when poverty results in the inability to have a stable schedule, depleting people of valuable time and ability to plan their days (Edwards 2018). Additionally, socioeconomic stratification in interactional styles and familiarity with institutions could result in unequal responses to disruptive events that limit their negative effects for more advantaged families (Calarco 2018; Lareau 2011). Resources governing variation in the effect of disruption are not restricted to individuals or families; they might also be relevant for aggregate units such as schools, cities, or countries. For example, in this issue, Manuel Alcaino and Pablo Argote (2024) show that the negative impact of a strong earthquake in Chile on children's educational achievement varied across municipalities depending on the governing experience of the mayor. This finding suggests that experienced bureaucrats were able to procure and mobilize resources needed to compensate for the harmful effect of disruption.

Constraints disadvantaged families face emerge not just from having fewer resources in a single domain but also from various forms of disadvantage that might interact with each other and compound over the life course and across generations (Manduca and Sampson 2019). The cumulative advantage framework suggests that an initial favorable socioeconomic position produces further relative gains, widening gaps over time, a phenomenon known as the Matthew effect (DiPrete and Eirich 2006; Merton and Merton 1968). Although employment, family stability, and good health can accumulate advantages, disruptions in these domains may deplete families of socioeconomic resources and result in accumulated disadvantage for parents and their children (Evans, Li, and Whipple 2013; Maroto 2015; Western et al. 2012). Disruptive events such as divorce, job loss, and health shocks are more likely to be experienced jointly by disadvantaged families and can precipitate a period of economic insecurity and impact children's developmental and socioeconomic trajectories (Maroto 2015; McCloud and Dwyer 2011; Renzulli and Barr 2017). For example, decreased parental psychological health resulting from disruption can inhibit attention and emotional warmth toward children or even lead to erratic or punitive parenting practices (Conger, Conger, and Elder 1997; Elder 1974; Kessler, Turner, and House 1989; McLeod and Shanahan 1993; McLoyd 1998; McLoyd et al. 1994; McLoyd and Wilson 1990). Parents subject to disruptive events may also model and communicate despair to their children, such that children imitate the behavior (McLoyd and Wilson 1990). Decreased social involvement resulting from household disruption and residential mobility can disrupt children's networks, which can affect their social capital and socioeconomic status (Astone and McLanahan 1994; Coleman 1988, 1990; Furstenberg et al. 1999; Haveman, Wolfe, and Spaulding 1991; Leventhal and Brooks-Gunn 2000; McLanahan 1983; Sampson, Morenoff, and Earls 1999; Sandefur and Laumann 1998).

A cumulation of disruptive events can also result in high allostatic load, that is, "wear and tear" of the body emerging from repeated exposure to multiple stressors such as neighbor-

hood violence, housing instability, or economic precarity (Evans 2003; McEwen and Stellar 1993). Allostatic load may result in a heavier morbidity burden and strained mental health. The stress response triggered by repeated harmful exposures could also act as a predisposing factor for the influence of new exposures. As a result, subsequent adverse events cause more damage to those already debilitated by long-term multidimensional disadvantage (McEwen and McEwen 2017). For example, disadvantaged children are more likely to suffer from mental health issues from cumulative exposure to harsh or dangerous conditions, which could reduce their ability to cope with exposure to a novel disruptive event (Currie et al. 2010; Jans, Johansson, and Nilsson 2018).

Socioeconomic resources do not unambiguously compensate for disruption, however. Low-income families may be less vulnerable to the economic loss from disruptive events simply because they have less to lose in terms of economic well-being. This kind of floor effect is likely to be relevant for outcomes, such as college graduation, that are rarely achieved by low-income children even in the absence of disruption (Jackson and Holzman 2020). For example, research suggests that the income loss following parental divorce does not affect the probability that low-income children graduate from college given that their baseline chances of graduation are so low (Bernardi and Boertien 2016; Bernardi and Radl 2014; Kalmijn 2010). Families' socioeconomic resources also correlate with how normative and predictable disruptive events are for different groups. As we discuss in the next section, the normativity of disruptive events could induce variation in their impact in ways that depart and might even offset variation predicted by socioeconomic resources.

Contextual Factors: Normativity and Predictability of Disruptive Events

The impact of disruptive events on individuals and families may also depend on the social context, particularly on how prevalent and normative a disruptive event is in a particular social setting. The literature offers many examples. Becoming unemployed might be less detrimental for the psychological well-being of

parents and children as the aggregate-level unemployment rate increases (Brand and Simon-Thomas 2014; Clark 2003). The loss of social connections following divorce is attenuated in regions where divorce is more accepted (Kalmijn and Uunk 2007). Similarly, the negative effect of a nonmarital birth on infant health declines as nonmarital fertility becomes more normative over time and across place (Torche and Abufhele 2021), and the impact of child death on intimate partner violence against the mother is more severe for mothers living in regions where this experience is uncommon (Weitzman and Smith-Greenaway 2020).

These diverse findings suggest a powerful contextual mechanism: as a negatively assessed event becomes more prevalent and normative in society, the stigma associated with it becomes less severe because the event represents a smaller deviation from the social norm. Declining stigmatization will reduce negative social responses such as labeling, isolation, status loss and discrimination and will ease the harm these responses cause to individual identity and self-worth (Burke 1991; Hatzenbuehler, Phelan, and Link 2013; Link and Phelan 2001).

The social normativity of disruptive events is closely associated with the likelihood that families or individuals experience them. For example, unemployment is likely more accepted and normative in communities where the possibility of becoming unemployed is high (Wilson 1996). Given the high level of network homophily (people who share networks are similar across race, age, SES, and other characteristics) and segregation in social networks, those unlikely to experience disruptive events are generally part of social networks where these events are non-normative.

Individuals with a low likelihood of disruption may experience disruptive events as an unexpected and unpredictable shock when they occur and may lack resources to cope with them. By contrast, people who are likely to experience adverse circumstances may be forced to develop protective mechanisms—a process variedly termed habituation, adaptation, and resilience—which could reduce their vulnerability to novel shocks (Feder, Nestler, and Charney 2009; Gump and Matthews 1999). For ex-

ample, research has suggested that job loss is not as consequential for psychological well-being among those accustomed to economic precarity as those accustomed to stability (Brand 2015; Brand and Simon-Thomas 2014). In this issue, Emily Rauscher and Xinyan Cao find the noxious impact of air pollution during pregnancy on infant health to be stronger among highly educated mothers than among those with less schooling. This pattern, the authors suggest, might emerge from limited coping mechanisms due to limited exposure among advantaged populations. Also in this issue, Stefanie DeLuca, Nicholas Papageorge, and Joseph Boselovic describe how adversity is part of the fabric of the lives of disadvantaged youth in some social settings. As youth grow accustomed to disruptive events, these exposures become less remarkable and impactful on their life outcomes. This is not to say that stress and anxiety are less prevalent among those with high levels of economic insecurity. In fact, disadvantaged populations tend to have higher levels of psychological distress. Instead, it is to say that groups with a high likelihood of disruption might develop coping mechanisms that reduce their reactivity to novel stressors (Aneshensel 1992; George 1993).

Even if the normativity of disruptive events is closely associated with the likelihood that individuals experience them, the conceptual distinction between the normativity of events and likelihood of their occurrence is important because it points at two distinct mechanisms. Stigmatization resulting from violating a social norm is a collective response by others. In contrast, the likelihood of experiencing a disruptive event is an individual-level attribute that shapes the expectation of disruption and the availability of coping mechanisms.

A related contextual factor likely to shape the effect of disruption on individual outcomes are institutions and policies intended to protect individuals from risks. For example, the probability of falling into poverty as a result of job loss and unemployment varies dramatically across countries depending on welfare state generosity (Brady, Finnigan, and Hübgen 2017), and the consequences of unemployment for mental and physical health depend on the availability of unemployment benefits (Cylus,

Glymour, and Avendano 2015; Rodriguez, Lasch, and Mead 1997). In this issue, Alcaino and Argote highlight the relevance of political leadership as a mediator of environmental exposures on children's educational outcomes. They find that the decline in children's test scores was deeper and more persistent after a devastating earthquake in Chile in municipalities with first-term mayors than those with re-elected mayors, highlighting the relevance of political experience in the context of natural disasters. Policies intended to alleviate the negative impact of disruptive events on well-being are intimately connected to the normativity of such events. For example, the generosity of unemployment insurance is jointly determined with the extent to which unemployment is seen as breaking a social norm and stigmatized across places (Lindbeck, Nyberg, and Weibull 1999) and the generosity of unemployment benefits critically depends on how stigmatized unemployment is in different localities (Stutzer and Lalive 2004). Put simply, policies and institutions reflect normative agreements and those agreements in turn shape policy arrangements. Even though the rollout of specific policies can sometimes be treated as exogenous—for example, when a policy is implemented in some locations earlier than other locations due to arbitrary factors—in general normative and policy contexts are mutually constitutive.

The normativity-predictability approach and the resource disparities approach yield opposing predictions about the socioeconomic stratification of the impact of disruption. The resource disparities approach predicts that disadvantaged populations will experience more harmful and persistent consequences from disruption given their lack of compensatory resources and greater vulnerability to shocks. In contrast, the normativity and predictability approaches suggest that micro-level events such as divorce and unemployment will take a larger toll among advantaged groups because they are more likely to violate deep-seated social norms and to be experienced as unexpected shocks by highly resourced groups. Most likely, both mechanisms will be at play in shaping heterogeneity in the impact of micro-level disruptive events such as job loss or divorce. That is, effect heterogeneity will be a net result of forces that

might operate in different directions and might even offset each other. The articles in this issue reflect both patterns.

METHODOLOGICAL FRAMEWORK TO ASSESS VARIATION IN THE EFFECTS OF DISRUPTION

Assessing variation in the effect of disruptive events among children is a challenging methodological task. Researchers face standard methodological challenges in identifying and estimating causal effects at the aggregate level, including confounding and reverse causality. Additionally, researchers face common methodological issues that become more acute when assessing heterogeneity, including model specification (how to select the characteristics that demonstrate heterogeneity), sample size (power-to-detect effects across subgroups of the population), and different degrees of confounding across diverse axes of heterogeneity.

A main risk to the identification of causal effects is confounding, that is, the possibility that the effect attributed to disruption (the treatment) is actually due to unobserved factors correlated with but distinct from disruption. Children likely to experience disruptive events might be different from others in terms of their socioeconomic resources, personality factors, family relationships, and other characteristics. If these characteristics are not accounted for, researchers could mistakenly attribute the effect of these unobserved factors to the disruptive event, a problem variously called confounding, selection bias, non-ignorability, and omitted variable bias.

Researchers are often concerned that they overestimate the true effect of disruption because the factors that cause some children to experience disruption may also limit their academic achievement, health, well-being, and other outcomes. However, another concerning source of selection bias could occur if the parents of children likely to be most harmed by an event make the strongest attempts to reduce their children's chances of experiencing it (that is, "selection on gains," see Heckman, Schmierer, and Urzua 2010). For example, parents who think their children will be harmed by their divorce may be more likely to seek alternatives such as counseling than parents who

think their children will be less affected. If these parents are correct in their assessment, then we will not observe the most harmful consequences of divorce because a selected group of parents refrained from marital dissolution. As a result, the estimated effect of divorce on children will be an underestimate of its true causal effect, and of its variation. If researchers were able to measure parents' expectations about the harm that divorce would cause on their children and adjust for this factor in their statistical models, they would be able to address the issue. Unfortunately, it is usually impossible for researchers to observe all sources of possible selection bias in the associations they are interested in.

To reduce the risk of confounding, recent studies of the impact of disruption deploy standard econometric tools, including adjustment for covariates, regression discontinuity, difference-in-differences, fixed effects, and instrumental variables. For example, many types of natural disasters provide "natural experiments" whose impact does not precisely follow administrative borders or residential segregation based on socioeconomic status and other household characteristics. Similarly, researchers interested in the effect of parental job loss on children's outcomes might restrict attention to parents who lost jobs due to large-scale business closures, which reduce selection into job loss by individual characteristics. Alternatively, researchers may use a fixed-effects approach to compare children's outcomes before and after their parents lose jobs. By relying on within-individual change over time, this approach accounts for sources of unobserved selectivity of parents into job loss that do not change over time, providing a plausible causal strategy to assess the impact on children.

Correctly estimating an average causal effect across the population is only the first step for researchers interested in effect heterogeneity. Additionally, researchers require a framework to select domains of heterogeneity (and negate others), an analysis of power-to-detect effects across subgroups, and an assessment of whether the research design continues to be valid for each subgroup. Finally, scholars should be mindful as to whether differential effects reflect heterogeneity in treatment ef-

fects rather than heterogeneous treatments. In what follows we discuss these issues in turn.

The selection of domains of heterogeneity—for example, parental income, education, race and ethnicity, among others—is often marked by limited clarity. Many studies rely on a combination of vaguely conjured theory and common conventions in the literature to justify the selection of certain axes of heterogeneity (and the implicit nonselection of other candidate domains). By far the most common domain considered by researchers is measures of socioeconomic status, such as parental income and education; yet other demographic measurements may be included as well, such as race-ethnicity, age of exposure, and gender. These analyses often operate under the implicit assumption that variation in effects is driven by a resource disparities theoretical framework.

Some scholars have also explored how effects vary by the likelihood or “propensity” of experiencing disruptive events (Brand et al. 2019b; Brand and Simon-Thomas 2014; Turney 2017). Propensity-stratified models are particularly well suited for testing whether individuals who are more or less likely to experience events suffer larger effects (Brand and Simon Thomas 2013; Xie et al. 2012). Others have considered how effects vary across social contexts. For example, some studies of job displacement consider how the effect varies by local economic contexts and test the hypothesis that job loss might be less harmful when unemployment is widespread because it represents a smaller violation of social norms (Brand 2015; Clark 2003; Torche and Daviss 2022). These analyses may suggest patterns that support the normativity and predictability theoretical frameworks.

Selection of common domains, for example, by socioeconomic status or race, raises additional questions of what heterogeneity findings we are failing to uncover and how to interpret the effects we estimate. Examining family socioeconomic status as a key domain of heterogeneity may not sufficiently narrow the set of potential mechanisms driving that heterogeneity. For example, measures of parental education might capture differences in family economic resources but could also capture differences in children’s access to information, social networks, cultural resources, or a com-

ination of these assets. This is because the measure used is correlated with many other measures that are not used (or collected) and because most measures are not sharp enough to adjudicate between different mechanisms, such as types of resources or preferences. These challenges require that scholars make explicit the theoretical foundations of the axis of heterogeneity examined. One promising way to proceed is provided by the logic of preregistration, in which research hypotheses are articulated and disclosed before conducting the empirical research and additional hypotheses that emerge during the research process are discussed (Freese and Peterson 2020; Manago 2023).

Although hypothesis preregistration is a promising approach, in practice researchers often explore their data to determine which subgroups have the largest effect estimates and report the effect estimates of those that do (leading to *p*-hacking). If researchers select which interactions to report as a result of exploratory analyses, and do not draw on cross-validation procedures or multiple-testing adjustments, they are likely to incorrectly reject a true null hypothesis. Such ad hoc searches for responsive subgroups may in other words reflect noise within the data rather than true response variation and result in misleading conclusions. Undocumented manual specification search procedures also lack transparency and reproducibility (Freese and Peterson 2020).

Still, it may be difficult to know *ex ante* the subgroups most affected by disruptive events. An emerging methodological approach to study effect heterogeneity is to use tools from machine learning to uncover sets of factors and interactions between factors that account for effect variation rather than focusing on a narrow set of specified modifiers. Typically, this approach is supervised by the researcher by both choosing a specific method or set of methods for estimation and specifying the features (covariates) that the algorithm can use (and again disallowing others). In this sense, the machine learning approach does not amount to pure and unconstrained discovery. It provides a strategy to reduce arbitrariness in the axes of heterogeneity considered, reducing the influence of the researchers’ priors. Potential

axes of heterogeneity may also be most informative when considered jointly, in complex and nonlinear ways (such as low-income children who report low social control). These approaches also reduce arbitrariness in researcher-specified functional forms estimated in the analysis, in that it is generally unclear which of the large number of possible covariate thresholds (such as parental income values) and interactions are best to consider. Machine learning has been rapidly gaining recognition in the social sciences for both prediction tasks and the possibility of discovery through integration with causal inference methods (Athey and Imbens 2019; Brand, Zhou, and Xie 2023; Lundberg, Brand, and Jeon 2022; Molina and Garip 2019; Wager and Athey 2018). Both emerging applications and continuing developments use these methods (Brand et al. 2021; Yu et al. 2021).

An additional challenge for researchers interested in heterogeneity in the effects of disruption is that the confounding problem could be worse for some subpopulations than for others (Zhou and Xie 2019). An observed pattern of variation in the effects of disruptive events could be due to variation in unobserved selection into those circumstances. For example, results may suggest that White workers are more negatively harmed by job displacement than Black workers. Yet if White workers are generally less likely to lose jobs than Black workers, displaced White workers may have unobserved characteristics that render them more negatively selected than their Black counterparts. Our analyses may not fully equalize some measure, such as unequal work conditions, for White and Black displaced workers. If so, our estimates of displacement effects for White workers could be larger than for Black workers not because Whites are harmed more by displacement, but because they were more negatively selected into displacement in the first place. Even when using plant-closing analyses of job loss, it could be that plant closings that displace White workers are in different industries, on average, than plant closings that displace Black workers because of racial segregation by occupation and industry. Consequently, outcome differences from displacement that appear to be differential by race could instead

reflect industry-based variation in unemployment duration, vacancies, starting wages, and other factors.

Likewise, research focusing on intent-to-treat estimates, such as place and time demarcated measures of exposure (such as air pollution or other environmental factors) face the challenge that first-stage relationships between the distal exposure and intermediate outcome may vary by subgroup (if, for example, more advantaged groups are able to invest in household filtering systems to reduce domestic exposure to contaminants). Another way of describing the challenge is that the compliers may vary by important measured and unmeasured characteristics. Researchers should attend to differential selection in stratified effect estimates, be mindful of the potential for heterogeneity at various “steps” of the process between distal exposures and outcomes, and use sensitivity analyses of subgroups effects (Hainmueller, Mummolo, and Xu 2019). In this issue, Martha Bailey, Peter Lin, A. R. Shariq Mohammed, and Alexa Prettyman (2024) discuss the likelihood that the meaning of the Great Depression differed by place due to the mix of agricultural and industrial sectors in the local area prior to this macroeconomic event; the authors discuss their results in the context of considering whether the treatment of the Great Depression includes effect heterogeneity, treatment heterogeneity, or (most likely) both.

Scholars may also try to elucidate patterns of effect heterogeneity by focusing on theoretical mechanisms that link disruptive events to children’s outcomes. For example, a study examining the impact of prenatal exposure to local homicides on infant health hypothesized that local violence shapes infant health by inducing a change in the use of prenatal care by mothers differently depending on the mother’s level of schooling (Torche and Villarreal 2014). Testing this kind of mediation process is challenging because even if the initial exposure (local homicides in this example) might be considered exogenous, behavioral responses to it (use of prenatal care) are not. In another example, Jennie Brand and her colleagues (2019b) considered the role of parental income and children’s psychological well-being after parental divorce as mechanisms linking divorce to

children's educational attainment. The causal mediation literature has emphasized careful attention to estimating valid mediating effects using a causal framework and laying out key identifying assumptions (Imai et al. 2011; VanderWeele 2016). That is, to define path-specific effects of disruptive events, we must address the possibility of confounding not only in the event-outcome relationship, but also in the event-mediator and mediator-outcome relationships. Recent work also applies flexible machine learning methods to uncover causal direct and indirect effects (Zhou and Yamamoto 2023).

Qualitative studies can also enhance our understanding of the complex pathways by which disruption impacts family well-being. Relying on individuals' accounts of the experience of disruption, and the rationale for any behavioral responses, studies based on interviews or ethnographic observations can explicate mechanisms accounting for disparities in the effect of disruption unobserved by quantitative approaches. For example, qualitative studies on the impact of unemployment uncover the guilt, shame, and isolation it produces among affected workers (Newman 1998) and the extent to which the experience and responses to unemployment vary by gender and socioeconomic standing (Damaske 2021; Rao 2020). In this issue, DeLuca, Papageorge, and Boselovic (2024) use semi-structured interviews to explore disruption and adversity among low-income Black youth in high-poverty neighborhoods. They describe variation in how these disadvantaged youth responded to disruptive events, attending to the resources and relationships that conditioned their heterogeneous response. Also in this issue, Kristin Turney, Amy Liu, and Estéfani Marín (2024) undertake an in-depth interview study to probe rich life course histories of exposure to paternal incarceration to show that children's responses of "stepping into" new responsibilities following a paternal incarceration event are strongly shaped by previous experiences with paternal incarceration.

Finally, patterns of variation in the observed effect of the treatment may reflect variation in the treatment condition itself. For instance, as Nazar Khalid, Jere Behrman, Emily Hannum, and Amrit Thapa (2024) show in this issue, se-

vere floods in India have a stronger impact on the educational outcomes of children from marginalized communities—those from low socioeconomic status and lower caste. This pattern largely emerges because destruction and dislocation following the flood is more severe in disadvantaged communities, and only secondarily because the effect given exposure is stronger among disadvantaged children. In another example in this issue, Turney, Liu, and Marín show that children whose parents are unlikely to be incarcerated may experience worse outcomes from parental incarceration than those whose parents were more likely to experience this event. Yet the authors suggest that this pattern may reflect different lengths of parental incarceration (that is, different treatment conditions). In all these cases, findings of effect heterogeneity across groups reflect exposure to different treatments rather than variation in the effect of the same exposure. This issue has been widely recognized in the causal inference literature as a violation of the critical requirement that there cannot be multiple versions of the same treatment (Rubin 1980, 1986). Restricting inference to a single version of the treatment is a challenging task. Researchers interested in effect heterogeneity should continue to consider strategies to address this issue (see, for example, VanderWeele and Hernan 2013).

THE IMPACT OF DISRUPTIVE EVENTS ACROSS DOMAINS

We now turn to a review of the growing literature examining the impact of disruptive events on families and children. We discuss disruptions in the following domains: economic (job loss, recession), household and family (divorce, incarceration), education (school closures), health (illness, death), and environmental (floods, earthquakes). These domains were selected for multiple reasons. First, they identify exposures with a large, documented impact on children's life chances. Second, a robust body of evidence examining patterns and sources of heterogeneity exists in each of them. Third, in all these cases, we can distinguish micro-level events (for example, parental job loss) from macro-level events (for example, recessions), gaining theoretical insight on the plausibility

of the two theoretical frameworks we have outlined.

Economic Disruptions

We characterize economic disruptions as events that affect the economic standing of families. They can be micro events, such as job loss, bankruptcy, eviction, and foreclosure, or macro events affecting larger populations, such as economic recessions. These events generally affect children's parents or caregivers and then children as families adjust to new economic realities. Scholars have studied variation in the effects of these events along various axes, such as socioeconomic status indicators, race, and the probability that disruption occurs. Here we discuss some of the main patterns in the literature and how they fit into broader theoretical paradigms and methodological considerations.

Job Loss

Job loss (also known as job displacement) is a disruptive and often unexpected life event. Macroeconomic conditions and individual characteristics influence the likelihood of workers experiencing displacement, such as technological change, foreign trade, employment reorganization, and macroeconomic downturn (Farber 2010; Farley 1996; Kalleberg 2000, 2009). Displacement is higher during economic downturns. Less-educated workers and workers in jobs with low status and low tenure have a high risk of displacement (Brand 2006, 2015; Farber 1997, 2010). However, rates of job loss have increased for more advantaged groups (Farber 2011). Job loss typically leads to a period of unemployment and lower lifetime earnings (Brand 2015; Couch and Placzek 2010a; Couch, Jolly, and Placzek 2011; Davis and von Wachter 2012; Fallick 1996; Farber 2005; Kletzer 1998; Podgursky and Swaim 1987; Ruhm 1991). Some estimates suggest an immediate loss of about 30 percent of earnings and as much as a 20 percent cumulative reduction in earnings twenty years after the job loss event (Couch and Placzek 2010b; Davis and von Wachter 2012; von Wachter 2010). Job loss can also lead to bankruptcy or home loss by foreclosure or eviction (Dwyer 2018; Western et al. 2012). These losses associated with displacement present a considerable economic shock to families with chil-

dren. A decrease in parental economic resources may restrict the ability to purchase goods critical for child development, such as schooling, housing, food, and cognitively enriching learning environments. Increases in job instability among displaced workers are also common, instigating continuing economic and social disruptions for families (von Wachter 2010).

Job loss disrupts not just economic and work conditions, but also the structure of daily life, psychological well-being, and family and social relationships (Brand 2015; Catalano et al. 2011; Brand and Burgard 2008; Deb et al. 2011; House 1987; Jahoda 1981, 1982; Paul and Moser 2009; Pearlin et al. 1981). The economic, psychological, and social effects of displacement impact family well-being and consequently children's social-psychological, educational, and socioeconomic outcomes (Brand and Simon-Thomas 2014; Johnson, Kalil, and Duni-fon 2012; Kalil and Ziol-Guest 2005, 2008; Oreopoulos, Page, and Stevens 2008; Page, Stevens, and Lindo 2009). Job loss can also lead to additional disruptions to households, such as divorce or separation, which affect children's well-being, as described more fully later.

Research has shown that the effects of job loss vary by worker characteristics and social and economic context. Although economic losses are greater for more disadvantaged workers with limited human capital, some of the social and psychological consequences can be worse for more advantaged workers and their families who are less likely to experience disruptive events (Brand 2015). Although economic adversity is more normative among more disadvantaged families, displacement and socioeconomic decline may instigate an acute sense of deprivation among more advantaged families whose peers tend to be likewise advantaged and for whom displacement is a considerable shock (Brand and Simon-Thomas 2014; Clark, Georgellis, and Sanfey 2001; Dooley, Prause, and Ham-Rowbottom 2000). Brand and Juli Simon-Thomas (2014), for example, find the largest effects of job loss among children whose mothers had a low likelihood of displacement. This finding supports the social normativity and predictability framework.

Similarly, studies suggest that though the ef-

fects of displacement on economic well-being are worse in high unemployment contexts (von Wachter 2010), the effects on physical and mental health are worse in low unemployment contexts (Clark 2003; Cohn 1978; Platt and Kreitman 1984; Torche and Daviss 2022; Turner 1995). This pattern is consistent with the theoretical expectation that when unemployment becomes normative, the stigma and shame associated with losing one's job decreases. Rich qualitative work on contexts of concentrated disadvantage also finds that in communities where "work disappears," unemployment loses its social stigma (Wilson 1996). In this issue, Anna Baranowska-Rataj, Björn Högberg, and Jonas Voßemer (2024) consider whether parental job losses lead to worse children's health outcomes at birth when unemployment in Sweden is higher. They find little evidence that job loss affects children's birth outcomes, and no evidence of heterogeneity across areas with different rates of unemployment. Compared with findings from the United States (Torche and Daviss 2022), this finding may suggest cross-national heterogeneity: the effect of job loss may not be as severe in a context like Sweden given the strong role of the Swedish welfare state in protecting families from material hardship and supporting the transition to reemployment in the event of displacement (Bambra and Eikemo 2018).

Economic Recession

Economic recessions and downturns differ from job loss in that they are macro-level events affecting large populations at the national or local levels. In the case of economic recessions, most children in exposed communities are affected, not just those whose parents have lost jobs (Gassman-Pines, Gibson-Davis, and Ananat 2015). Economic downturns negatively affect children's psychological health and education (Ananat, Gassman-Pines, and Gibson-Davis 2011; Gassman-Pines, Gibson-Davis, and Ananat 2015) and their later outcomes (Noghanibehambari and Fletcher 2023; Schmitz and Duque 2022). Both displaced workers and continuously employed parents may experience earnings loss and psychological distress during economic downturns. Anna Gassman-Pines, Christina Gibson-Davis, and Elizabeth Ananat

(2015) suggest that state-level economic contexts could influence how families are affected by downturn. In this issue, Bailey and colleagues consider the effects of the Great Depression on children's mobility. The authors find large differences by child gender, where the downturn had little effect on sons' mobility experiences but reduced daughters' intergenerational mobility outcomes and interpret these effects to reflect gendered differences in educational and occupational opportunities during the early twentieth century. The authors' focus aligns with the described resource disparities framework as a potential source of heterogeneity in responses to macro events, such as the Great Depression. That is, in examining social mobility, the authors' (at least implicit) focus on whether children from low-resource households are differently affected than children from high-resource households in attaining high status as adults. However, the finding of no social mobility differences for sons who were exposed to different levels of macroeconomic downturn from the Great Depression suggests that the impact of changing macroeconomic conditions on the socioeconomic outcomes of these sons did not vary by their family background.

Home Loss

Home loss via foreclosure or eviction can have a significant impact on family well-being. Foreclosure is associated with declines in mental health and increases in suicide, especially for White men (Downing 2016; Fowler et al. 2015; Houle and Light 2017), increased substance use (Burgard, Seefeldt, and Zelner 2012), and financial instability (Brevoort and Cooper 2013; Diamond, Guren, and Tan 2020), which can significantly affect family and child well-being. Rebecca Diamond, Adam Guren, and Rose Tan (2020) suggest that those on the margin of foreclosure, who tend to be families from more affluent neighborhoods, experience larger effects of foreclosure on the likelihood of divorce and mobility than families residing in less affluent neighborhoods. Because those on the margin of foreclosure have a relatively low likelihood of home loss, this finding supports the social normativity and predictability framework.

Home loss via eviction is associated with de-

creased psychological well-being (Desmond and Kimbro 2015; Fowler et al. 2015; McLaughlin et al. 2012), worse physical health (Hoke and Boen 2021; Leifheit et al. 2020; Nande et al. 2021), downward economic mobility (Desmond and Gershenson 2016), and homelessness (Rutan and Desmond 2021). Eviction disproportionately affects Black and Latino renters, especially Black women (Desmond 2012; Hepburn, Louis, and Desmond 2020), and those who live in areas with high rent burdens and low investment in welfare (Thomas et al. 2019). Heterogeneity in the effect of eviction is understudied. However, one study finds that Hispanic households were more likely to move again after eviction than other households (Desmond, Gershenson, and Kiviat 2015).

Household Disruptions

A large literature has established that family and household disruption decrease household income and economic security and influence the well-being and attainment of children. Here we focus on changes in family and household configuration, including parental divorce and separation and parental incarceration.

Divorce, Separation, and Household Change

A large literature suggests that parental divorce decreases children's socioemotional well-being and limits their educational attainment (Amato 2000; Brand et al. 2019a, 2019b; Cherlin, Chase-Lansdale, and McRae 1998; McLanahan, Tach, and Schneider 2013; Fletcher and Sindelar 2012). With the loss of a parent in the household, typically fathers, mothers generally have fewer economic resources, which can negatively affect children's attainment. Moreover, relationship transitions occur more frequently following parental divorce, and such instability disrupts children's lives (Lee and McLanahan 2015).

Research has found that parental divorce and other changes in family structure have heterogeneous effects, with the largest effects observed for advantaged children. Studies suggest larger effects for children with more educated parents than children with less-educated parents (Bernardi and Boertien 2016; Bernardi and Radl 2014; Martin 2012). Other studies find larger effects for White children

than for non-White children (Brand et al. 2019b; Lee and McLanahan 2015; Perkins 2019; Wu and Thomson 2001). Brand and her colleagues (2019a) find that parental divorce resulted in lower educational attainment among children whose parents had a low likelihood of divorce but no effect among their counterparts with a higher probability of divorce. They argue that children of unstable marriages, who face many social disadvantages over childhood, anticipate or otherwise adapt to the dissolution of their parents' marriage. By contrast, divorce is an unexpected shock for more advantaged children with relatively fewer disruptive family circumstances. Additionally, the stronger adverse effects among advantaged groups may be partly due to the change in available resources before and after divorce: children from high-SES backgrounds experience a marked economic decline after a divorce. A high prevalence of family and socioeconomic instability among children of color, low-SES children, and children with a high expectation of family instability renders an additional disruptive family transition less impactful, and indeed, less disruptive (Cross 2020; Harvey and Fine 2011).

These findings support the social normativity and predictability theoretical framework. That is, response to parental divorce is greater for these more advantaged families because family disruption is less expected and constitutes a more stigmatizing deviation from norms in their social milieu. In this issue, Kristin Perkins (2024) assesses heterogeneous effects of household change involving extended families and nonrelatives on Black children's outcomes. Whereas prior research finds small or insignificant effects of household disruption on educational attainment for Black children, she finds that the effects are heterogeneous: Black children with a low propensity for disruption experience larger effects of household change on education than those with a high propensity for disruption. The finding also aligns with research suggesting the importance of social normativity and expectations of disruption but in this case among a population previously assumed to experience homogenous responses. Perkins's findings speak to the importance of clearly defining the treatment condition in studies of household disruption as

well as the complex processes of response variation among children.

Variation in the effect of disruptive events on individuals and families could also emerge from interactions between macro- and micro-level exposures. For example, as the prevalence of divorce in sub-Saharan Africa regions increases, parental divorce effects on children's health decreases (Smith-Greenaway and Clark 2017). This effect holds even for children who lived in higher SES households. Similarly, Florencia Torche and Alejandra Abufhele (2021) find that being born to unmarried parents causes worse infant health in contexts where most births occur within marriage. By contrast, after one accounts for socioeconomic differences between married and unmarried parents, being born to unmarried parents has limited or no effect in settings where nonmarital fertility is prevalent. These studies suggest that in contexts where events such as experiencing a marital disruption or having a child out of wedlock are unusual and non-normative, they can result in stigmatization, isolation, and depletion of resources with negative consequences for children.

Incarceration

The literature on parental incarceration reveals negative effects on children's academic achievement, socioemotional outcomes, and juvenile delinquency driven by multiple mechanisms, including physical and emotional absence, family strain, socioeconomic decline, stigma, and shame (Eddy and Poehlman 2012; Foster and Hagan 2015; Johnson and Easterling 2012; Turney and Wildeman 2013). Some research indicates that the consequences of parental incarceration depend on the likelihood of experiencing it. Children whose parents were less likely to be incarcerated experienced greater negative effects on educational attainment and well-being (Turney 2017). Similarly, children least likely to experience maternal incarceration experienced increased internalizing and externalizing problem behaviors and increased early juvenile delinquency (Turney and Wilde-

man 2015). The effects of parental incarceration also vary by contextual-level factors, including the normativity of the event at the neighborhood level. Scholars have shown weaker associations between parental incarceration and the likelihood that children live in disadvantaged neighborhoods as adults in contexts where parental incarceration is more prevalent (Finkeldey and Dennison 2020). In this issue, Turney and her coauthors find that parental incarceration alters children's emotional well-being and instrumental and financial responsibilities. However, their in-depth interview data also reveal that children vary in their response, with some children carrying considerable burden and others stepping away from responsibilities or even expressing relief when a father is incarcerated.

Educational Disruptions

Educational disruptions involve changes in the schooling experienced by children, emerging from partially expected events such as students' school transfers and absenteeism and from unexpected events such as school closures.

School Transfers

Student mobility across schools—that is, students changing schools throughout their educational career—is a widespread phenomenon with consequences for learning. The reasons for school transfers are diverse and include unplanned moves usually made in response to another disruptive event in the family and planned moves made to achieve a desired end such as a better residential situation.¹ Regardless of the reason, school transfers could have negative effects on children's educational outcomes due to disruption of learning environments, loss of social networks, and the need to adapt to new curriculums and teaching styles. School mobility could also impose negative externalities for nonmovers by altering the composition of peer groups, demanding resources that otherwise could be devoted to instruction, and inducing disruption in the

1. Some school mobility is determined by the structure of the educational system, such as the transition from elementary to middle school or middle school to high school. However, the mobility that we are concerned with is so-called nonstructural.

classroom (Hanushek, Kain, and Rivkin 2004; Raudenbush, Jean, and Art 2011; Rumberger et al. 1999).

Observational studies show that changing schools is usually associated with worse educational outcomes, including test scores, grade retention, and school dropout (Welsh 2017). In many cases, this negative association declines significantly or disappears after controlling for students' characteristics and achievement (Alexander, Entwisle, and Dauber 1996; Grigg 2012; Lleras and McKillip 2017; Strand 2002; Temple and Reynolds 1999). This suggests that students who are already struggling are more likely to move but that mobility itself might not have a separate negative impact.

Changing schools is much more prevalent among disadvantaged students, including racial and ethnic minority, low-income, and immigrant children residing in urban areas (Alexander, Entwisle, and Dauber 1996; Grigg 2012; Lleras and McKillip 2017; Strand 2002). Given their lower likelihood of changing schools, advantaged children may experience a larger impact of school transfers if it is more of an unexpected shock, particularly if they are moving to schools with fewer resources. Conversely, the potential negative impact of moving could be outweighed by transferring to a higher quality school among disadvantaged students. Research on the consequences of school mobility, however, has not systematically explored effect heterogeneity.

School Closures

The impact of school closures has gained importance in recent years given the widespread closures during the COVID pandemic. To prevent the spread of the virus, most governments worldwide closed schools for several weeks or months in the spring of 2020. After the initial reopening, additional waves of closures occurred in late 2020 and 2021. Studies have examined the impact of COVID-related school closures on students' educational outcomes around the world, largely with a focus on test scores. Most studies show a substantial negative effect with an average magnitude of approximately 0.1 standard deviations in both math and reading scores (Hammerstein et al. 2021; König and Frey 2022; Zierer 2021).

Given that COVID-related school closures were so widespread, we expect patterns of heterogeneity to align with a resource disparities framework rather than a normativity framework. Indeed, the literature consistently anticipated greater losses among students from low-income families, whose parents had low levels of schooling and who lived in poor neighborhoods (Agostinelli et al. 2020; Azevedo et al. 2020; Di Pietro et al. 2020; Fuchs-Schündeln et al. 2020; Kaffenberger 2021; Kuhfeld et al. 2020). Empirical analyses are consistent with these predictions about unequal effects, confirming that socioeconomically disadvantaged students experienced greater learning losses than their more advantaged peers. For example, Per Engzell, Arun Frey, and Mark Verhagen (2021) find learning losses up to 60 percent greater for children with parents with low levels of schooling than for more advantaged students in the Netherlands. Given that the Netherlands features low levels of income inequality and virtually universal broadband connectivity, this finding might provide a lower bound estimate of the disparities in the impact of school closures on learning. Similarly, Joana Maldonado and Kristof De Witte (2022) find substantial losses among students in the most socioeconomically disadvantaged schools in Belgium but no decline among children in advantaged schools. Vladimir Kogan and Stéphane Lavertu (2021) report postpandemic declines in test scores in Ohio that were more pronounced among racial minorities and economically disadvantaged groups. Rebecca Jack and her colleagues (2023) find that remote learning was more detrimental for districts with larger populations of Black students.

To assess heterogeneity in the effects of school closures, most studies focused on the differential ability of families to transition to online education, including differential access to remote instruction, differential parental responses, and loss of beneficial peer effects among disadvantaged groups. Families differ in their digital connectivity as well as ability to use technology for learning purposes. An early pandemic Education Trust (2020) survey reported that nearly 50 percent of low-income families and 42 percent of families of color reported lacking enough devices at home to ac-

cess distance learning. In the United States in 2021, only 59 percent of low-income households (those earning less than \$30,000 a year) owned a computer and 57 percent had access to broadband. The comparable figure for households with incomes greater than \$100,000 a year were 92 and 91 percent, respectively (Vogels 2021).

In addition to basic infrastructure barriers, several studies report socioeconomic disparities in time and resources devoted to at-home learning. For example, children in high-income households spent more time on home learning than those in poor families in England (Andrew et al. 2020) and socioeconomic gaps in digital learning widened in Denmark during the pandemic (Reimer et al. 2021). Similarly, the sharp increase in internet searches for online learning materials as schools closed in the United States was concentrated among households with higher income and better internet access (Bacher-Hicks, Goodman, and Mulhern 2021).

These studies direct attention to a demand-side response to the COVID shock by families. Disparities have also been observed on the supply side, that is, in the responses by schools and educators to the pandemic shock. In the United States, schools serving high-poverty populations were less likely to provide online learning and reported higher proportions of students completely absent. Similarly, disadvantaged children, including minorities and those with low parental schooling, living in single parent households, and receiving free meals, spent less time on schoolwork at home (Bayrakdar and Guveli 2023). This gap was due in large part to uneven school online learning provisions. The work by Douglas Harris and colleagues (2024) in this issue focuses on high school graduation and college entry and provides additional and novel findings of heterogeneity in the impact of the pandemic. They find an increase in high school graduation that was largest for socioeconomically disadvantaged and minoritized students, but a decline in college entry, the largest occurring in two-year colleges serving larger percentages of Black, Hispanic, and low-income students. Their evidence suggests that increased high school graduation is associated with the relaxation of

graduation standards, whereas instructional mode appears to be a relevant driver of two-year college entry.

In sum, research on adverse effects of school closures triggered by the COVID pandemic suggests marked stratification consistent with the resource disparities approach. This process likely emerges from consecutive, cumulative forms of precarity: disadvantaged children are more likely to face connectivity and access barriers to digital education, and less likely to receive compensatory support from their parents and effective assistance from their schools.

When extrapolating findings from the COVID-induced school closures, it is important to consider several ways in which the pandemic is a unique and unprecedented exposure. First, the pandemic affected the entire population rather than being a group-specific risk. It was also an unexpected occurrence completely beyond individual control. Given these attributes, differences in the normativity of the disruptive event are unlikely to play a role in accounting for effect heterogeneity. Second, COVID school closures were long term, lasting from several weeks to several months, forcing families to make lasting adjustments. Given that families had the ability to substitute in-school education with home-based learning experiences that depend on differential economic, information, and time resources, substantial inequality in effects is to be expected. To the extent that schools play an equalizing role in learning, albeit a debated assertion (see, for example, Passaretta and Skopek 2021), the transition to home-based learning is expected to contribute to inequalities in outcomes. Finally, the COVID crisis altered virtually every dimension of life and well-being, not just educational contexts. As a result, the studies reviewed here have a limited ability to identify the unequal impact of school closures as distinct from the likely unequal impact of other measures intended to curb infection, and from the direct toll of infection itself.

Health Disruptions

Children's Health Shocks

The evidence is strong that child health shocks have lasting impacts as people age. Children in

poor households are more likely to be subject to health shocks (Currie and Stabile 2003). A common example of a health “shock” is low birth weight. Janet Currie and Rosemary Hyson (1999) consider the potential heterogeneity of birth weight on longer-term outcomes. They outline three theories on why birth weight matters and why heterogeneity by SES may be expected. First, they suggest that birth weight may shape the efficiency of child investments into later outcomes, with the implication that children in low-SES families will have worse outcomes than children in high-SES families because of higher incidence of “adverse environmental influences” (Watson et al. 1996). Second, they argue that heterogeneity is possible in behaviors and preferences between families, which shape the types or quantity of investments and inputs in children. If these behaviors and preferences are correlated with SES, we expect to then see heterogeneity in outcomes based on birth weight status of children between different families that could mimic SES differences but may not be responsive to income transfers or other social programs. Third, families stratified by SES have different levels of monetary constraints, such that low-SES families may not be able to undertake costly investments in their children that might otherwise compensate for the adverse effects of low birth weight (Becker and Tomes 1976).²

A broader literature expands the set of health shocks experienced during childhood but typically has a limited focus on heterogeneous effects. ADHD has been one such expansion, where researchers have shown impacts on educational achievement and attainment (Currie et al. 2014; Currie and Stabile 2003; Fletcher and Wolfe 2008) and broader out-

comes (Fletcher 2014; Fletcher and Wolfe 2009). The work by Jayanti Owens and Xinyan Cao (2024) in this issue extends this literature on childhood ADHD symptoms by considering variation in treatment and outcomes by race-ethnicity and other axes of heterogeneity. They find that heterogeneity in ADHD diagnosis varies by a complex combination of race-ethnicity and outcome domain, such that diagnosed Black children experience worse outcomes in teacher reports of school behavior, diagnosed White children experience worse outcomes in perceived school competence, and diagnosed Hispanic children experience worse outcomes in parental educational expectations. The authors present an important expansion of inquiry across domains of outcomes and axes of heterogeneity and highlight the empirical challenges of considering differential selection bias across the axes of examined heterogeneity.

Family Health Shocks

Although differential effects of children’s own health shocks on their own outcomes contribute to a growing literature, a related literature focuses on the consequences of parental (or other family members’) health shocks on children’s outcomes. Both parental death and sibling death experiences during childhood are somewhat rare in developed countries in recent times, but occur in 5 to 10 percent of the population (Fletcher et al. 2012). Studies suggest these experiences negatively affect human capital outcomes (Fletcher et al. 2012; Fletcher, Vidal-Fernandez, and Wolfe 2018). Hints of potential heterogeneity aside, in general the low prevalence of these events and reduced sample sizes limit precise estimates.³ Patterson et al.

2. Some analyses also consider heterogeneity of health shocks by sex. One motivating reason for these analyses is that sex, and the different biological and social mechanisms tied with it, fit into either a differential efficiency argument or in a differential preferences and behaviors argument in societies that discriminate by sex. Differential efficiency by sex could result from the average differences in body size by sex in early life, different average pathways/timing of organ/brain development, or other processes—in economic jargon, are the “production functions” that translate inputs (nutrition, medical interventions, and so forth) into outputs (birth weight, cognition) different by sex? Differential preferences/behaviors reflect differential treatment by sex that does not reflect the efficiency differences but instead is driven by societal/parental mechanisms that discriminate by sex of the child.

3. Registry-based studies outside of the U.S. have been able to pursue these questions in more detail. Yongfu Yu and colleagues (2017) show evidence of mortality effects on bereaved individuals who experienced loss of a

(Patterson, Verdery, and Daw 2020) show that experiencing the death of family members during childhood reduces educational attainment and the effects vary somewhat by decedent relationship, gender, and race-ethnicity.

The short-term direct health effects of the COVID pandemic on children appear not to be severe, and many children have been far more protected from the virus (for example, through school closings) than adults. However, ongoing work on the pandemic suggest some initial findings related to family health shocks. The average effects appear to be large, with substantial effect heterogeneity. Ashton Verdery and his colleagues (2020) estimate the large differences in children's exposures to deaths and health shocks of close family members, which differ enormously by socioeconomic status and race-ethnicity, mirroring the pandemic itself.

Environmental Disruptions

Environmental disruptions are macro-level events with both immediate and long-term consequences on families and communities. These sources of disruption include floods, earthquakes, hurricanes, tornadoes, winter storms, and wildfires. The short-term effects of environmental disruptions involve death and injury, destruction of residences and infrastructure, economic losses, and residential displacement. In the long term, processes of return, relocation, and redevelopment also have consequences on the well-being of families and communities. The unequal impact of environmental disruptions has gained relevance in the recent past given the evidence linking climate change with severity of extreme weather events and the likelihood that these events will increase in frequency and devastation in the future (Boustan et al. 2020; Diffenbaugh et al. 2017).

Research on the consequences of environmental disruptions has explicitly considered and theorized heterogeneity in both exposure and effects, linking the very notion of a disaster to prior social conditions and sources of inequality. The literature conceptualizes weather disruptions as triggering events with diverse

capacity to cause harm depending on social conditions such as environmental degradation, settlement patterns, and protective systems across regions (Blaikie et al. 1994).

Environmental shocks have been found to expose and magnify existing sources of socioeconomic disparities. Several factors account for the multiplicative effect of disasters on disparities, including the stratification of the consequences of the disaster, institutional and social responses that tend to benefit advantaged groups most, and differential opportunity to benefit from redevelopment opportunities (Birkmann et al. 2010; Olshansky et al. 2008; Vale and Campanella 2005). Factors such as minoritized status, gender, and age shape differential preparation for disaster and vulnerability to damage (Bolin and Kurtz 2007; Fothergill and Peek 2004; Peacock, Morrow, and Gladwin 1997; Tierney 2001). Indeed, the expectation that negative effects from natural disasters will be stronger among vulnerable groups is so widespread that Clark Gray and Valerie Mueller (2012) refer to it as the “conventional narrative” in the natural disaster field of study. Examples abound and show the diverse set of mechanisms—including differential access to social connections, insurance, political influence, ability to negotiate with bureaucratic institutions, among others—linking socioeconomic resources to unequal outcomes. Torche (2018) finds marked heterogeneity in the effect of prenatal exposure to a strong earthquake on children's cognitive ability. Prenatal exposure to this environmental stressor had a strong negative effect on children's cognitive performance and no effect among more advantaged families. Socioeconomic heterogeneity was likely driven by differential parental responses: advantaged families could mobilize resources to compensate for observed impacts or delays among affected children.

The vulnerability approach also highlights interacting sources of vulnerability. For example, Alice Fothergill and Lori Peek (2015) document cumulative vulnerability to the consequences of Hurricane Katrina among children. Children in unstable family structures were

sibling during childhood and find some heterogeneity based on sex, the siblings' age difference, and sibship composition.

more likely to lose their peer networks due to dislocation and to experience further housing instability than children in more stable family structures. Given that weather events are geographic, the interaction between individual-level and community-level sources of vulnerability is particularly important. For example, in part because of long-lasting housing policies, poor or minority children who have a higher likelihood of suffering from asthma (a kind of health vulnerability) tend to live in areas with higher land-surface temperatures than adjacent neighborhoods, which increases risk of asthma-inducing events (Hoffman, Shandas, and Pendleton 2020).

In some instances, however, relocation forced by disasters could create beneficial opportunities especially for populations living in disadvantaged areas even if they disrupt individuals' lives. For example, Bruce Sacerdote (2012) finds that, after a short-term decline in test scores among students who evacuated after hurricanes Katrina and Rita, their test scores improved. Gains were concentrated among students in the bottom half of the test score distribution, probably driven by benefits of moving to better schools.

An important way in which disasters magnify inequalities is through recovery and redevelopment efforts (Arcaya, Raker, and Waters 2020; Bolin and Stanford 1998; Dash et al. 2007; Fothergill and Peek 2004; Tierney 2007). Disaster aid and recovery has been characterized as a Matthew effect process in which "benefits accrue to those who possess wealth and social and cultural capital, while larger proportional losses are borne by the poor and marginalized" (Tierney 2006, 210). Rebuilding is an unequal process in which the interests of disadvantaged groups are usually displaced by coalitions of business interests, powerful organizations, and political actors favoring more advantaged residents (Dash et al. 2007; Pais and Elliott 2008; Peacock, Morrow, and Gladwin 1997). Unequal development is particularly noticeable in housing recovery. Disasters tend to damage rental and low-income properties the most, and this type of housing is built more slowly than owner-occupied housing (Bolin and Stanford 1998; Fothergill and Peek 2004; Fussell

2015; Peacock et al. 2014; Zhang and Peacock 2009).

Environmental and weather-related events also induce stratified migration responses. The literature offers two hypotheses about patterns of heterogeneity in post-disaster population trajectories. The "unequal displacement" hypothesis (the literature refers to it as the displacement approach only, we add unequal to emphasize predicted heterogeneity in effects) suggests that disadvantaged populations are more likely to be displaced than advantaged ones after a disaster because the poor reside in dwellings that are more likely to suffer damage (Peacock et al. 2014), have limited financial resources to rebuild, and face more difficulties accessing disaster support and assistance (Bolin and Stanford 1998; Cochrane 1975; Elliott and Pais 2006; Fothergill and Peek 2004; Hewitt 1997).

In contrast, the "segmented resilience" hypothesis suggests a post-disaster *increase* in the proportion of disadvantaged residents precisely due to their inability to leave, which "trap them in place" (Logan, Issar, and Xu 2016). Considering the impact of thirty-two hurricanes in the Gulf Coast between 1970 and 2005, John Logan, Sukriti Issar, and Zengwang Xu (2016) find that White residents and young adults were more likely to move away after hurricanes than Black residents and the elderly. Similarly, Elizabeth Fussell (2015) finds that in the case of Katrina, disadvantaged populations (minorities, elderly, low-income) were less able to evacuate due to lack of transportation, need of assistance, and different perception of risk.

Interestingly, these two divergent approaches invoke the same mechanism—lack of socioeconomic resources—as the main driver of heterogeneity. Although the unequal displacement emphasizes constraints to rebuild, the segmented resilience focuses on constraints to escape harm and relocate. The divergence in expectations highlights the importance, when examining heterogeneous effects of macro-level shocks, to consider multiple conditions under which people remain in place or relocate and that socioeconomic resources might invoke different context-specific mechanisms (Elliott and Pais 2010; Fussell et al. 2017).

CONCLUSION

This introduction outlines conceptual considerations and recent findings of differential effects of disruptions during childhood across many domains of exposure, a variety of outcomes, and numerous methodological approaches. Indeed, we view heterogenous effects from disruption to be a near-universal feature of children's trajectories across a variety of domains and time points—a feature researchers should regularly consider in their analyses. However, uncovering the potential axes of this heterogeneity is a challenging task, given that few models are precise enough to allow strong directives of domains to include and to exclude in hypothesis tests. Instead, we view much of the literature as relying on somewhat vague theories, research conventions, and ad hoc functional form assumptions to elicit sources of heterogeneity. This issue seeks to outline promising approaches and showcase new results to further motivate examination of heterogeneity.

This issue, while advancing new ideas and results, is not comprehensive. We primarily focus on U.S. contexts and only briefly summarize the literature across a subset of exposures, domains, and axes of heterogeneity. The literature we draw from, though, and the new studies in this issue largely approach these questions using an overlapping set of viewpoints, interests, and insights, if not a specific disciplinary perspective and methodological conventions. We summarize the literature's focus on socioeconomic sources of heterogeneity. Scholars often theorize that highly resourced households will buffer or absorb the impacts of disruptive events during childhood. Other common tests of heterogeneity focus on demographic subgroups, such as age, gender, and race-ethnicity. Theories here are a bit more disparate, including differences in preferences, culture, or developmental periods that affect how children react to negative shocks.

We add to these popular foci an interest in considering intersections between micro- and macro-level events. These intersections point to theories of social normativity to understand the diverse consequences of disruptive events. For example, the stress from unemployment

might be higher in an area with low levels of job loss relative to an area with high unemployment because of the stigma, shame, and guilt from being unemployed in the former context. Linkages between macro and micro contexts also encourage further consideration of prior experiences with other disruptive shocks and, alternatively, being unprepared for or unaccustomed to disruption in households with high levels of resources. Indeed, we see a notable pattern in which those unlikely to experience disruption, possibly because they expect stability in their lives, may be most profoundly affected by a disruptive event.

In addition to summarizing and integrating conceptual approaches and findings from the prior literature, we focus on the methodological challenges involved in identifying heterogeneous effects. Estimating credible main effects are often hard enough without attempting to uncover variation in these effects across subpopulations. Many conventional tools we use focus on getting the best estimates for the main effects and have less to say about their variation. We also face the issue that in assessing heterogeneous treatment effects (of a single treatment) we may in fact be capturing effects of heterogenous treatments. Moreover, we need to expand our toolkits to consider new axes of heterogeneity. To move beyond long-standing theories and conventions in quantitative social science, we should further integrate findings from qualitative studies and novel approaches using machine learning. Machine learning depends on researchers to select what is measured (and therefore what can be tested for heterogeneity) yet can direct our attention to promising axes of heterogeneity we may not have considered. These approaches could provide a powerful strategy against the current practice of, implicitly, assuming away many key sources of heterogeneity.

Considering heterogeneity in the impact of disruption on children's lives and trajectories is an important social-scientific task. Researchers across disciplines are increasingly undertaking this task, yet at times with limited theoretical foundations and analytic strategies. We hope this issue provides a useful resource to the research community and that it contributes

to the systematic understanding of potentially vast variation in the consequences of disruption, especially in early life.

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