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A Scoping Literature Review on Indicators and Metrics for Assessing Racial Equity in Disaster Preparation, Response, and Recovery

In the context of extreme events, *racial equity* would mean that race predicts the distribution of aid for disaster preparation, response, or recovery (PRR) to the extent that race is related to the need for aid (Berke et al., 2019; Lawrence et al., 2009; Martín and Lewis, 2019; Muñoz and Tate, 2016). Equity is a complex construct, encompassing the interrelated dimensions of how benefits and costs are distributed, which stakeholders are recognized and included, and preexisting conditions that influence access to decision-making procedures and resources. The U.S. Department of Homeland Security (DHS) and the Federal Emergency Management Agency (FEMA) made a commitment to reduce racial inequities through their *Whole Community* approach—one that aims to

reduce the negative consequences of disasters based on race, color, or national origin. However, frameworks, indicators, and metrics for tracking progress toward racial equity goals have not been identified consistently by DHS or FEMA. This exploratory study addresses the following three main questions:

1. What conceptual frameworks are useful for identifying racial equity indicators and metrics across FEMA disaster PRR programs?
2. What are the most valid indicators and metrics of equity in processes and outcomes experienced by

KEY FINDINGS

- Equity frameworks have been designed to address different topics at different geographic scales, but some indicators lack validation.
- Indicators and metrics are often not specific to racial equity; additional disaggregated data and analytic techniques are needed to measure differences by race.
- Most metrics are quantitative, but qualitative information might be useful for process improvements in FEMA programs.
- A theory of change for achieving racial equity in FEMA programs is lacking.
- A comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster impacts has not been established.
- Criteria for systematic selection of indicators, metrics, and data are needed.

different racial groups as a result of funding from FEMA disaster programs?

3. What are the gaps in knowledge that FEMA would need to address to ensure disaster funding systems progress toward racial equity?

To assess opportunities and challenges encountered when developing frameworks or selecting indicators and metrics, we searched peer-reviewed and gray literature on equity, vulnerability, and resilience. An initial set of 7,736 documents was identified; 55 documents remained after removing duplicates and conducting a title, abstract, and article review. We identified 16 main themes from the literature review.

Our review of relevant conceptual frameworks suggests that

- Equity frameworks have been designed to address different topics at different geographic scales, but some indicators lack validation.
- Common categories of outcomes in the equity frameworks relate to health, environment, economics, energy/utilities, education, housing, and transportation/mobility.
- Selection of equity indicators requires trade-offs.
- Criteria for selecting metrics for indicators are not always specified.

Abbreviations

ALM	action-logic model
DHS	Department of Homeland Security
DRRA	Disaster Recovery Reform Act
FEMA	Federal Emergency Management Agency
IA	Individual Assistance
PA	Public Assistance
PRR	preparation, response, or recovery
RSF	recovery support function
SNAP	Supplemental Nutrition Assistance Program

- Sociopolitical and economic differentials shape disaster experiences.
- Models of vulnerability are necessary but are not sufficient for assessing racial equity.
- Identifying meaningful indicators and metrics of racial equity requires frameworks that highlight the particular resource losses different social groups are facing.

Our review of documents related to relevant indicators and metrics suggests that

- Indicators and metrics are often not specific to racial equity; additional disaggregated data and analytic techniques are needed to measure differences by race.
- Many indicators have not been used to assess racial equity in real-world contexts (disaster or nondisaster).
- Indicators and metrics used outside disaster PRR might offer insights for FEMA.
- There is not a one-to-one correspondence between many indicators and recovery support functions.
- Most metrics are quantitative, but qualitative information might be useful for process improvements in FEMA programs.

Our review of the literature also identified the following outstanding gaps in knowledge:

- A theory of change for achieving racial equity in FEMA programs is lacking.
- Appropriate measures of baseline conditions have not been identified.
- A comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster effects has not been established.
- Criteria for systematic selection of indicators, metrics, and data are needed.

The following are recommendations for enhancing FEMA's efforts to assess racial equity in PRR programs:

1. **Develop a systematic and robust approach to racial equity assessments**, including identifying goals or standards, logic models, and best practices for selecting indicators and metrics in different contexts.

2. **Partner closely with communities** affected by racial inequities to better understand nuances and complexities and to identify relevant and acceptable indicators and metrics across recovery functions and disaster phases.
3. **Evaluate the reliability and validity of quantitative indicators and metrics** for capturing racial equity in processes and outcomes of real-world PRR programs.
4. **Identify qualitative approaches** for understanding the barriers, facilitators, and other factors that lead to racially inequitable experiences and outcomes with PRR programs and establish processes for collecting and analyzing these data.
5. **Develop strategies for closing data gaps**, including leveraging existing data (e.g., data used in other federal programs) and identify where new or improved data are needed.
6. **Develop communication and education strategies** to ensure that all stakeholders understand the appropriate use and interpretation of selected indicators and metrics.

In-depth assessment of the racial equity of FEMA's disaster funding programs would be needed to empower diverse community members and effectively target groups that need the most help to prepare for, respond to, and recover from disasters. This work could be complemented with a comprehensive approach to understanding and addressing racial equity more broadly in disaster contexts across DHS. Empirical research and analysis will be an important foundation for these efforts.

CHAPTER 1 Introduction

U.S. federal agencies, including DHS, recognize that structural barriers, including inequitable funding systems, impede progress toward social and economic well-being for Americans of all races and ethnicities (U.S. Department of Education, undated; DHS, 2011a; U.S. Department of Housing and Urban Development, 2020). Matching policy responses (e.g., disaster grant funding) to social needs requires assessment of racial equity (Siders, 2019). However,

few federal agencies (e.g., Environmental Protection Agency) have assessed whether the highest areas of need are being targeted adequately by program funding. Such assessments require the identification of appropriate indicators and metrics, which is complex because equity is a multifaceted concept. Furthermore, the causal pathways linking observed measures of performance and funding (for instance, from disaster programs administered by FEMA) are hard to determine because of the many (often simultaneous) ongoing activities and changing conditions (e.g., worsening extreme events). This report addresses the following three main questions:

1. What conceptual frameworks are useful for identifying racial equity indicators and metrics across FEMA disaster PRR programs?
2. What are the most valid indicators and metrics of equity in processes and outcomes experienced by different racial groups as a result of funding from FEMA disaster programs?
3. What are the gaps in knowledge that FEMA would need to address to ensure disaster funding systems progress toward racial equity?

Background

Equity is a multidimensional construct typically characterized by fairness and a lack of self-interest (Konow, 2003; *Oxford English Dictionary*, 2020; Schroeder and Pisupati, 2010). Unlike *equality*, where the same treatment is given to all regardless of personal advantage or disadvantage (Sen, 1992), equity allows for unequal distribution of benefits and costs for the sake of net social gain (McDermott, Mahanty, and Schreckenberger, 2013). Equity is an inherently comparative construct, whereas *justice* can be conceptualized as absolute, for example, in the form of a moral right (Grasso, 2007). One goal of racial equity is fair access to livelihood, education, and resources such that race is no longer a factor in the assessment of merit or in the distribution of opportunity (Lawrence et al., 2009).

In the context of extreme events, racial equity would mean that race predicts the distribution of aid for disaster PRR to the extent that race is related to the need for aid (Berke et al., 2019; Lawrence et al.,

2009; Martín and Lewis, 2019; Muñoz and Tate, 2016). In an analytic framework for assessing equity in ecosystem payments, McDermott and colleagues identify three interrelated dimensions of equity: (1) *distributive equity*, which relates to the distribution of benefits and costs; (2) *procedural equity*, which relates to the recognition and inclusion of all parties in decision making; and (3) *contextual equity*, which relates to the preexisting socioeconomic conditions that influence access to decision-making procedures, resources, and, thereby, benefits (McDermott, Mahanty, and Schreckenber, 2013).

To understand inequities in disaster contexts, scholars have highlighted the importance of *social vulnerability*, defined as “the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of an extreme event or process” (Wisner et al., 2004, p. 11). Research suggests that racial, ethnic, political power, and gender stratification are drivers of disparate disaster experiences (Cutter et al., 2008; Garrett and Sobel, 2003; Muñoz and Tate, 2016; Peacock and Bates, 1982; Peacock, Morrow, and Gladwin, 1997; Tierney, 2009). Racial and ethnic minorities often experience more vulnerability at all stages (before, during, and after) of a catastrophic event (Cutter, Boruff, and Shirley, 2003; Flanagan et al., 2011; Morrow, 1999). An equity framing based on needs is useful for determining differences across and within racial and ethnic groups.

A glossary of terms is provided in Appendix A.

Disasters and Inequity

Disasters have the potential to exacerbate preexisting racial inequities. Such events as Hurricane Katrina demonstrate how structural inequity and lack of socioeconomic resources constrain important “choices” about preparing for or responding to a disaster and might result in disproportionate losses. For instance, choosing to evacuate was not possible for some New Orleans residents because of lack of economic means, limited access to transport, or inability to function without substantial assistance (Barnshaw and Trainor, 2007; Tierney, 2006). Black Americans were the majority of the small group who did not evacuate (Fussell, 2015). Recovery efforts

by the people more likely to rent housing—which included mostly Black, low-income, and female-headed households—were slowed early in the process when Louisiana policymakers chose not to allocate public resources to renters (Clark and Rose, 2007).

A bias in postdisaster housing recovery results from more-efficient delivery of insurance payments and federal disaster aid to homeowners than to renters (Fothergill, Maestas, and Darlington, 1999; Fussell, 2015; Peacock et al., 2014). However, Black homeowners are more likely than white homeowners to face rebuilding costs that exceed their resources because recovery grants are based on a home’s pre-storm value and Black homeowners are more likely to own homes with lower values (Gotham, 2015; Rose, Clark, and Duval-Diop, 2008).

DHS and FEMA Policy on Equity

DHS and FEMA have expressed a commitment to reducing social inequity in mission and value statements, sometimes pointing to race, but have not explicitly highlighted racial equity as a goal. For instance, FEMA’s 2018–2022 Strategic Plan identifies “diversity and inclusion” as a key driver that needs to be understood to ensure “that FEMA and the whole community are prepared to face a variety of challenges” (FEMA, 2020, pp. 10–11). The *Whole Community* approach includes such principles as meeting the needs of—and empowering—diverse community members (DHS, 2011b). Furthermore, the National Disaster Response Framework’s principle of Individual and Family Empowerment actively seeks to reduce negative consequences based on race, color, or national origin (DHS, 2011a). Similarly, FEMA’s predisaster recovery planning guide for local governments highlights the importance of social equity in disaster planning and recovery (DHS, 2017). A report by the National Advisory Council to the FEMA Administrator explicitly highlights the goal of achieving racially equitable outcomes in emergency management activities (National Advisory Council, 2020). The report recommends creating an equity standard for judging whether grants (disaster and nondisaster) increase or decrease equity over time, incorporating equity-based performance measures that break data down by race. The report states that

While it is not the role of FEMA to dismantle a series of systems that cause inequity, it is within the role of FEMA to recognize these inequities (and the disparities caused by them) and ensure that existing or new FEMA programs, policies, and practices do not exacerbate them. (National Advisory Council, 2020, p. 11)

The report emphasizes that the 2018 Disaster Recovery Reform Act (DRRA) allows FEMA to provide more funding to support people with more systemic or structural need, including underserved and historically marginalized communities (e.g., people of color).

FEMA disaster programs (e.g., Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities, Public Assistance [PA], Individual Assistance [IA], and National Flood Insurance Program) vary in their goals related to phases in the disaster cycle and the nature of the activities eligible for support (Ratcliffe et al., 2019). Disaster funding (e.g., IA) is heavily weighted toward property owners, and, because home ownership is higher among white than Black Americans, FEMA's aid distribution policy can exacerbate racial inequity. Empirical research suggests that FEMA's PA program (1) generally operates as designed (e.g., places with the highest losses receive the most funding), but (2) delivers less support to socially vulnerable counties when total losses are held constant, and (3) relates to different types of inequities in different years (Domingue and Emrich, 2019; Howell and Elliott, 2018; 2019). Prior legislation (e.g., the 1988 Stafford Act [Pub. L. 100-707, 1988]) constrained FEMA by prohibiting distribution of response and recovery aid based on race or economic status. However, the aforementioned National Advisory Council report suggests that the DRRA advocates a more equitable approach to the administration of public resources that is appropriate for FEMA (National Advisory Council, 2020).

Tools for Tracking Progress Toward Equity

Frameworks, indicators, and metrics for tracking progress toward equity goals have not yet been iden-

tified consistently by DHS and FEMA. For many years, FEMA has measured effectiveness using metrics that tell us little about the differential experiences of vulnerable groups. For instance, progress in response and recovery efforts is tracked via metrics including number of assistance registrations, dollar value of assistance provided, or number of contract actions, but equity analyses are rarely included (DHS, 2018). To provide additional quantitative insight into whether FEMA is making progress on reducing racial inequity on an annual basis, metrics need to capture change, either toward or away from equity. Equity indicators are often a collection of related but distinct metrics (e.g., racial equity in public transit access might involve examining differences between Black and white residents' distance to the closest bus stop or wait time between buses). Metrics in multiple categories of desired outcomes for communities have been identified in previous equity assessments, including economic prosperity, healthy lifestyles, food security, affordable housing, clean environment, and transportation choices. However, exactly which metrics are valid for which FEMA programs at different phases of the disaster cycle is an open question.

CHAPTER 2 Methods

We searched existing documents (peer-reviewed and gray literature) to identify

1. conceptual frameworks from which we can highlight processes and outcomes driving systemic inequities in disaster PRR
2. indicators and metrics of equity in domains relevant to reducing racial inequities potentially affected by FEMA programs at different phases of the disaster cycle
3. gaps in knowledge that FEMA would need to address to ensure disaster funding systems progress toward racial equity.

Our search parameters included U.S.-based publications from the past 20 years (January 2000–July 2021), written in English. Table 2.1 shows the databases used for the literature searches. For gray literature searches (Figure 2.1), we limited results to the top 50 results from each database.

We conducted two separate searches across all databases based on the strategy described, searching titles and abstracts of documents using keywords, including *equity, inequality, social justice, disparity, indicator, metric, FEMA, preparedness, disaster relief, disaster recovery, and resilience*. We identified frameworks and definitions and examples of indicators and metrics related to racial equity and relevant to disaster PRR. Our search was broken into three subsearches to capture equity indicators and metrics relevant to (1) FEMA programs, (2) other federal pro-

grams, and (3) other related domains (e.g., resilience, health, social services). The full search strategy and example keywords are shown in Table B.1 in Appendix B.

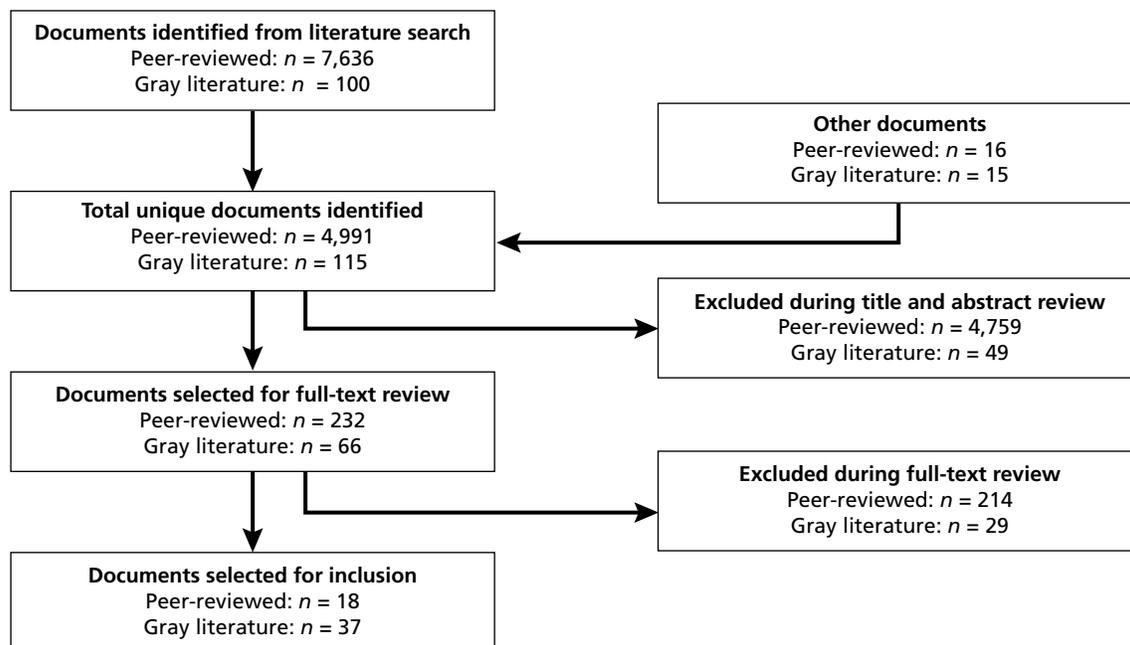
We also located additional documents via purposive searching for related disaster PRR projects. We conducted a first round of screening for appropriate content using only titles, and then another round of screening, reviewing titles and abstracts. We then conducted a full-text review of the documents until we determined that we had achieved conceptual

TABLE 2.1
Databases Used to Search for Peer-Reviewed and Gray Literature

Category	Database	Publisher
Peer-reviewed literature	PubMed	National Library of Medicine
	CINAHL Plus	EBSCO
	APA PsycINFO	EBSCO
	Social Sciences Abstracts	EBSCO
	Scopus	Elsevier
Gray literature	Advanced Google Search	
	New York Academy of Medicine	

NOTE: EBSCO = Elton B. Stephens Company.

FIGURE 2.1
Number of Peer-Reviewed and Gray Literature Documents Included at Each Stage of the Review Process



saturation and were not identifying any new frameworks or indicator examples from the documents. Therefore, this was not an exhaustive review, though there was adequate coverage to represent the state of the literature in this research area. Figure 2.1 shows the number of documents identified and the number that met inclusion criteria at each stage of the review process. A full list of citations for the 55 documents included for final review is provided in Appendix D.

CHAPTER 3 Findings

Findings from our literature search are reported as repeating themes related to (1) conceptual frameworks, (2) indicators and metrics, and (3) gaps in knowledge. A summary of the main findings is

shown in the box. FEMA-specific implications are highlighted in italics at the end of each theme's section.

Themes About Conceptual Frameworks

In this section, we address the following question: What frameworks are useful for identifying racial equity indicators across FEMA programs? Several relevant themes emerged from 18 documents identified in our literature search for equity frameworks or context and from the broader literature on community vulnerability and resilience.

Equity frameworks have been designed to address different topics at different geographic scales, but some indicators lack validation. At the

Summary of Main Themes Identified in the Literature Search

Conceptual frameworks

- Equity frameworks have been designed to address different topics at different geographic scales, but some indicators lack validation.
- Common categories of outcomes in the equity frameworks relate to health, environment, economics, energy/utilities, education, housing, and transportation/mobility
- Selection of population indicators requires trade-offs
- Criteria for selecting metrics for indicators are not always specified
- Sociopolitical and economic differentials shape disaster experiences
- Models of vulnerability are necessary but are not sufficient for assessing racial equity
- Identifying meaningful indicators and metrics of racial equity requires frameworks that highlight the particular resource losses different social groups are facing

Indicators and metrics

- Indicators and metrics are often not specific to racial equity; additional disaggregated data and analytic techniques are needed to measure differences by race
- Many indicators and metrics have not been used to assess racial equity in real-world contexts (disaster or nondisaster)
- Indicators and metrics used outside disaster PRR might offer insights for FEMA
- There is not a one-to-one correspondence between many indicators and recovery support functions (RSFs)
- Most metrics are quantitative, but qualitative information might be useful for process improvements in FEMA programs

Gaps in knowledge

- A theory of change for achieving racial equity in FEMA programs is lacking
- Appropriate measures of baseline conditions have not been identified
- A comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster impacts has not been established
- Criteria for systematic selection of indicators and metrics are needed

national level, some documents included policy recommendations for actions to address inequity. For instance, one recommendation for national health care reform is to establish benchmarks (e.g., infant mortality rate) for reducing disparities in health care by race (Community Catalyst, National Immigration Law Center, National Immigration Forum, and Joint Center on Political and Economic Studies, 2009). Other documents addressed environmental justice and social equity concerns for regions or cities (Franz et al., 2015), creating new indexes (e.g., the City of San Diego’s Climate Equity Index) and identifying population indicators for measuring equity at the census tract level (City of San Diego, 2019). In some cases, limitations were discussed, including data for some population indicators being unavailable, old, or inaccurate. A key limitation not often discussed is the need for indicators derived from the frameworks to be validated against their stated objectives (Bakken et al., 2017). *The array of available frameworks*

offers FEMA diverse ways to think about equity, but unvalidated indicators may have limited use for policymakers developing regional policy or making investment decisions.

Common categories of outcomes in the equity frameworks relate to health, environment, economics, energy/utilities, education, housing, and transportation/mobility (City of San Diego, 2019). The exact number and type of outcome categories depend on the purpose of the framework (see Table 3.1). Often, they are described as reflecting the most prominent issues of concern within the responsibility of policymakers rather than being exhaustive. Sometimes the categories overlap or are consolidated (e.g., health and food might be identified separately or as one category; an overarching category of socioeconomic issues might be separated into employment, education, culture, and poverty). *To understand the comprehensiveness of existing or proposed equity assessments and how to interpret results, FEMA would*

TABLE 3.1
Illustrative Outcome Categories from Example Equity Framework Documents

Outcome Category	Wisconsin Center for Health Equity (2014)	NAACP (2015)	Warren May et al. (2017)	Franz et al. (2015)	Nutters (2012)	City of San Diego (2019)	Martin and Lewis (2019)
Health	X	X	X	X	X	X	X
Environment	X	X	X	X	X	X	X
Economic	X	X	X	X	X	X	
Energy/utilities	X	X	X		X		X
Education	X	X	X	X		X	X
Housing	X	X	X	X		X	X
Transportation/mobility	X	X	X	X	X	X	
Food	X	X	X	X		X	
Culture	X	X		X		X	
Civic engagement	X	X	X	X	X		
Emergency services	X	X			X		
Criminal or restorative justice	X		X	X			
Report topic domain	Health	Climate	Community development	Transport	Climate	Climate	Energy
Geography of focus	State	Unspecified	City	Regional	State	City	Unspecified

NOTE: NAACP = National Association for the Advancement of Colored People.

need to know what outcomes are included in any given category.

Selection of equity indicators requires trade-offs. Indicators are imperfect representations of reality. When indicators are being selected, considerations include (1) balancing the validity, reliability, and timeliness of data used; (2) assessing the utility of different spatial resolutions; and (3) supplementing them with relevant qualitative data (Besser, 2014). At an agency level, FEMA might prefer to adopt a common set of equity indicators that are mission-relevant, but these might not be suitable indicators to examine performance at a program level. Consequently, decisions about trade-offs need to be made transparently and with consideration of constraints that different choices might imply. *Identifying a set of best practices for selecting equity indicators in different contexts and for different purposes would support a robust selection process. Additionally, identifying strategies for communicating with and educating stakeholders about the appropriate use and interpretation of the selected indicators would help FEMA engage key audiences about understanding best practices.*

Criteria for selecting metrics for indicators are not always specified. Generally, specific measures might change over time as new or better data become available, but assessing progress toward the desired end result of racial equity means that indicators need to remain stable over time. A common starting point for researchers and practitioners is the U.S. Census because it provides a population-level view of traditionally defined protected classes and income groups. Additional metrics are often needed to ensure that performance assessments tap into multiple potential sources of inequity, which can arise from a wide variety of decisions, actions, and omissions (Martín and Lewis, 2019). For instance, simple measures of community engagement by race can determine proportional representation relative to the general population, but these data are not always collected or available. The reasons for focusing on a specific set or source of metrics need to be transparent and revisited regularly to ensure that they match the purpose of the equity assessment. Franz et al. suggests several useful criteria for selecting metrics. Metrics should be (1) generated by a trusted source; (2) available con-

sistently over time so that trends can be examined; (3) disaggregated by race and ethnicity (and national origin, language, gender, income, age, and disability status) to the greatest degree possible; (4) available regionally, but with an ability to be disaggregated locally for comparisons and mapping; (5) supportive of collaboration and capacity-building with community-based organizations; and (6) affordable and feasible to collect (Franz et al., 2015). *Identifying criteria like these would help FEMA PRR programs develop a robust approach to assessing equity.*

The remaining themes about conceptual frameworks in this section are drawn from existing theories of community resilience, vulnerability, and uneven disaster effects, to ensure that our review of equity frameworks is grounded in a broader social science literature. These next three themes highlight important considerations about the purpose and nature of equity indicators that arise from interdisciplinary research and practice but might not be obvious to scholars, administrators, or planners within sectoral or institutional silos.

Sociopolitical and economic differentials shape disaster experiences. Social vulnerability reflects the combinations of social, demographic, economic, cultural, political, and institutional processes that profoundly influence how people prepare for, respond to, and recover from extreme events (Karakoc et al., 2020; Turner et al., 2003). Practitioners and policy-makers are increasingly interested in including social vulnerability through the use of data-driven tools that quantify vulnerability among diverse populations and places (Spielman et al., 2020). One example of an effort to collapse the many relevant but different dimensions into a single indicator is the Social Vulnerability Index (Cutter, Boruff, and Shirley, 2003). However, such indices reflect only latent variables (i.e., something inherent to a person or place, but not directly observable), and recent analyses suggest that they lack theoretical and internal consistency (Spielman et al., 2020). Some analyses suggest that only a subset of social vulnerability measures are needed to define different socioeconomic characteristics, as follows: percentage of population over 65 years old, percentage under five years old, percentage Hispanic/Latino; percentage single-female parent households, and households living under the poverty

line (Karakoc et al., 2020). Because vulnerability manifests itself in different forms in different places, measures of vulnerability should reflect the local context in which the vulnerability to extreme events occurs when determining optimal PRR approaches. For instance, local perceptions of risk and coping capacity might vary across different community groups, such as those whose livelihoods depend on natural resources (e.g., fisheries) versus those dependent on the oil and gas sector (Rufat et al., 2015). Furthermore, the complex dynamics in social-ecological systems might cause inequities to vary across contexts (Finucane et al., 2020). *Consequently, to account for these kinds of differences across groups, FEMA could consider racial equity within integrated physical and social vulnerability assessments (Nutters, 2012).*

Models of vulnerability are necessary but are not sufficient for assessing racial equity. For the latter, we need a well-designed theory-based evaluation model to structure assessments of whether the highest areas of need are targeted adequately by PRR program funding. Building on established evaluation procedures, an action-logic model (ALM) is helpful for highlighting how interdependent program elements lead to expected outcomes (Birnbaum et al., 2016). An ALM shows the chain of reasoning linking program funding with expected outputs and outcomes and identifies what type of evidence (e.g., population indicators and metrics) is needed to document program performance. Such evidence is necessary to generate usable, context-sensitive information that informs improvements in funding programs and to identify generalizable knowledge about racial inequities more broadly (National Research Council, 2008).

An example logic model is provided with the Centers for Disease Control and Prevention's (CDC's) Public Health Emergency Preparedness 2020 notice of funding opportunity (CDC-RFA-TP19-1901). The ALM in this case summarizes how funding (to support state, local, and territorial public health departments to strengthen effective response to a variety of public health threats) is linked with expected outputs and outcomes (e.g., continuity of emergency operations). Drawing on program evaluation theory and methods and the CDC example, we provide a high-level, illustrative ALM for FEMA disaster programs

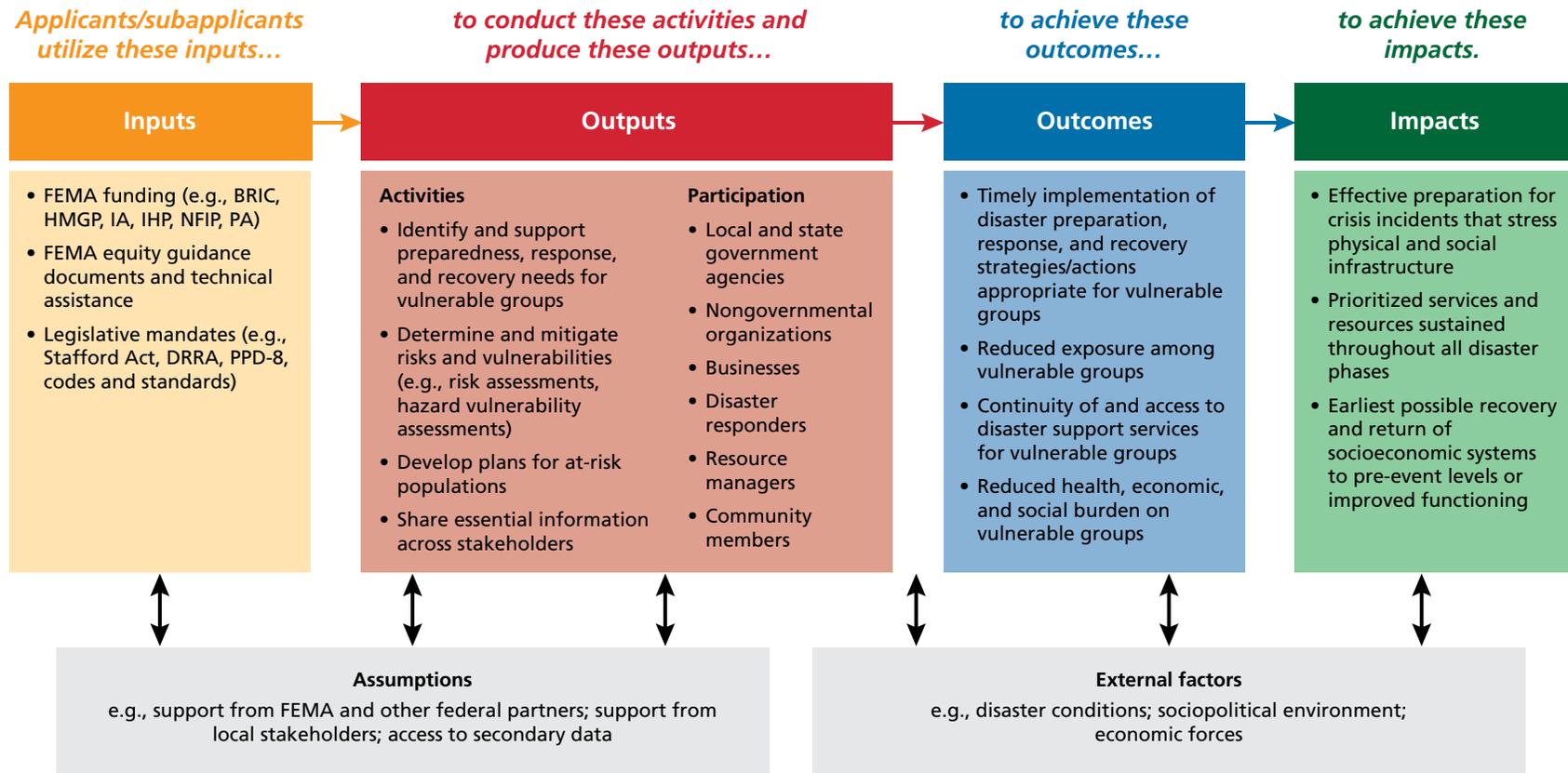
in Figure 3.1. *To be directly applicable to FEMA, this approach could be defined in more detail for specific racial equity goals and outcomes of particular FEMA programs.*

An ALM can be used in combination with other methods (e.g., backward mapping) to operationalize equity and identify a comprehensive variety of relevant metrics for evaluating the racial equity of a given program. Practical guidance provided by the Aspen Institute Roundtable on Community Change offers steps for identifying relevant structural factors contributing to specific racial inequities and capacities needed to change those factors (Lawrence et al., 2009). Clearly stating performance measures (and how they should be interpreted in analyses of race/ethnicity differences in outcomes and effects) allows monitoring of the success of PRR program activities that have a reasonable chance of contributing to results (Nelson and Brooks, 2016). *To implement this approach, FEMA would need to consider what performance metrics best capture (1) how much was done, (2) how well it was done, and (3) whether racial inequity gaps have closed (Is anyone better off?).*

Identifying meaningful indicators and metrics of racial equity requires frameworks that highlight the particular resource losses different social groups are facing. Empirical work suggests that resource loss is key to understanding the stress and poor outcomes experienced by different racial groups affected by disaster (Hobfoll, 2001). Hobfoll's conservation of resources theory is useful for identifying three main categories of relevant resources that people value: (1) *objects*, which are physical or tangible forms in the real world; (2) *conditions*, which are "support mechanisms derived from life situations or roles in which people interact on a consistent basis"; and (3) *energies*, which are "time and money which people allocate to acquire and sustain resources" (for definitions, see Halbesleben et al., 2014) (Hobfoll, 1989; 2001). Debate is ongoing about how resources should be defined and their value determined (Halbesleben et al., 2014), but the broad concept of resources provides a valuable starting point for identifying relevant population indicators and metrics that cut across key functional areas of assistance in the National Disaster Recovery Framework (DHS, 2011a; Dwyer and Horney, 2014). For

FIGURE 3.1

Example ALM Depicting Linkages Between FEMA Disaster Programs and Equitable Outcomes



NOTE: BRIC = Building Resilient Infrastructure and Communities; HMGP = Hazard Mitigation Grant Program; IHP = Individuals and Households Program; NFIP = National Flood Insurance Program; PPD = Presidential Policy Directive.

instance, an object resource potentially threatened by a hurricane might be a house or its contents. The loss incurred might be damage, or the need to sell the possession(s), even if undamaged, to generate cash to cover other disaster-related expenses. An example metric in this case would be percentage change in value of household assets. Other examples of resources threatened by extreme events are provided in Table A.3 in Appendix A. *FEMA might need different indicators and metrics for assessments pre-event and post-event because community resource needs differ in predisruption preparedness contexts and post-disruption response and recovery contexts* (Karakoc et al., 2020).

Themes About Indicators and Metrics

In this section, we address the following question: What are the most appropriate indicators and metrics of equity in processes and outcomes experienced by different racial groups as a result of funding from FEMA disaster PRR programs?

Our review of 55 documents identified a vast array of possible indicators and metrics for measuring racial equity. The themes that follow describe patterns observed in the types of indicators we identified, the context in which they were used, data issues associated, and applicability to FEMA PRR programs.

Indicators and metrics are often not specific to racial equity; additional disaggregated data and analytic techniques are needed to measure differ-

ences by race. We identified 1,051 indicators and metrics (not de-duplicated; there was overlap across many indicators in our set) related to processes or outcomes relevant to disaster PRR or other topic domains. Table 3.2 shows a subset of documents with indicators and metrics that looked specifically at processes and outcomes by race. These documents reflect race variables collected using a variety of techniques; the strengths and limitations of the techniques need to be considered in the context of their use. Each of the metrics listed in Table 3.3 was calculated separately for white residents and racial/ethnic minority residents, and the results by race were compared to determine whether inequity existed. Other metrics analyzed differences in access to services or outcomes by geography, which could then be (and occasionally were) correlated with demographics to understand racial equity. In some cases, metrics measured processes and outcomes but comparison groups were not established and inequity could not be examined. *In sum, although some indicators and metrics have been used to assess inequity specifically related to race, additional data and methods would be needed for robust analyses of FEMA’s PRR programs.*

Many indicators and metrics have not been used to assess racial equity in real-world contexts (disaster or nondisaster). Our review of documents identified whether the indicators and metrics described had been used previously in real-world contexts (both disaster and nondisaster) or whether they were theoretical, proposed, or recommended for use by the authors (Table 3.2). We also identified the

TABLE 3.2
Percentage of Indicators and Metrics Using Each Type of Data Source in Different Usage Contexts

Usage Context	Data Publicly Available—National	Data Publicly Available—State or Local	Data Primary/Not Publicly Available	Data Not Described
Used in disaster context	42	2	8	48
Used in nondisaster context	39	44	6	11
Theoretical/proposed—disaster	0	1	2	97
Theoretical/proposed—nondisaster	5	3	19	73
All contexts	20	13	9	57

data sources (when provided) as publicly available at the national or local level or gathered via primary data collection (e.g., survey, interview). Table 3.2 summarizes the percentage of indicators and metrics of each type by data source. Note that Table 3.3 describes a set of indicators and metrics that specifically measured racial equity, but the majority of indicators referred to in Table 3.4 did not explicitly measure racial equity.

The metrics used in disaster contexts relied on available FEMA data and primarily measured disparities in IA and PA disbursements. The met-

rics used in nondisaster contexts were fairly evenly split across national and local data sources. Most indicators/metrics did not do primary data collection. The vast majority of proposed or theoretical indicators/metrics did not identify a data source across disaster and nondisaster contexts. Many authors identified challenges with data availability to capture the metrics they recommended, especially in disaster contexts. *FEMA will be challenged by the lack of indicators and metrics tested in real-world settings and would need to conduct additional research to identify data sources for some of the indicators and*

TABLE 3.3
Example Equity Indicators and Metrics Used to Analyze Differences by Race in Disaster and Nondisaster Contexts

Resource Category	Indicator	Metric	Context of Use	Source
Objects	Housing affordability and recovery	Number of applications to FEMA's home assistance program	Disaster	Rivera, 2016
Objects	Housing affordability and recovery	Relative recovery ratio of a census block (computed as the total dollar amount received divided by the property's predisaster assessed value and appraisal multiplier)	Disaster	Muñoz and Tate, 2016
Objects	Natural environment	Percentage living within 1/4 mile of a green space (e.g., park)	Nondisaster	Martin and Lewis, 2019
Conditions	Natural environment	Percentage living with air quality of annual average particulate matter (PM) 2.5 values of above 12.0	Nondisaster	Martin and Lewis, 2019
Conditions	Housing affordability and stability	Percentage denied loan for home purchase	Nondisaster	Warren May et al., 2017
Conditions	Financial health	Percentage of households with an annual income below the federal poverty threshold	Nondisaster	Warren May et al., 2017
Conditions	Financial health	Median income	Nondisaster	Warren May et al., 2017
Conditions	Entrepreneurship and workforce development	Median contract size to firms/businesses	Nondisaster	Colette Holt & Associates, 2019
Conditions	Health	Percentage hospitalized with asthma	Nondisaster	Warren May et al., 2017
Conditions	Health	Percentage without health insurance	Nondisaster	Warren May et al., 2017
Energies	Housing affordability and stability	Percentage of households spending 30 percent or more of their income on housing	Nondisaster	Franz et al., 2015
Energies	Utilities affordability and stability	Percentage of annual income spent on utilities	Nondisaster	Warren May et al., 2017
Energies	Transportation/mobility	Percentage with access to high-frequency transit network	Nondisaster	Grengs, Levine, and Shen, 2013
Energies	Entrepreneurship and workforce development	Percentage owning businesses	Nondisaster	Warren May et al., 2017

TABLE 3.4

Count and Percentage of All Indicators Reviewed by Method of Analysis

Method of Analysis	Count of Indicators/Metrics by Method	Percentage of Indicators/Metrics by Method
Quantitative	875	83
Qualitative	30	3
Not described or multiple methods used	146	14
Total	1,051	100

metrics that it might consider using. Additionally, FEMA will confront the trade-offs identified in the literature when it comes to selecting indicators, metrics, and data sources to measure equity, and a lack of criteria for selecting appropriate data.

Indicators and metrics used outside disaster PRR might offer insights for FEMA. As described previously, our review covered indicators and metrics directly measuring disaster PRR topics and related topic domains, including community resilience, health, social services, and climate. We identified comparably fewer indicators and metrics specifically used or proposed in disaster PRR contexts but found a large assortment of indicators and metrics from other topic domains that could be adapted for disaster contexts (see Table 3.3 for examples). Depending on the timing of data collection, these indicators and metrics could be useful for assessing predisaster conditions (baseline) (e.g., proximity of houses to brownfields or legacy industrial sites), disaster preparation processes or outcomes (e.g., percentage of households with liquid assets), disaster response (e.g., proximity to community centers or other public facilities), or disaster recovery (e.g., loan applications and approvals/denials). *Other federal programs (e.g., metrics assessing participation in and effect of the Supplemental Nutrition Assistance Program [SNAP], rental assistance application processes, and experiences with the U.S. Department of Housing and Urban Development) could be adapted to assess racial equity in FEMA programs, including Disaster-SNAP, IA, PA, and beyond, assuming the data can be disaggregated by race.*

There is not a one-to-one correspondence between many indicators and RSFs. For example, indicators measuring resources related to home

ownership postdisaster certainly would be in the domain of the Housing RSF (e.g., addressing physical infrastructure of homes), but could also fall under the domain of the Economic RSF (e.g., addressing economic conditions that enable home ownership). Though some efforts have been made to map indicators to RSFs (Dwyer and Horney, 2014), FEMA will find it difficult to use many existing indicators in the RSF structure. *Given the complex, dynamic social systems that give rise to racial inequity, as described previously, it will be challenging for FEMA to identify independent racial equity goals, objectives, indicators, and metrics for each RSF.*

Most metrics are quantitative, but qualitative information might be useful for process improvements in FEMA programs. Quantitative metrics are useful to understand the prevalence of a particular outcome, to understand how widespread experiences might be, or to capture the magnitude of inequities between groups when they are compared. However, for the purposes of making decisions or improving processes to address inequities, scholars recommend supplementing quantitative data with qualitative information about on-the-ground experiences (Besser, 2014). For example, there is a body of work analyzing inequity in FEMA IA application and approval rates for low-income communities affected by disasters, which points to the experience of low-income residents receiving comparably less assistance than higher-income residents (Adams, 2018; Drakes et al., 2021; Emrich et al., 2020; Martín et al., undated). In order for FEMA to address the source of the inequity, it would be valuable to understand where in the process experiences diverged and to identify the barriers, facilitators, and other factors that lead to inequitable experiences and outcomes.

As shown in Table 3.4, there is a dearth of available qualitative indicators across disaster and nondisaster contexts.

Qualitative indicators that were identified were specific to small geographies and/or disasters (e.g., low-income neighborhoods experiencing damage after Hurricane Katrina) and consisted of perceptions of FEMA programs and experiences with applying for and receiving relief funding. *Additional research would be needed for FEMA to identify aspects of PRR programs that could be assessed most appropriately using qualitative methods and to establish processes for collecting and analyzing the data to assess inequity.*

Themes About Gaps in Knowledge

In this section, we address the following question: What are the gaps in knowledge that FEMA needs to address to ensure disaster funding systems progress toward racial equity? The order of themes presented below does not indicate relative importance.

A theory of change for achieving racial equity in PRR programs is lacking. To develop an effective racial equity strategy with meaningful accountability, FEMA would first need to articulate how PRR programs are expected to address racial equity goals and then adopt a systematic approach to quantifying racial equity concerns over which it has some influence (Knowlton and Phillips, 2013). Focusing specifically on the structural factors contributing to racial inequities (rather than more broadly on social inequities) is necessary for identifying and measuring the capacities needed to change those factors. A logic model for racial equity evaluation could provide FEMA with a baseline of inequities from which future progress can be measured and priority areas for support can be identified (Birnbaum et al., 2016; Greenfield, Williams, and Eiseman, 2006). Although program-specific logic models might be needed to articulate the reasoning underlying substantively different programs, FEMA could benefit from establishing an overarching equity standard (National Advisory Council, 2020) and aligning logic models to emphasize generalizable mechanisms and metrics of impact. *A systematic approach to identifying relevant indicators and metrics at the program level would help FEMA to consistently collect and evaluate existing*

data and reveal areas in which new or improved data are necessary.

Appropriate measures of baseline conditions have not been identified. One reason racial equity performance evaluations are inadequate is that baseline data against which progress can be measured are often missing and prospective; longitudinal designs are lacking (Parker et al., 2020). Sometimes, data collected for other purposes can suffice, but rigorous tracking of human disaster experiences (and an ability to identify causal relationships) requires planning and purpose. Moreover, knowing which baseline to measure is not always straightforward. For instance, postdisaster migration might worsen inequities in disaster-prone areas, regardless of FEMA recovery efforts (Howell and Elliott, 2019). *FEMA could benefit from a systematic approach to identifying where existing data provide a valid snapshot of baseline conditions and where new data would need to be collected.*

A comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster impacts has not been established. In recent years, we have seen a variety of resilience and vulnerability indices proposed, often based on quantifiable census metrics. Many of these indices draw on the same variables, but few have been empirically validated (Bakkensen et al., 2017) or been thoroughly vetted for theoretical or internal consistency (Spielman et al., 2020). Additionally, these indices are not necessarily appropriate indicators of real-world resource losses experienced to different extents by different groups. The policy relevance of an indicator is directly tied to identifying processes or outcomes that can be improved. Data approaches for measuring racial inequities need further development. Racial equity assessments are further complicated by the instability of resources in terms of their meaning and value across cultural and time contexts (Halbesleben et al., 2014). In short, indicators and metrics might not perform as expected. *To aid appropriate use and interpretation, FEMA would need empirical testing and qualitative guidance on whether metrics are suitable for wide application or relevant only to a specific region, scale, phase, or type of disaster.*

Criteria for systematic selection of indicators, metrics, and data are needed. Establishing these criteria through consensus with key stakeholders

would help build trust and transparency (Hsu and Sandford, 2007). Groups most affected by racial inequities—or by the strategies designed to address the inequities—could help to determine a range of possible criteria for alternative indicators and metrics (National Research Council, 2008). Policymakers with authority, responsibility, or capacity in specific functional areas may need help to prioritize relevant indicators and metrics even when they do not align with critical functions (Bakkensen et al., 2017). Similarly, selecting metrics with existing data might be appropriate in some but not all contexts; collecting new data might provide more-relevant assessments of equity in other contexts. *FEMA policymakers would benefit from close partnerships with diverse stakeholders in their efforts to understand and address nuanced and complex issues related to racial equity.*

CHAPTER 4

Conclusions and Recommendations

In this final chapter, we consolidate the FEMA-specific implications of these findings into a set of recommendations aimed at enhancing focus and efficiency in efforts to assess and address racial equity in PRR. In particular, the following are recommendations for enhancing FEMA’s efforts to assess racial equity in PRR programs:

1. **Develop a systematic and robust approach to racial equity performance assessments**, including identifying goals or standards, logic models, and best practices for selecting indicators and metrics in different contexts.
2. **Partner closely with communities** affected by racial inequities to better understand nuances and complexities and to identify relevant and acceptable indicators and metrics across recovery functions and disaster phases.

3. **Evaluate the reliability and validity of quantitative indicators and metrics** for capturing racial equity in processes and outcomes of real-world PRR programs.
4. **Identify qualitative approaches** for understanding the barriers, facilitators, and other factors that lead to racially inequitable experiences and outcomes with PRR programs and establish processes for collecting and analyzing these data.
5. **Develop strategies for closing data gaps**, including leveraging existing data (e.g., used in other federal programs) and identifying where new or improved data are needed.
6. **Develop communication and education strategies** to ensure that all stakeholders understand the appropriate use and interpretation of selected indicators and metrics.

A mapping of the primary findings supporting each recommendation is shown in Table 4.1. In all instances, more than one finding supports each recommendation. For example, the first recommendation to “develop a systematic and robust approach to racial equity performance assessments” is supported by ten of the 16 findings. The finding that “a comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster impacts has not been established” supports all recommendations.

With increased attention to racial inequities, FEMA can better target underserved populations that need more help than others in disaster PRR activities. Improving access to and support from PRR programs for those who need the most help is essential to fulfill FEMA’s commitment to a *Whole Community* approach that empowers racially diverse community members. Empirical research and analysis will be an important foundation for these efforts.

TABLE 4.1

Summary of Connections Between Findings and Recommendations

Findings	Recommendations					
	1. Develop a systematic and robust approach to racial equity performance assessments	2. Partner closely with communities	3. Evaluate the reliability and validity of quantitative indicators and metrics	4. Identify qualitative approaches	5. Develop strategies for closing data gaps	6. Develop communication and education strategies
Equity frameworks have been designed to address different topics at different geographic scales, but some indicators lack validation.	X		X			
Common categories of outcomes in the equity frameworks relate to health, environment, economics, energy/utilities, education, housing, and transportation/mobility.	X	X				X
Selection of equity indicators requires trade-offs.	X	X		X		X
Criteria for selecting metrics for indicators are not always specified.	X	X				X
Sociopolitical and economic differentials shape disaster experiences.		X		X		X
Models of vulnerability are necessary but are not sufficient for assessing racial equity.	X	X	X			X
Identifying meaningful indicators and metrics of racial equity requires frameworks that highlight the particular resource losses different social groups are facing.	X	X	X	X	X	
Indicators and metrics are often not specific to racial equity; additional disaggregated data and analytic techniques are needed to measure differences by race.			X		X	

Table 4.1—Continued

Findings	Recommendations					
	1. Develop a systematic and robust approach to racial equity performance assessments	2. Partner closely with communities	3. Evaluate the reliability and validity of quantitative indicators and metrics	4. Identify qualitative approaches	5. Develop strategies for closing data gaps	6. Develop communication and education strategies
Many indicators and metrics have not been used to assess racial equity in real-world contexts (disaster or nondisaster).			X			
Indicators and metrics used outside disaster PRR might offer insights for FEMA.			X		X	X
There is not a one-to-one correspondence between many indicators and RSFs.	X	X			X	X
Most metrics are quantitative, but qualitative information might be useful for process improvements in FEMA programs.		X		X		X
A theory of change for achieving racial equity in PRR programs is lacking.	X	X				X
Appropriate measures of baseline conditions have not been identified.		X			X	
A comprehensive set of reliable and valid indicators and metrics reflecting the uneven distribution of disaster impacts has not been established.	X	X	X	X	X	X
Criteria for systematic selection of indicators, metrics, and data are needed.	X	X				X

APPENDIX A

Glossary of Key Terms

ALM: A visual depiction of the chain of reasoning linking program inputs (e.g., funding) with expected outputs (e.g., strengthening social capital) and outcomes (e.g., improved disaster resilience) (Knowlton and Phillips, 2013).

Contextual equity: The extent to which preexisting political or socioeconomic conditions limit or enable people's capacity to engage in and benefit from resource distributions (McDermott, Mahanty, and Schreckenberg, 2013).

Distributive equity: The extent to which costs, risks, and benefits are distributed fairly across groups (McDermott, Mahanty, and Schreckenberg, 2013).

Equity: A complex construct reflecting the quality of being fair, including the interrelated dimensions of how benefits and costs are distributed, which stakeholders are recognized and included, and preexisting conditions that influence access to decision-making procedures and resources (McDermott, Mahanty, and Schreckenberg, 2013).

Impact: The long-term results likely to occur over time as program outcomes are achieved (Julian, 1997).

Indicator: Attributes of an object or a system from which conclusions on the state or quality of the phenomenon of interest can be inferred (Heink and Kowarik, 2010).

Metric: A system or standard of measurement (*Oxford English Dictionary*, 2020).

Outcome: The immediate results of program activities (Julian, 1997).

Procedural equity: The extent to which groups are recognized to ensure their inclusion and representation (McDermott, Mahanty, and Schreckenberg, 2013).

Racial equity: Fair access to livelihood, education, and resources such that race predicts the distribution of disaster aid to the extent that race is related to the need for aid (Lawrence et al., 2009).

APPENDIX B

Keywords for Literature Search

In Table B.1, we provide a full list of terms and keywords that we used in our literature review.

TABLE B.1
Example Keywords for Literature Search

Search	Keywords
Framework and definitions	"equity measur*"; "measur* equity" "defin*equity" "equity indicator"; "indicator for equity" "metric for equity"; "metric of equity" AND Conceptual Model Framework Index
Indicators searches (included these keywords in all subsearches listed below)	Metric*; Measure*; Indicator* Evaluat* Index; indices Quantify* Analysis; analyses
Subsearch 1 (indicators specific to FEMA program equity)	FEMA AND Preparedness "disaster mitigation"; "pre-disaster mitigation" "flood mitigation" "emergency preparedness" "regional catastrophic preparedness" "national mitigation investment strategy" "disaster relief" "individual assistance" "public assistance" "Individuals and Households Program" "Disaster Unemployment Assistance" "Disaster Legal Services" "Other Needs Assistance" "Transitional Sheltering Assistance" "small business administration loan"; "SBA loan" "National Flood Insurance Program" "disaster recovery" "community development block grants"; CDBG "HOME Investment Partnerships Program"; "HOME grants"; "HOME funds"
Subsearch 2 (indicators related to other government assistance programs)	"federal housing program" "Low-Income Housing Tax Credits" "rental assistance" "housing choice voucher"; "section 8" "Homeless Assistance Grants" "supplemental nutrition assistance program"; SNAP "Temporary Assistance for Needy Families"; TANF "National Institute of Standards and Technology"; NIST
Subsearch 3 (indicators related to PRR [not FEMA specific] and related to other domains)	resilien* "health equity"; "social equity" Inequalit*; unequal "social justice" "social disparit*"; "health disparit*" "social service" Preparedness "social vulnerability" disaster recovery "disaster relief"

APPENDIX C

Resources, Losses, and Example Indicators and Metrics

In Table C.1, we provide examples of the types of resources that could be measured, and indicators and metrics that could be used predisaster and postdisaster.

TABLE C.1
Examples of Resources, Losses, and Indicators and Metrics

Category	Resource	Example Loss	Example Indicators and Metrics Pre-Event	Example Indicators and Metrics Post-Event
Objects	Possessions	Damaged, need to sell	Being deficient in no more than 1 of the 6 actionable preparedness measures included in the Behavioral Risk Factor Surveillance System	Change in value of household assets
Objects	Infrastructure	Destroyed, contaminated drinking water systems	Percentage of customers whose water exceeds total daily limit of specific contaminants	Percentage of customers without access to water service
Objects	Natural environment	Contaminated land, air, ocean, fresh watersheds	Air quality monitoring	Average distance to nearest waste site
Objects	Homes	Flood damage to structure	Flood insurance; homes with flood proofing; percentage who own/rent	Deficit of affordable rental homes and low income levels
Objects	Schools	Contaminated classrooms, playgrounds; school closures	Proximity of schools to brownfields/toxic sites	Average concentration of contaminants; percentage of schools closed temporarily or permanently
Objects	Businesses	Stock damage from disrupted energy sector	Backup generator; flood insurance	Percentage of businesses permanently closed
Conditions	Job security	Unemployment	Unemployment rate	Percentage of jobs lost permanently; applications for disaster unemployment assistance
Conditions	Income	Reduced wages	Historical or current median household or per capita income	Percentage decrease in median household or per capita income
Conditions	Job type	High-risk category	Percentage dependent on natural resources	Percentage classified as essential worker
Conditions	Physical health	Injury, illness, death	Morbidity and mortality estimates	Morbidity and mortality estimates
Conditions	Mental health	Stress, anxiety, depression, posttraumatic stress disorder, substance misuse	Morbidity estimates	Morbidity estimates
Conditions	Food security	Reduced access, affordability of healthy food	Households identified as food insecure	Percentage participating in SNAP
Conditions	Relations with family, friends	Disrupted social support network	Neighborhood cohesion, neighborhood sentiment	Disruption to routine behaviors; loss of social capital

Table C.1—Continued

Category	Resource	Example Loss	Example Indicators and Metrics Pre-Event	Example Indicators and Metrics Post-Event
Conditions	Housing	Damage to roof, ventilation system, etc.	Disaster plan in place	Healthy Home Rating System (dry, clean, pest free, safe, contaminant free, well ventilated, well maintained, thermally controlled)
Conditions	Financial health	Credit card debt, mortgage delinquency	Percentage of households contributing to savings	Loan applications and denials; high-interest loans
Conditions	Health care	Quality of health care services	Access to health-care services	Provider meets all 14 national standards on culturally and linguistically appropriate services
Conditions	Decision making	Participation in decision-making process	Representativeness of population input for intervention design	Extent to which decision makers match the demographics of the community
Energies	Money	Outlay for survival needs (e.g., accommodation)	Access to \$500 emergency cash	Change in amount of savings
Energies	Time	Involved in compensation or litigation	Hours spent on prior compensation or litigation processes	Hours spent on new compensation or litigation processes
Energies	Investment without gain	Second job taken to compensate for loss	Hours at second job	Change in hours at second job
Energies	Transport	Access to public transit	Average distance to nearest transit stop	Frequency of transit service

APPENDIX D

Documents Included in the Review

Ablah, Elizabeth, Kurt Konda, and Crystal L. Kelley, “Factors Predicting Individual Emergency Preparedness: A Multi-State Analysis of 2006 BRFSS Data,” *Biosecurity and Bioterrorism*, Vol. 7, No. 3, 2009, pp. 317–330.

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About This Report

The U.S. Department of Homeland Security (DHS) has committed to reducing racial inequity through the *Whole Community* approach to disaster management and reducing negative consequences based on race, color, or national origin. To support assessment of the racial equity of DHS disaster programs, RAND Corporation researchers conducted an exploratory study to identify suitable equity indicators and metrics. This report briefly summarizes the study's results, drawing on a search of peer-reviewed and gray literature. The authors describe key themes related to conceptual frameworks, indicators and metrics, and knowledge gaps; they also provide recommendations for assessing racial equity in DHS programs. The findings will be of interest to policymakers in federal, state, and local agencies and to other organizations and individuals engaged in initiatives aimed at enhancing racial equity.

About the Homeland Security Research Division

This research was conducted using internal funding generated from operations of the RAND Homeland Security Research Division (HSRD) and within the HSRD Recovery Cost Analysis Program. HSRD conducts research and analysis for the U.S. homeland security enterprise and serves as the platform by which RAND communicates relevant research from across its units with the broader homeland security enterprise. For more information on the Recovery Cost Analysis Program, see www.rand.org/hsrd/hsoac or contact Jessie Riposo, Program Director of the Recovery and Cost Analysis Program, by email at riposo@rand.org or (703) 413-1100 ext. 5162.

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