Analysis Plan

Project Name: Descriptive study of visitation trends at FEMA Disaster Recovery Centers

Project Code: 2412

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Project description

Disaster survivors, who may be experiencing trauma and managing acute needs for themselves or their family, are often faced with information overload (as well as potentially information gaps) related to assistance programs and how to access them. Survivors can apply for various forms of assistance from the Federal Emergency Management Agency (FEMA) and Small Business Administration (SBA) in the aftermath of a disaster. Disaster Recovery Centers (DRCs) are set up in the aftermath of certain natural disasters to support disaster survivors as they navigate different supports they can apply for and receive.

In collaboration with FEMA and the Office of Management and Budget (OMB), OES is conducting a descriptive study to examine disaster survivor visits to DRCs. Specifically, we will examine the volume, timing and purpose of disaster survivors' visits to DRCs that were open between 2022-2023. To date, FEMA has not examined DRC data, and insights from this study may be useful in learning about why and when disaster survivors visit DRCs.

Research questions

This descriptive study seeks to answer the following research questions (RQs):

- **RQ1:** What does the life cycle of a DRC look like during a disaster response?
    - a. How long on average does it take to stand up DRCs after a disaster declaration has taken place?[1]
    - b. How long on average are DRCs typically operational?
    - c. Does DRC stand-up time vary based on different contextual factors (e.g., disaster type, disaster severity, geographical location, population)?
    - d. How many DRCs are stood up for different disaster types? Does the number of DRCs stood up for a given disaster relate to different contextual factors (e.g., disaster severity, geographical location)?
- **RQ2:** What does DRC visitation look like during a disaster response?
    - a. When during a disaster response are people most likely to visit DRCs?

[1] FEMA cannot act on a disaster incident until it has been formally declared a disaster. [Source]

    - b. When during a disaster response are repeat visits to DRCs most prevalent?
    - c. When during a disaster response are people most likely to visit DRCs by different disaster types?
- **RQ3:** What do the different services/activities that DRC visitors seek help for look like during a disaster response?
    - a. What are the most common activities that DRC visitors seek help for?
    - b. How does the most common activity change over the course of disaster responses?
    - c. What types of activities are most common for different disaster types (e.g., flooding, hurricane/tropical storms), and when?

Data and data structure

This section describes variables that will be analyzed, as well as changes that will be made to the raw data with respect to data structure and variables.

Data source(s):

To carry out this descriptive study, we intend on using one primary data source and two secondary data sources, described further below.

Primary data source: DRC daily reports

The primary data source to be analyzed for this project is DRC daily report data (‘*DRC data*’), which will be transferred by FEMA to OES (not available publicly). The DRC data will cover the time period 2022-2023,[2] and data is provided in the format of DRC-day level (i.e., each row of data corresponds to a particular DRC on a given day). The full list of data elements contained in the DRC data is in Appendix A.

Secondary data source: OpenFEMA data

The secondary data source to be analyzed is OpenFEMA data, which is available publicly on the OpenFEMA platform.[3] The OpenFEMA datasets we expect to include in our analysis are summarized below:

- ‘Disaster Declarations Summaries - v2’ dataset (‘*Disaster Info data*’), contained within the ‘Disaster Info’ section on OpenFEMA.[4] These data are organized at the county-level, i.e.,

[2] This includes data for DRCs that are operational past 2023 (i.e., if a DRC began operations on or before December 31, 2023 but remained operational past December 31, 2023, we will receive full data for that DRC that includes operational days in 2024).
[3] OpenFEMA is the public’s resource for FEMA program data: https://www.fema.gov/about/reports-and-data/openfema (accessed 8/16/2024).
[4] ‘OpenFEMA Dataset: Disaster Declarations Summaries - v2’ is located on OpenFEMA: https://www.fema.gov/openfema-data-page/disaster-declarations-summaries-v2 (accessed 8/16/2024).

there may be more than one observation for each disaster declared during the study period. This dataset contains indicators of disaster characteristics (data elements listed in Appendix B). These data will be used to associate disaster dates and characteristics with the DRCs included in the study. We expect to match this data to DRC data using the 'disaster unique ID' variable (called 'disaster number' in the OpenFEMA dataset), contained within both datasets.

- 'Registration Intake and Individuals Household Program (RI-IHP) - v2' (*'Registration data'*), contained within the 'Individual Assistance' section on OpenFEMA.[5] Similar to the *'Disaster Info data'*, data are organized at the disaster-county-zipcode level. This dataset contains counts of IHP registrations aggregated by geographic areas for declared disasters (data elements listed in Appendix C). The purpose of using this data in our analysis is to explore the scale of disaster response or size of survivor population in areas served by DRCs, though it is important to note that the individual assistance program is not activated for all disasters.[6] Again, we expect to be able to match this data to DRC data using the 'disaster unique ID' variable.

Secondary data source: USDA Rural-Urban Classification Data

The third data source we will analyze is the USDA Economic Research Service '2023 Rural-Urban Continuum Codes' dataset (*'Rural-Urban Data'*), in order to determine the urban/rural classification of DRCs.[7] The list of data elements we will include from this dataset is in Appendix D. The data will be matched to the DRC and OpenFEMA dataset using the 'FIPS' variable contained within the 'Rural-Urban Data', and the 'fipsStateCode' and 'placecode' variables contained within the 'Disaster Info' dataset.[8]

Outcomes to be analyzed:

Outcomes are summarized below and provided at the DRC-day level.

Table 1. Outcomes to be analyzed

Variables	**Description**
Number of visitors to DRCs	We will summarize, for each DRC, and DRCs overall: • Total number of visitors to DRCs • Total number of visitors to a DRC, by disaster type

[5] 'OpenFEMA Dataset: Registration Intake and Individuals Household Program (RI-IHP) - v2' is located on OpenFEMA: https://www.fema.gov/openfema-data-page/registration-intake-and-individuals-household-program-ri-ihp-v2 (accessed 8/16/2024).

[6] FEMA's determination of which assistance programs are authorized is based on the types of assistance specified in the governor's request and on the needs identified during joint Preliminary Damage Assessment (PDA) and any subsequent PDAs. [Source]

[7] https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/ (accessed 8/16/2024).

[8] The two digits in 'fipsStateCode' combined with the last three digits in 'placeCode' makes up the 'FIPS' code.

	• Total number of visitors to a DRC, by visitor type (first time vs. repeat visitors) • Total number of visitors to DRCs, at different time points throughout a DRC life cycle
Number of visitors to DRCs for different activity/service purposes	We will summarize, for each DRC, and DRCs overall: • Total number of visitors for different activities/services, by disaster type • Total number of visitors for different activities/services, at different time points throughout a DRC life cycle

We will also summarize the following outcome at the DRC level:

Number of DRCs	• Average (and range) of DRCs stood up in aftermath of all disaster declarations • Average (and range) of DRCs stood up, by different disaster types (e.g., hurricane) • Average (and range) of DRCs stood up, by geographical locations (urban vs. rural, FEMA region)
DRC operational time	• Number of days each DRC was operational • Number of days each DRC was operational, by disaster type • Number of days between disaster declaration date and start date of DRC being operational

Imported variables:

We will import variables from the 'Disaster Info' datasets (sample list of data elements in Appendix B), located on the OpenFEMA platform, in order to answer questions related to disaster type and geographical location, including RQ1(b), RQ2(c), and RQ3(c).

We will import variables from the 'Registration intake' dataset (list of data elements in Appendix C), also located on the OpenFEMA platforms.

We will also import variables from the USDA Economic Research Service '2023 Rural-Urban Continuum Codes' ('Rural-Urban Data') dataset (data elements in Appendix D).

We will import codes for FEMA regions based on the state or territory where each DRC is located using the list of regions published on FEMA's website.[9]

Transformations of variables:

[9] FEMA region definitions can be found at: https://www.fema.gov/about/organization/regions (accessed 8/16/2024).

A description of the variables we expect to create using the DRC data and Disaster Info datasets are included in Table 2 below.

Table 2. Transformation of variables

Transformed variable name	Description	How calculated	Format
'Post_declaration_day'	Time elapsed since the disaster incident was declared (count)	Calculated as 'Visit Date' (contained in DRC data) minus 'Declaration Date' (contained in Disaster Info data)	Integer (count of number of days)
'DRC_day'	Time elapsed since the start of the DRC being open (count)	Calculated as 'Visit Date' (contained in DRC data) minus 'DRC open date' (contained in Disaster Info data)	Integer (count of number of days)
'Post_disaster_day'	Time elapsed since the disaster incident ended (count)	Calculated as 'Visit Date' (contained in DRC data) minus 'Incident End Date' (contained in Disaster Info data)	Integer (count of number of days)
'FIPS_code'	FIPS code for matching to 'Rural-Urban Data'	Calculated as the two digits contained within the 'fipsStateCode' variable, plus the three last digits of the 'placeCode' variable (both variables contained within the Disaster Info data)	5-digit string

We may also create a new variable called 'DRC_duration' that is a categorical indicator providing DRC duration value for each DRC (e.g., short duration vs. long duration). This will be created if we see that there is wide variation or a bi-modal distribution in 'DRC_day'. If creation of this variable is feasible, we may report some of the descriptive statistics below relating to 'DRC_day', grouped by 'DRC_duration'.

Transformations of data structure:

We expect DRC data to be provided in a DRC-day format, whereby each row of data corresponds to one day at a DRC, with columns providing the data elements.

In addition to this day-level dataset, we will transform the raw data into a second dataset called 'DRC overall visitors dataset'. This will transform the DRC data into a dataset where each row corresponds to a DRC (cumulative; not at the day-level), and provides aggregate counts for that DRC across each of the variables.

Treatment of missing data:

We do not expect to have high levels of missingness for the DRC data. Where data is missing (e.g., for a particular DRC on a particular day), we will indicate this in the findings. Where there are no

visitors for a particular service/activity type at a DRC, we will not report descriptive statistics for that particular service/activity type.[10]

Data is recorded manually by DRC staff, which is then sent through to FEMA. Therefore, we acknowledge that there may be inaccuracies (i.e., human error) in how various visitation counts are recorded on a given day at DRCs, and thus, potential inaccuracies in the DRC data.

Descriptive statistics, tables, and graphs

Outcomes will be summarized by calculating the mean and median values and comparing the frequencies of each outcome variable for each DRC, and DRCs overall, and DRCs associated with different disaster types. Summarized indicators will be presented in descriptive charts (i.e. bar charts, histograms or pie charts), or in tabular format as appropriate. Table 3 lists the planned descriptive statistics to be conducted for each of the RQs.

Table 3. Descriptive statistics

Research question	Descriptive statistics to be conducted
RQ1(a) How long on average does it take to stand up DRCs after a disaster declaration has taken place?	- Mean and median number of days between disaster incident date and disaster declaration date - Mean and median number of days between disaster declaration date and DRC open date
RQ1(b) How long on average are DRCs typically operational?	- Overall mean and median number of days DRCs are operational - Interquartile range of number of days DRCs are operational
RQ1(c) Does DRC stand-up time vary based on different contextual factors (e.g., disaster type, disaster severity, geographical location, population)?	- Mean and median number of days DRCs are operational, by different disaster types (e.g., hurricane, wildfire, tornado) - Mean number of days DRCs are operational, by disaster incident length - Mean number of days DRCs are operational, by geographical location (rural vs. urban, FEMA region)
RQ1(d) How many DRCs are stood up for different disaster types? Does the number of DRCs stood up for a given disaster relate to different contextual factors (e.g., disaster severity, geographical location)?	- Number of DRCs, by different disaster types (e.g., hurricane, wildfire, tornado) - Number of DRCs, by different disaster severity (e.g., number of registrations made) - Number of DRCs, by geographical location (rural vs. urban, FEMA region)

[10] Not all service/activity types are offered at each DRC.

RQ2(a) When during a disaster response are people most likely to visit DRCs?	- Mean of 'DRC_day' when the maximum number of visits occurs, for each DRC[11]
RQ2(b) When during a disaster response are repeat visits to DRCs most prevalent?	- Mean daily proportion of repeat visitors - Mean of the DRC maximum proportion of repeat visitors
RQ2(c) When during a disaster response are people most likely to visit DRCs by different disaster types?	- Mean 'DRC_day' when the maximum number of visits occurs, by disaster type - Mean 'DRC_day' when the maximum proportion of repeat visitors occurs, by disaster type
RQ3(a) What are the most common services/activities that DRC visitors seek help for?	- Overall frequency of visitor counts to DRCs, by service/activity type
RQ3(b) How does the most common activity change over the course of disaster responses?	- Mean DRC days where each service/activity is most common (e.g., "Home Repair was most commonly activity for 50% of DRC days"), across DRCs and at individual DRC level - Total number of DRCs that had different services/activities as its most common visit purpose (e.g., "20 DRCs had 'Housing Assistance' as its primary service/activity type)
RQ3(c) What types of activities are most common for different disaster types (e.g., flooding, hurricane/tropical storms), and when are they most frequent?	- Mean DRC days where each service/activity is most common, by disaster type - Mean daily proportion of visitors for each service/activity, by disaster type - Overall frequency of visitor counts to DRCs, broken down by service/activity type, by different disaster types, over the average life cycle of DRCs

We also plan to conduct the following statistical tests to examine differences between DRCs based on contextual factors (e.g., disaster types and geographic locations):

- RQ1(d): To test whether the number of DRCs is significantly different based on different contextual factors, we will explore mean differences in the number of DRCs using a one-way analysis of variance (ANOVA) across the following contextual factors:
    - Disaster type
    - Rural vs. urban setting
    - FEMA region
- RQ2(c): To test whether the timing of (1) maximum number of visits and (2) maximum number of repeat visitors varies based on disaster type, we will conduct a one-way ANOVA

[11] In the event that a DRC has multiple days with the same maximum number of visits, we will include all of these days in the mean calculation.

examining mean differences across these two outcomes using disaster type as an explanatory factor.

Limitations:

DRC data only includes counts of visitors and does not index individual visitors. This prevents us from summarizing how many individual visitors account for repeat visits, or whether repeat visitors tend to visit for the same or different services/activities. This also prevents us from comparing the reasons for visits among individuals who are one-time vs. repeat visitors.

DRC data does not indicate whether visitors had their issue resolved or if they received the help they were seeking at a DRC. We cannot say whether patterns of more or fewer repeat visitors is indicative of visitors being more or less likely to to receive the help they need or is associated with a better or worse customer experience.

While feasibility of matching DRC data to OpenFEMA 'Disaster Info data seems high, we will not be certain of matching until data analysis is started. If we are unable to match DRC data to the OpenFEMA datasets, we will be unable to answer certain sub research questions related to disaster characteristics (i.e., RQ1(a), part of RQ1(c), part of RQ1(d), RQ2(c), and RQ3(c)).

Appendices

Appendix A. List of DRC data elements

Each of the rows in the dataset correspond to a different DRC day (i.e., one row indicating the visit counts and service and activity type for a particular DRC on a particular day).

Data element	**Description**	**Variable type/format (example)**
'Disaster unique ID'	Unique ID used by FEMA to identify the disaster	4 digit / numerical (e.g., 4635)
'DRC Open Date'	When the DRC was open/first operational	Date (e.g., 04/04/22)
'DRC Closed Date'	When the DRC was closed/last day of being operational	Date (e.g., 05/28/22)
'DRC Planned Closed Date'	Planned date for DRC closure	Date (e.g., 02/23/22)
'DRC Type'	DRC types, including the following: 1. DRC – Standard DRC 2. MDRC – Mobile DRC 3. VDRC – Virtual DRC 4. DDC – Document Dropoff Center 5. CRC – Community Recovery Center 6. CVC – Community Vaccination Center	Text / categorical (e.g., DRC)
'DRC #'	Unique ID used to uniquely identify DRC	Numerical (e.g., 11)
'DRC Sequence'	Populated when 'DRC Type' is 'MDRC' or 'CVC'	1 letter (e.g., A)
'DRC Name'	Name of DRC	Text (e.g., Montgomery County Library)
'DRC City'	City location of DRC	Text (e.g., Montgomery)
'DRC County/Parish/Borough'	County/parish/borough location of DRC	Text (e.g., Montgomery)
'DRC Zip Code'	Zip code of DRC	Numerical (e.g., 01234)
'Visit Date'	DRC date for which the data is being provided	Date (e.g., 01/19/22)
'First Time Visitor Count'	Numerical indicator of count of visitors who are first time visitors for date given in 'Visit Date'	Numerical (e.g., 22)

'Returning Visitor Count'	Numerical indicator of count of visitors who are returning visitors for date given in 'Visit Date'	Numerical (e.g., 10)
'Service/Activity Name'	Purpose of visit	Text / categorical (e.g., Home Repair)
'Service/Activity Visitor Counts'	Numerical indicator of count of visitors by different service/activity types	Numerical (e.g., 6)

Appendix B. List of Open FEMA Disaster Info 'Disaster Declarations Summaries - v2' data elements

Data element	**Description**	**Variable type/format (example)**
'femaDeclarationString'	Agency standard method for uniquely identifying Stafford Act declarations - Concatenation of declaration type, disaster number and state code.	String (e.g., FM-5530-NV)
'disasterNumber'	Sequentially assigned number used to designate an event or incident declared as a disaster. For more information on the disaster process, please visit https://www.fema.gov/disasters/how-declared	Numerical / 4 digits (e.g., 5530)
'state'	The name or phrase describing the U.S. state, district, or territory	Text / 2 letters (e.g., NV)
'Declaration Type'	Two character code that defines if this is a major disaster, fire management, or emergency declaration. For more information on the disaster process, please visit https://www.fema.gov/disasters/how-declared	Text / 2 letters (e.g., FM)
'declarationDate'	Date the disaster was declared	Date / time (e.g., 2024-08-12T00:00:00.000Z)
'fyDeclared'	Fiscal year in which the disaster was declared	Numerical / year (e.g., 2023)
'incidentType'	Type of incident such as fire or flood. For more information on incident types, please visit https://www.fema.gov/disasters/how-declared.	Text / categorical (e.g., Fire, Flood)
'declarationTitle'	Title for the disaster	Text (e.g., BIG L FIRE)
'ihProgramDeclared'	Denotes whether the Individuals and Households program was declared for this disaster. For more information on the program, please visit https://www.fema.gov/assistance/individual/program. To determine which FEMA events have been	Numerical / binary (0 or 1)

	authorized to receive Individual Assistance, use both ihProgramDeclared and iaProgramDeclared. For more information see https://www.fema.gov/about/openfema/faq	
'iaProgramDeclared'	Denotes whether the Individual Assistance program was declared for this disaster. For more information on the program, please visit https://www.fema.gov/assistance/individual/program. To determine which FEMA events have been authorized to receive Individual Assistance, use both ihProgramDeclared and iaProgramDeclared. For more information see https://www.fema.gov/about/openfema/faq	Numerical / binary (0 or 1)
'paProgramDeclared'	Denotes whether the Public Assistance program was declared for this disaster. For more information on the program, please visit https://www.fema.gov/assistance/public/program-overview	Numerical / binary (0 or 1)
'hmProgramDeclared'	Denotes whether the Hazard Mitigation program was declared for this disaster. For more information on the program, please visit https://www.fema.gov/grants/mitigation/hazard-mitigation	Numerical / binary (0 or 1)
'incidentBeginDate'	Date the incident itself began	Date / time (e.g., 2024-08-11T00:00:00.000Z)
'incidentEndDate'	Date the incident itself ended	Date / time (e.g., 2024-08-11T00:00:00.000Z)
'disasterCloseoutDate'	Date all financial transactions for all programs are completed	Date / time (e.g., 2024-08-11T00:00:00.000Z)
'fipsStateCode'	FIPS two-digit numeric code used to identify the United States, the District of Columbia, US territories, outlying areas of the US and freely associated states	Numerical (e.g., 53)
'fipsCountyCode'	FIPS three-digit numeric code used to identify counties and county equivalents in the United States, the District of Columbia, US territories, outlying areas of the US and freely associated states. Please note that Indian Reservations are not counties and thus will not have a FIPS county code, please utilize the placeCode field instead. If the designation is made for the entire state, this value	Numerical (e.g., 31)

	will be 000 as multiple (all) counties cannot be entered.	
‘placeCode’	A unique code system FEMA uses internally to recognize locations, that takes the numbers '99' + the 3-digit county FIPS code. There are some declared locations that don’t have recognized FIPS county codes in which case a unique identifier is assigned.	Numerical / 5 digits (e.g., 99031)
‘designatedArea’	The name or phrase describing the geographic area that was included in the declaration.	Text (e.g., Washington (County))
‘declarationRequest Number’	Number assigned to the declaration request.	Numerical / 5 digits (e.g., 24123)
‘lastIAFilingDate’	Last date when Individual Assistance (IA) requests can be filed. Only applies if IA has been approved for the disaster.	Date / time (e.g., 2011-11-30T00:00:00.000 Z)
‘incidentId’	Unique identifier for an incident. Incidents are events that may or may not become declared disasters.	Numerical / string (e.g., 2024073101)
‘region’	Number (1-10) used to represent the FEMA region where the disaster occurred.	Numerical (e.g., 10)
‘designatedIncident Types’	A comma-separated list of incident types designated for the disaster. The primary incident type is described in the incidentType field. Codes are: 0: Not applicable; 1: Explosion; 2: Straight-Line Winds; 3: Tidal Wave; 4: Tropical Storm; 5: Winter Storm; 8: Tropical Depression; A: Tsunami; B: Biological; C: Coastal Storm; D: Drought; E: Earthquake; F: Flood; G: Freezing; H: Hurricane; I: Terrorist; J: Typhoon; K: Dam/Levee Break; L: Chemical; M: Mud/Landslide; N: Nuclear; O: Severe Ice Storm; P: Fishing Losses; Q: Crop Losses; R: Fire; S: Snowstorm; T: Tornado; U: Civil Unrest; V: Volcanic Eruption; W: Severe Storm; X: Toxic Substances; Y: Human Cause; Z: Other	String / one letter (e.g., R)

Appendix C. List of ‘Registration data’ data elements

Data element	Description

'disasterNumber'	Sequentially assigned number used to designate an event or incident declared as a disaster. For more information on the disaster process, https://www.fema.gov/disasters/how-declared
'state'	Two-letter state abbreviation for disaster state
'county'	The name of a U.S. county, parish, borough, independent city or other political subdivision of a U.S. state or territory
'city'	City
'zipCode'	Zip code
'totalValidRegistrations'	Total number of valid registrations
'validCallCenterRegistrations'	Total number of valid registrations submitted through the call center
'validWebRegistrations'	Total number of valid registrations submitted through the website
'validMobileRegistrations'	Total number of valid registrations submitted through a mobile device
'ihpReferrals'	Cumulative number of applicants referred to the IHP Program
'ihpEligible'	Total number of valid registrations eligible for IHP assistance
'ihpAmount'	Total IHP Amount awarded in dollars for Housing Assistance (HA) and Other Needs Assistance (ONA) among eligible applicants for designated incident
'haReferrals'	Total number of applications referred to the Housing Assistance (HA) Program

‘haEligible’	Total number of valid registrations eligible for Housing Assistance (HA)
‘haAmount’	Total amount awarded for Housing Assistance (HA) in dollars from the Individual and Households Program (IHP)
‘onaReferrals’	Total number of applications referred to the Other Needs Assistance (ONA) Program
‘onaEligible’	Total number of valid registrations eligible for Other Needs Assistance (ONA)
‘onaAmount’	Total amount awarded in dollars for Other Needs Assistance (ONA) from the Individual and Households Program (IHP)
‘id’	Unique ID assigned to the record

Appendix D. List of ‘Rural-Urban Data’ data elements

Data element	**Description**
‘FIPS’	State+county Federal Information Processing System (FIPS) code
‘State’	State or territory abbreviation
‘County_Name’	County or county-equivalent name
‘Population_2020’	Total population 2020, at the county level (From the 2020 Census Demographic and Housing Characteristics File)
‘RUCC_2023’	Rural-Urban Continuum Code, 2023
‘Description’	Description of code