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**Demonstration Use Case on Skilled Nursing Facilities – An Overview**

## Introduction

We propose to build and enhance the Curated Data Enterprise (CDE) use case by use case. We define a Use Case as a research method to identify, clarify, and organize requirements to create a system or overall system component, such as the CDE. For example, a Use Case can help define a process or processes to discover, acquire, curate, and store data; develop a hierarchy for data sources on the same topic; benchmark or validate synthetic data; and develop statistical methods for estimating hard-to-quantify metrics – all of which can help guide the development of the CDE platform. The Appendix B presents a high-level overview of a pilot demonstration project to learn about some of the CDE capabilities that will need to be developed and Appendix C an example of how data, code, and document can be curated in a GitHub environment.

The CDE is a continuously evolving infrastructure that will empower and enable Bureau scientists and their data users to develop new measures of people, places, and the economy focused on purpose and use. The CDE will make it possible to exploit disparate data sources, from sample and population surveys, official administrative data, and synthetic data, which can provide more robust, timely, and comprehensive measures when combined.

When fully developed, the vision is for the Census Bureau to shift how they produce official statistics from a focus on single surveys to an integrated CDE approach. Building on an *art of the possible* Use Case, (Shipp, Salvo, and Zhang, 2022), the University of Virginia’s Biocomplexity Institute (BI) conducted a pilot demonstration project to create a baseline picture of Skilled Nursing Facilities (SNF) and then added data about the risks of extreme climate events, explicitly flooding, to assess their preparedness and compute the probability that workers could make it to the facility during a flood event. The team comprised a statistician, economist, policy researcher, and three computer scientists from the University of Virginia’s Biocomplexity Institute. This work has been vetted with the proposal team here and with key stakeholders from the Census Bureau’s enterprise initiatives.

The CDE framework guided the work (See Exhibit 1). This framework presents a high-level set of principles and a process for stating and documenting goals and criteria at each step.

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**Exhibit 1.** Curate Data Enterprise (Keller et al., 2020)

The goal for the CDE platform is to facilitate the integration of multiple types of data, including new types, e.g., networks, new sources of collected data, e.g., administrative data, and new sources of generated data, e.g., synthetic data. The CDE platform will fundamentally combine computational and statistical methods, supported by a high-performance computing infrastructure. The CDE is purpose-driven in the sense that each new Use Case is supported by the infrastructure to select data and compose a computational and statistical workflow that leads to new insights and data products. These new data products are in turn, integrated into the CDE, enhancing the environment and enabling future computation and analyses of new questions of increasing sophistication and complexity.

The plan for this Use Case (and others to follow) is to illuminate the capabilities required of a CDE and support its development. We walk through the framework as it unfolded for this project. We completed the steps through from Purpose & Use to Communication & Dissemination.

## Purpose and Use

A Skilled Nursing Facility is a nursing facility with the staff and equipment to provide skilled nursing care, skilled rehabilitation services, and other related health services (CMS Glossary). The impact of crisis events, such as emergency preparedness response to the COVID-19 pandemic or severe climate-related events, have highlighted the need for an integrated view of SNFs (Skilled Nursing Facilities). The White House (2022) initiative highlights the importance of these issues in their fact sheet “[Protecting Seniors by Improving Safety and Quality of Care in the Nation’s Nursing Homes.](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/literature/quality/FACT%20SHEET_%20Protecting%20Seniors%20by%20Improving%20Safety%20and%20Quality%20of%20Care%20in%20the%20Nation%E2%80%99s%20Nursing%20Homes%20_%20The%20White%20House.pdf)” This pilot study focuses on emergency preparedness and nurse staffing two of the issues raised in in the White House initiative:

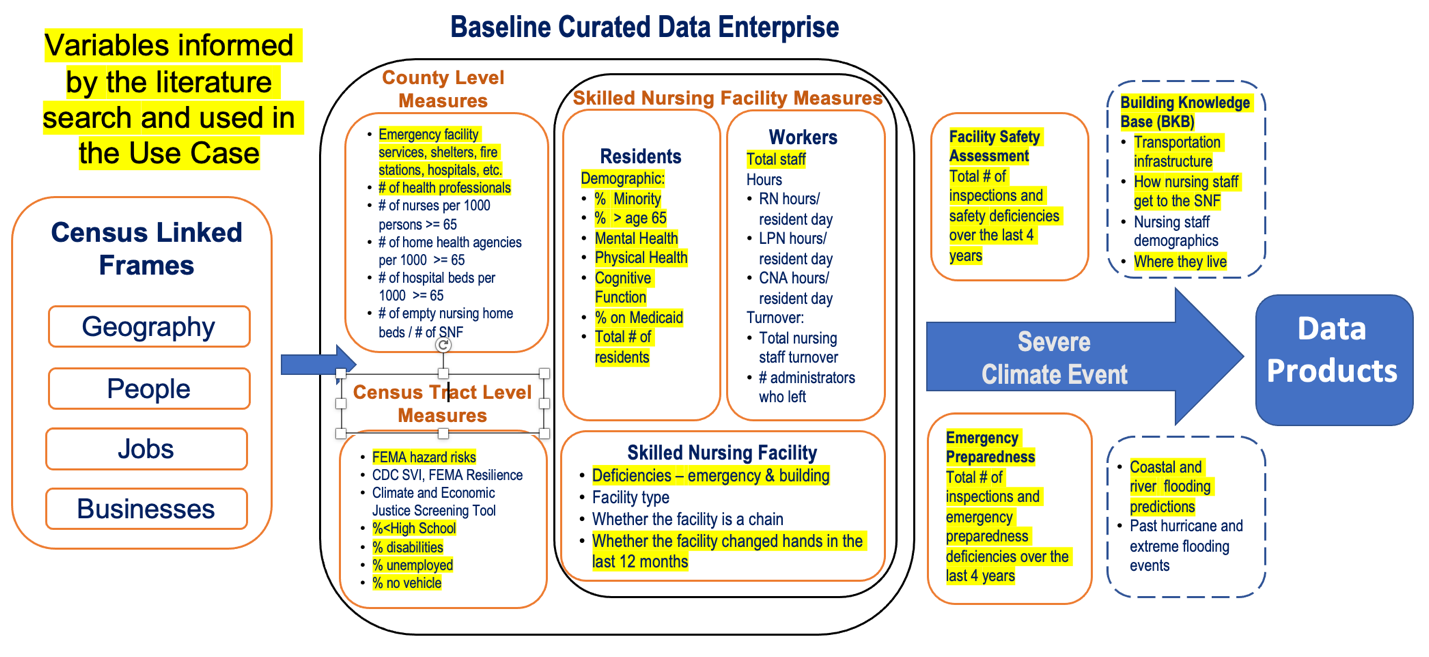
* RQ1: Can Skilled Nursing Facilities (SNF) workers get to work during an extreme flood event?
* RQ2: Are SNFs prepared for a flood emergency?
* RQ3: Can communities support SNFs during an emergency?

For this Use Case we have limited the population of SNFs to those in Virginia.

## Data Discovery

We first created a conceptual data map aligned with the three research questions listed above and informed by a SNF literature review to help identify our data needs and availability (See Exhibit 2). This map was used to guide the data discovery process and serve as a template to organize the variables into topic areas. Those variables that were selected to address the research questions went through our inventory, screening, and acquisition process and are highlighted in the data map and listed by data source below.

* Skilled Nursing Facilities (SNF) from the Centers for Medicare & Medicaid Services (CMS); Long Term Care Focus (LTCFocus) Public Use Data sponsored by the National Institute on Aging
* Community Resilience, Demographics, and Assets by geography (County, City, Census tract) from American Community Survey; Health Resources and Services Administration / Area Resource Files; Homeland Security / Homeland Infrastructure Foundation Level Data
* Transportation routes NSSAC synthetic population ver. 2.0 for Virginia, US (DP-US-VA-2.0); NSSAC Building Database for the US (BDB-1.0); [HERE](https://www.adci.com/here/here-map-data) Map Data (2021/Q1); FEMA (Federal Emergency Management Agency) Riverine and Coastal Flooding Maps



**Exhibit 2.** Conceptual Data Map Aligned to Purpose and Use

## Data Ingestion and Governance

All the public data, meta data, code, data products, data processes, and relevant literature on SNF resilience and regulations are stored in a GitHub repository. The structure of the repository can be viewed at [CENSUS SNF Use Case GitHub Repo Structure](https://github.com/uva-bi-sdad/census_cde_demo_2) and a detailed Table of Content with links to the GitHub files is provided in Appendix C. What is not in the GitHub repo is the data used to construct the routes nursing staff used to travel to the SNF. In this case, proprietary synthetic population data and private sector digitized mapping data were used to construct the routes and public data from FEMA to estimate the risk of flooding on a particular route. Proprietary and private data were used for this Use Case for expediency but these estimates could have been constructed from public use data as described in the [Commute Vulnerability Synopsis](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/commute_vulnerability/algorithm.md) file on the repo.

## Data Wrangling

Of the 288 SNFs in Virginia, 283 had sufficient staffing data to be included in this Use Case. We hypothesize the missing staffing data are linked to the severe staffing shortages in Virginia during COVID. Virginia nursing homes lost more than [9,500 facility employees](https://www.virginiamercury.com/2021/11/10/virginia-nursing-homes-have-lost-more-than-9500-employees-since-the-start-of-the-pandemic/) during the pandemic. Staffing data are submitted quarterly to CMS and are due 45 days after the end of each reporting period and data submitted outside the deadline are not accepted.

The two predominant issues with data wrangling for this Use Case included reconciling data sources that contain data on the same topic and data linkage. For example, we reviewed three hospital data sources:

1. [Homeland Security Infrastructure Foundation-Level Data](https://hifld-geoplatform.opendata.arcgis.com/);
2. [Health and Human Services Covid-19 Reported Patient Impact and Hospital Capacity by City](https://healthdata.gov/dataset/COVID-19-Reported-Patient-Impact-and-Hospital-Capa/6xf2-c3ie); and
3. [Virginia Hospital & Healthcare Association Map of VHHA Hospital and Health System Members](https://www.vhha.com/about/virginia-hospitals/).

Inconsistences and omissions observed between the three data sources included:

* non-standard names for hospitals;
* inconsistent reporting of hospital systems/conglomerates;
* non-standard classification systems for types of hospitals;
* absence of data dictionaries that would allow a user to compare variables and inconsistencies across datasets;
* inconsistent availability of hospital IDs (such as Medicare Provider Number); and
* inconsistent geographic information including address, latitude, and longitude.

Because of the short term around time for this use study we did not attempt to reconcile these inconsistencies but rather made the decision to use a single source for public health and emergency services data the, Homeland Security Infrastructure Foundation-Level Data, since they provided the most current data (January 2022).

Not only are there inconsistencies between data sources on the same topic, there are some current topics like, climate change and community resilience, that spawn an array of metrics from numerous departments and agencies within the federal government, state governments, and private and non-profit sectors. It is a monumental task to review the technology reports (if available) in order to understand the differences in the risk projections for the various climate events that are most relevant (fitness-for-use) for a particular Use Case. For this Use Case we made the decision to use the National Risk Index for riverine and coastal floods from FEMA since it provides the most detailed technical report, *National Risk Index Technical Document* (November 2021) and clearly states the assumptions and limitations of the data and how the risk estimates are derived.

Although the National Risk Index also provides estimates of social vulnerability and community resilience (from University of South Carolina’s Hazards & Vulnerability Institute, Cutter et al., 2019) they are at the county level and the latest estimates are constructed using 2015 data. We chose to estimate our own metric based on guidance from the Department of Homeland Security’s technical document, [*Community Resilience Indicator Analysis*: *County-Level Analysis of Commonly Used Indicators from Peer-Reviewed Research*](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/literature/resilience/fema_community-resilience-indicator-analysis_2020.pdf) (2020) using current data from the American Community Survey (2020) and Homeland Security Infrastructure Foundation-Level Data (2022). Resilience metrics are constructed from community characteristics that researchers have theorized may make individuals and households less resilient to natural hazards. These estimates are provided to aid emergency managers in planning and outreach by identifying vulnerable households. We benchmarked our metric against the Census Bureau’s *2019 Community Resilience Estimates* (August, 10, 2021).

These same inconsistencies made it difficult to link data sources on similar topics. For example, we used public health and emergency services data sources from the Homeland Security Infrastructure Foundation-Level Data that included hospitals, Red Cross Chapter Facilities, National Shelter System Facilities, emergency medical service stations, fire stations, and urgent care facilities, to calculate a metric for potential community support. The goal was to place each of the hospitals, stations, and facilities in a Virginia county or city but the data sources use different variables to identify location (lat and long, address, zipcode, FIP code, and county/city name). It was necessary to first canonicalize the county and city names (when available), which meant aligning upper and lower cases, removing unnecessary characters, and making the distinction between county and city. Virginia is divided into 95 counties and 38 independent cities that are considered county-equivalents for census purposes, in some cases there is a county and a city with the same name (e.g., Richmond County and Richmond City). In cases where the data source only had a zip or FIP code a HUD crosswalk was used to link the two codes; in other cases a crosswalk that linked non-independent cities and towns to counties was needed; and in others a crosswalk that linked FIP codes to counties and independent cities.

### RQ1: Can SNF workers make it to work during a flooding event?

The home location of nursing staff employees were identified using NSSAC’s synthetic population and building database and their potential routes to the SNF were identified using HERE map data (Exhibit 3). For each census tract along the route the FEMA riverine and coastal flood risks were overlaid and the maximum riverine and coastal flood risks for each transportation route combined to provide the risk for a particular route. Information on how the natural hazard risks are calculated is provided in the FEMA technical document *National Risk Index Technical Document* (November 2021). These combined risks was used as a proxy for the probability of a nursing staff employee reaching the SNF. For each SNF a Monte Carlo simulation was conducted to estimate the average probability of getting to work and the percentage loss in nursing staff based on the average daily skilled nursing staff reports from CMS. These data along with a 95 percent confidence interval for the estimate average daily nursing staff during a flood event are displayed in Exhibit 4.

Map

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**Exhibit 3.** Routes that workers can take to get to work at Heritage Hall King George SNF.

Risk levels of each road: blue (low), yellow, red, dark red (high)

The estimated percent loss of nursing staff for the 283 SNFs ranged from a low of 7 percent to a high of 52 percent. The average probability for a nursing staff employee to reach their place of employment ranged from a low of 0.48 to a high of 0.92. For example, in King George County, the Heritage Hall King George facility (Federal Provider Number 495300 in Exhibit 3) is located near the Potomac River, which opens to the Chesapeake Bay. The range of risks for the 26 transportation routes to the facility range from 5.65 to 66.74. This averages to a potential loss of 24 percent of the nursing staff during an extreme flood event or out of the 41 daily average nursing staff, on average 31 will be able to reach the SNF (95% confidence interval 16-38).

Sufficient nursing staff with the appropriate competencies is of major concern to assure resident safety and quality of care. Higher nursing staff numbers are associated with improved activities of daily living independence; less weight loss, dehydration and improper and overuse of antipsychotics; and lower mortality rates ([Harrington et al., 2020](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/literature/nurse_staffing_levels/%20Harrington_2020.pdf); [White House Fact Sheet, February 28, 2022](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/literature/quality/FACT%20SHEET_%20Protecting%20Seniors%20by%20Improving%20Safety%20and%20Quality%20of%20Care%20in%20the%20Nation%E2%80%99s%20Nursing%20Homes%20_%20The%20White%20House.pdf)). Because of their importance, nursing staff numbers are required to be recorded daily and reported quarterly in the Payroll Based Journal Daily Nurse Staffing Data to the Center for Medicare & Medicaid Services and are due within 45 days after the end of each reporting period. Only data submitted and accepted by the deadline are used by CMS for staffing calculations. These data were used along with synthetic data on transportation routes to estimate the nursing staff numbers in the event of an extreme flood event that are displayed in Exhibit 4. In the figure, the orange line is the average daily nursing staff numbers for the 283 SNFs ordered from lowest to highest and the black line is the estimated number of staff that will be able reach work during an extreme flood event with a 95% nonparametric confidence interval.

**Exhibit 4.** Observed and Estimated Average Daily Nursing Staff.

### RQ2. Are SNF prepared for emergencies?

To address this RQ, we examine how prepared SNFs are for emergency events using inspections and deficiency data as a proxy for preparedness. Skilled Nursing Facilities are inspected annually. CMS issues deficiencies to SNFs that fail to meet the federal standards for Medicare and Medicaid participation. Every deficiency is classified into one of twelve categories based on the scope and severity of the deficiency. There are two broad types of non-health related deficiencies – Emergency Preparedness and Life Safety Code Deficiencies. See Appendix A for a list of the most frequent deficiencies in each group (CMS 2022) for Virginia SNFs.

* Emergency Preparedness (EP) Deficiencies - There are four elements of emergency preparedness, they cover an emergency plan; policies and procedures; a communication plan; and training and testing.
* Life Safety Code (LSC) - The set of fire protection requirements are designed to provide a reasonable degree of safety from fire; they cover construction, protection, and operational features designed to provide safety from fire, smoke, and panic.

We calculated **Emergency Preparedness (EP) and Fire Life Safety Code (LSC) deficiency indices** with the goal of creating an index with sufficient variability to distinguish between high and low performing SNFs. The computation of the index has four steps. (1) For each SNF, the number of deficiencies were normalized by the number of SNF inspections over the past four years (2018 – 2022). (2) We next computed the average number of days it took to resolve each deficiency. (3) Then, transformed the letter inspection rating for scope and severity to a numerical weight using the CMS technical guide, *Care Compare Nursing Home Five-Star Quality Rating System,* and averaged the ratings. (4) The estimates from these three steps were summed to compute a separate EP and LSC deficiency index. Exhibit 5, displays the descriptive statistics for each index. For both indices there is sufficient variability to explore SNF differences with two obvious outliers for both index (Q-Q plots). The average EP deficiency score (left-hand side) is 15 with half of the scores between 0 and 36. Most SNFs do not have EP deficiencies (histogram and box plot). The deficiency scores are right-skewed (box plot). The average LSC deficiency score (right-hand side) is 65 with half of the SNF scores between 45 and 77. There are more than a dozen SNFs with deficiency scores that are outside the main body of the data (histogram and box plot).

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**Exhibit 5.**Descriptive Statistics for Emergency Preparedness and Life Safety Code Indices for

283 Virginia Skilled Nursing Facilities

**Legend:** Min=minimum value; Q(.25)=lower quartile; Median=middle of the distribution; Q(.75)=upper quartile; Max=maximum value; Mean=average of the distribution; SD=standard deviation; CS=Coefficient of Skewness; CK=Coefficient of Kurtosis; CV=coefficient of variation; K2=Test statistic for H0: Data=Normal; p(K2)=p-value for K2; Z(CS)=Test Statistic for CS=0 (Normal); p(Z(CS))=p-value for Z(CS); Z(CK)=Test Statistic for CK=3 (Normal); p(Z(CK))=p-value for Z(CK).

**Data Sources:** The Centers for Medicare & Medicaid Services

Fire Safety Deficiencies <https://data.cms.gov/provider-data/dataset/ifjz-ge4w>

Inspection Dates <https://data.cms.gov/provider-data/dataset/svdt-c123>

We summed the EP and LSC indices and categorized them into high, medium, low, and no deficiencies. The combined index for each SNF is color coded on the maps to identify those with the highest combined index (orange), those with no deficiencies (gray), and those with some deficiencies (light and dark blue) (see Exhibit 6). By carefully specifying each step in the development of the metrics, this research question provides a roadmap for the key places where modeling choices have been made. By designing proper curation of this type of information, researchers can replicate and/or transparently deviate from these modeling choices to create alternative metrics.

### RQ3: Can the community provide support to SNF during emergency events?

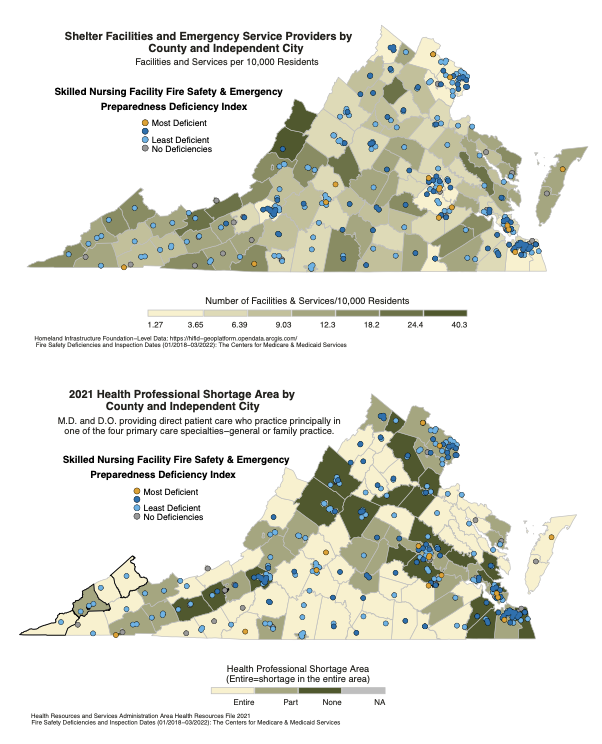
To answer this question, we computed community resiliency index using the US Census American Community Survey and the guidance provided by the *Homeland Security document Community Resilience Indicator Analysis: County-Level Analysis of Commonly Used Indicators from Peer-Reviewed Research* (2020). The index was constructed by summing the county (census tract) level percentages for the following variables:

* Fraction Employed
* Fraction with No Disability
* Fraction with a High School Diploma or Greater
* Fraction of Households with at least one vehicle, and
* Reverse GINI Index – so all indicators are in a positive direction.

**Exhibit 6.** 2020 Population Resilience Composite Index by Virginia Census Tract. The shading indicates the least resilient tracts (light yellow) to the most resilient (dark green). The map is overlaid with the deficiency index for each of the 283 SNFs. The SNFs with the most deficiencies are colored orange; those with least are shaded light blue; and those with no deficiencies are gray.



The map in Exhibit 6 above presents the results of two indices, the EP+LSC deficiency index for each SNF and the community resilience index at the census tract level. SNFs with the highest number of deficiencies (orange dots) tend to be in lower resilient counties (lighter color counties). We also examined the number of emergency services and shelters along with the availability of medical staff per 10,000 residents and constructed isochrones to establish the distance from the SNF to these potential sources of support (See Appendix B). Working this component of the Use Case highlighted the need for cross-agency data, pointing to the utility of future strategic partnering between the Census Bureau and CMS.

In addition to describing the population using a resilience index we also developed measures to access the number of shelter facilities and emergency service providers (data from Homeland Security / Homeland Infrastructure Foundation Level Data)

and the number of M.D.s and O.D.s who describe direct patient care (data from Health Resources and Services Administration / Area Resource Files) (See Exhibit 7).

The number of shelter facilities and emergency service providers include Red Cross Chapter Facilities, National Shelter System Facilities, emergency medical service stations, fire stations, and urgent care facilities per 10,000 population aggregated at county level. The number of M.D.s and O.D.s is described in terms of a primary care health professional shortage area. HRSA defines these contiguous areas where primary medical care professionals are overutilized, excessively distant or inaccessible to the population of the area under consideration.

**Exhibit 7.** Assessment of thenumber of shelter facilities and emergency service providers per 10,000 population and medically underserved areas both at the county level.

As seen in the bottom choropleth in Exhibit 7, approximately one-third of the counties and independent cities are health professional shortage areas across their entire boundary and another 40 percent have shortages within parts of their boundaries. Some of the health professional shortage areas occur in counties and independent cities that also have a few shelter facilities and emergency service providers (See top choropleth in Exhibit 7). This information could be useful for SNFs when developing evacuation plans and deciding whether to evacuate or not.

A more detailed assessment of SNFs in the City of Richmond is provided in Appendix B.

## Communication and Dissemination

Our work is disseminated through a GitHub repository which contains a [Products folder](https://github.com/uva-bi-sdad/census_cde_demo_2/tree/main/documents/products) with sub-folders with data tables for SNF and Virginia counties / independent cities; presentations and our curation report; visualizations (maps and statistical graphics); and processes which includes subfolders for tables of derived variables and an explanation of the synthetic data process.

The CDE will need to develop some standards for data representations that enable researchers to use these data and not have to start from scratch if they plan to study Skilled Nursing Facilities. Working more Use Cases will provide insights into how this harmonization can be applied to broad sets of data, purposes, and uses.

## What did you learn that applies to CDE development?

This is an abbreviated version of the Use Case to highlight what we learned. In choosing a Use Case, we developed initial criteria and evaluated which of them were met for this pilot demonstration. A Use Case does not need to meet all criteria but must address many of them as a baseline to continue the work or have other researchers build on the initial Use Case. For this demonstration project, we address the following criteria (those with a checkmark):

* Relevancy of the research domain, e.g., White House Issue
* Availability of data from multiple sources across multiple frames
* Ability to identify computing measurement requirements
* Experts to advise on the research approach and implementation
* Curate and document each step in the CDE processes and outputs
* Ethical and equity dimensions
* Partnerships to access data from multiple types of organizations (potential is high)
* Potential viability of proposed platforms
* Identify data product gaps and propose new data collection

The Use Case is important for defining and designing the capabilities that the CDE must develop and maintain. For example, the CDE must have capabilities to inform CDE component development and reusability. In this Use Case, at least three components are reusable – the data sources, the functions, and the applications.

**CDE component development and reusability**

**Data sources**

* Synthetic population estimates
* SNF Location and characteristics
* Baseline community emergency preparedness assets

**Functions**

* Creating transportation routes
* Computing probability of riverine and coastal flood risks
* Estimating SNF resiliency and community resilience

**Applications**

* Expedite provenance tracking of collected and generated data
* Wrangle and integrate many types and sources of data
* Understand differences in similar measures
* Facilitate composable workflows from microservices
* Plug and Play components
* Sustain high-performance computing
* Support sophisticated statistical analysis

This Pilot Demonstration on Skilled Nursing Facilities provides a first step for creating a Use Case Research Program. Many more Use Cases are needed for building the Curated Data Enterprise.

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## Appendices

### Appendix A. Most Frequent Virginia Skilled Nursing Facilities non-Health Deficiencies

|  |  |
| --- | --- |
| Emergency Preparedness Deficiencies (2022) | **Freq** |
| Establish staff and initial training requirements. | 53 |
| Establish emergency prep training and testing. | 47 |
| Address subsistence needs for staff and patients. | 45 |
| Address patient/client population and determine types of services needed. | 41 |
| Establish roles under a Waiver declared by secretary. | 39 |
| Conduct testing and exercise requirements. | 35 |
| Provide family notifications of emergency plan. | 35 |
| Establish policies and procedures for volunteers. | 34 |
| Establish procedures for tracking staff and patients during an emergency. | 31 |
| Establish policies and procedures for medical documentation. | 24 |
| Conduct risk assessment and an All-Hazards approach. | 23 |
| Establish methods for sharing information. | 23 |
| Develop Emergency Preparedness policies and procedures. | 22 |
| Establish policies and procedures for sheltering. | 20 |
| List the names and contact information of those in the facility. | 19 |
| Provide primary/alternate means for communication. | 19 |
| **Life Safety Code Deficiencies (2022)** | **Freq** |
| Inspect, test, and maintain automatic sprinkler systems. | 322 |
| Install corridor and hallway doors that block smoke. | 209 |
| Ensure proper usage of power strips and extension cords. | 181 |
| Have properly installed electrical wiring and gas equipment. | 172 |
| Have approved installation, maintenance and testing program for fire alarm systems. | 170 |
| Meet other general requirements that are deficient. | 163 |
| Have generator or other power source capable of supplying service within 10 seconds. | 159 |
| Ensure smoke barriers are constructed to a 1-hour fire resistance rating. | 146 |
| Add doors in an exit area that do not require the use of a key from the exit side unless in case of special locking arrangements. | 137 |
| Keep aisles, corridors, and exits free of obstruction in case of emergency. | 122 |
| Ensure that special areas are constructed so that walls can resist fire for 1- hour or have an approved fire extinguishing system. | 120 |
| Ensure heating and ventilation systems that have been properly installed according to the manufacturer's instructions. | 117 |
| To conduct inspection, testing and maintenance of fire doors by qualified individuals. | 114 |
| Have properly located and lighted Exit signs. | 108 |
| Have proper medical gas storage and administration areas. | 93 |
| Provide properly protected cooking facilities. | 87 |

DATA SOURCE: The Centers for Medicare & Medicaid Services Fire Safety Deficiencies <https://data.cms.gov/provider-data/dataset/ifjz-ge4w>

### Appendix B. Detailed Assessment of City of Richmond SNFs

Exhibit B-1 displays the resilience index for the census tracts in the City of Richmond, Virginia. The resilience index across the census tracts is heterogeneous, from a low of 0.61 in the south and east to a high of 0.95 in the north (See section for RQ3 for the definition of resiliency). The low population resilience aligns with the parts of the city identified as having primary care health professional shortages. With regard to the ratio of shelter facilities and emergency service providers per 10,000 population, the city is in the lower quartile among Virginia counties and independent cities (Range of 1.27 to 40.32). The city has a total of 68 shelter facilities and emergency service providers for a population of 226,610 or a ratio of 3.



**Exhibit B-1.** Resilience Index for Richmond City Census Tracts, 2020. The shading indicates the least resilient census tracts (light yellow) to most resilient (dark green). The map is overlaid with the deficiency score for each of the 6 SNFs located in the City. SNFs with the most deficiencies are colored orange and those with no deficiencies are gray.

None of the six SNFs in the City of Richmond changed ownership in 2021 year. There are three for-profit, two not-for-profit, and one government owned. The concern is for-profit private equity ownership which researchers have shown result in increases in the resident mortality, hospitalizations, and emergency room visits; increases in the number of deficiencies and serious

deficiencies; while at the same time increasing spending per patient by 11% (Braun et al., 2021; Gupta et al., 2021, Harrington et al., 2012). To identify SNFs owned by private equity firms, researchers identify SNFs owned by the largest for‐profit chains through Internet searches and company reports and match this information with federal secondary data for each ownership group; or private equity ownership data is purchase from Pitchbook, a venture capital, private equity, and M&A data base.

Exhibit B-2 displays the river and coastal flood risk, percent nursing staff loss if there is a flood event, the SNF deficiency index, and ownership type for the six SNFs in the City of Richmond. There are relatively high riverine flood risk and low coastal flood risk. On average 18% of the SNF workers will not make it to work if an extreme flooding event occurs. SNF 495327 (highlighted in olive green) had emergency preparedness deficiencies that were wide in scope but not an immediate jeopardy to residents and staff. Their deficiencies include:

* EP: failed to conduct tests and exercises for requirements;
* EP: failed to establish policies and procedures for sheltering; and
* LSC: failed to test and maintain the automatic sprinkler and fire alarm systems.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Exhibit B-2: Risk Indicators for Six SNFs in the City of Richmond** | | | | | | |
| **City of Richmond & SNF Indicators** | **Census Tracts** | | | | | |
| SNF Federal Provider Number | 495260 | 495327 | 495393 | 495423 | 49A022 | 49E084 |
| Maximum Riverine Flood Risk | 13.80 | 15.51 | 14.57 | 16.39 | 14.41 | 14.48 |
| Maximum Coastal Flood Risk | 2.91 | 2.33 | 1.66 | 2.28 | 1.62 | 2.30 |
| % Nursing Staff Loss if Flood Event | 18% | 20% | 17% | 21% | 15% | 17% |
| SNF Deficiency Index | Low | High | None | Low | Low | High |
| SNF Ownership Type | For- Profit  Corp. | For- Profit Corp. | Govt.  State | For- profit  P’ship | Non- profit Corp. | Non- profit  Corp. |
| Data Sources: FEMA National Risk Index (Nov 2021) and computations by the Biocomplexity team. <https://hazards.fema.gov/nri/data-resources>  The Centers for Medicare & Medicaid Services   * Fire Safety Deficiencies <https://data.cms.gov/provider-data/dataset/ifjz-ge4w> * Inspection Dates <https://data.cms.gov/provider-data/dataset/svdt-c123> * Provider Information <https://data.cms.gov/provider-data/dataset/4pq5-n9py> | | | | | | |

Exhibit 7 which displays the number of shelter facilities and emergency service providers per 10,000 population using a chloropleth map can also be displayed using the longitudes and latitudes of the facilities and providers. In Exhibit B-3 an isochrone map is used to display the location of SNF 495327 (orange marker) and the shelter facility and emergency service provider locations (black circles). in the Richmond metropolitan area. The isochrones on the map delineate drive times of 15 and 30 minutes.

### Map Description automatically generated

**Exhibit B-3.** The orange marker is the location of SNF 495327 and the black circles are the location of hospitals, Red Cross Chapter Facilities, National Shelter System Facilities, emergency medical service stations, fire stations, and urgent care facilities. The isochrones outline a 15 and 30 minute drive from the SNF.

### Appendix C. CENSUS Skilled Nursing Facility Use Case GitHub Repository

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**Data Folder**

* Subfolder: **Virginia** **Skilled Nursing Facility**
  + Subfolder: **Owners** 
    - File: [va\_cms\_ownership\_2022-08.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/owners)
      * + Subfolder: **Meta Data**
    - File: [cms\_five\_star\_users\_guide\_2022-01.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/owners/meta_data/cms_five_star_users_guide_2022-01.pdf)
    - File: [cms\_primary\_data\_dictionary.xlsx](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/owners/meta_data/cms_primary_data_dictionary.xlsx)
  + Subfolder: **Facility** 
    - File: [us\_cms\_inspection\_dates\_2022-06.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/facility)
    - File: [va\_cms\_fire\_safety\_deficiencies\_2022-12.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/facility)
    - File: [va\_cms\_provider\_final\_2022-07.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/facility)
      * + Subfolder: **Meta Data**
    - File: [cms\_deficiency\_citation\_descriptions\_2022-07.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/facility/meta_data/cms_deficiency_citation_descriptions_2022-07.csv)
    - File: [cms\_five\_star\_users\_guide\_2022-01.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/facility/meta_data/cms_five_star_users_guide_2022-01.pdf)
    - File: [cms\_primary\_data\_dictionary.xlsx](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/facility/meta_data/cms_primary_data_dictionary.xlsx)
  + Subfolder **Nursing Staff**
    - File: [va\_cms\_pbj\_puf\_payroll\_nursing\_staff\_2019-Q4.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/nursing_staff)
      * + Subfolder: **Meta Data**

File: [cms\_payroll\_based\_journal\_daily\_nurse\_staffing\_data\_dictionary\_2022-08.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/nursing_staff/meta_data/cms_payroll_based_journal_daily_nurse_staffing_data_dictionary_2022-08.pdf)

* + - File: [pbj\_puf\_documentation\_042022.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/nursing_staff/meta_data/pbj_puf_documentation_042022.pdf)
  + Subfolder **Residents**
    - File: [va\_ltcfocus\_2020.xlsx](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/residents)
      * + Subfolder: **Meta Data**
    - File: [LTCFocus\_data\_dictionary\_merged.xlsx](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/virginia_skilled_nursing_facility/residents/meta_data/LTCFocus_data_dictionary_merged.xlsx)
    - File: [hrs\_ltcfocus\_data \_manual\_042016\_v2.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/virginia_skilled_nursing_facility/residents/meta_data/hrs_ltcfocus_data%20_manual_042016_v2.pdf)
* Subfolder: **Community**
  + Subfolder: **Climate Change Risk**
    - File: [virginia\_fema\_nri\_county.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/climate_change_risk)
    - File: [virginia\_fema\_nri\_census\_tract.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/climate_change_risk)
      * + Subfolder: **Meta Data**
    - File: [fema\_nri\_data\_dictionary.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/climate_change_risk/meta_data/fema_nri_data_dictionary.csv)
  + Subfolder: **Resilience** 
    - File: [va\_hifld\_american\_red\_cross\_chapter\_facilities\_2022.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience/va_hifld_american_red_cross_chapter_facilities_2022.csv)
    - File: [va\_hilfd\_hospitals\_2022.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_hilfd\_emergency\_medical\_service\_stations\_2022.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_hilfd\_urgent\_care\_facilities\_2018.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_hilfd\_national\_shelter\_system\_facilities\_2022.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_hilfd\_fire\_stations\_2020.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_hrsa\_ahrf\_2021.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_total\_county\_population\_2020.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_town\_county\_crosswalk.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
    - File: [va\_zipcode\_town\_county\_crosswalk.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/data/community/resilience)
      * + Subfolder: **Meta Data**
    - File: [hrsa\_ahrf\_data\_dictionary\_2020-2021.doc](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/community/resilience/meta_data/hrsa_ahrf_data_dictionary_2020-2021.doc)
    - File: [hifld\_data\_catalog-2022-Q3.xlsx](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/community/resilience/meta_data/hifld_data_catalog-2022-Q3.xlsx)
    - File: [fema\_resilience\_analysis\_and\_planning\_tool\_2021-04.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/data/community/resilience/meta_data/fema_resilience_analysis_and_planning_tool_2021-04.pdf)
  + Subfolder: **Demographic** – files are pulled down from the CENSUS API within the Rcode; see files [VA\_Population\_Resilience\_Index\_Census\_Tract.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses) and [VA\_Population\_Resilience\_Index\_County.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses)
    - DOC/Census/ACS/**B18101 Sex by Age by Disability**
    - DOC/Census/ACS/**B19083 Gini Index of Income Inequality**
    - DOC/Census/ACS/**B23025 Employment Status for the Populations 16 Years and Over**
    - DOC/Census/ACS/**S0101 Age and Sex**
    - DOC/Census/ACS/**S1501 Educational Attainment**

**Source Code Folder**

* Subfolder: **Discovery**
  + - File: [EDAshape.R](https://github.com/uva-bi-sdad/census_cde_demo_2/tree/main/source_code/discovery)

Output: [eda\_emergency\_preparedness\_deficiency\_index.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/eda_emergency_preparedness_deficiency_index.pdf)

Output: [eda\_fire\_life\_safe\_code\_deficiency\_index.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/eda_fire_life_safe_code_deficiency_index.pdf)

* File: [EDA\_flatviolin.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/discovery/EDA_flatviolin.R)

Output: [eda\_snf\_deficiency\_index\_by\_hazard.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/eda_snf_deficiency_index_by_hazard.pdf)

* File: [EDA\_boxplots.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/discovery/EDA_boxplots.R)

Output: [county\_population\_indicator\_resilience\_box\_plots.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/visualizations/county_population_indicator_resilience_box_plots.pdf)

* File: [EDA\_Choropleths\_Resilience\_Indicator\_Variables.R](file:///Users/vicki/Documents/Counting%20People/Paper/EDA_Choropleths_Resilience_Indicator_Variables.R)

Output: [census\_tract\_population\_16\_and\_over\_unemployed\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_16_and_over_unemployed_choropleth.pdf)

Output: [census\_tract\_population\_no\_hs\_diploma\_choropleth.p](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_no_hs_diploma_choropleth.pdf)

Output: [census\_tract\_population\_with\_disability\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_with_disability_choropleth.pdf)

Output: [county\_old\_age\_dependency\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_old_age_dependency_choropleth.pdf)

* + - File: [Richmond\_Isochrones\_Map\_All\_Facilities.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/discovery/Richmond_Isochrones_Map_All_Facilities.R" \o "Richmond_Isochrones_Map_All_Facilities.R)
    - File: [Richmond\_Isochrones\_Map\_Hospitals.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/discovery/Richmond_Isochrones_Map_Hospitals.R" \o "Richmond_Isochrones_Map_Hospitals.R)
* Subfolder: **Analyses**
* File: [SNF\_Deficiency\_Index.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/analyses/SNF_Deficiency_Index.R)

Output: [va\_snf\_deficiency\_indices\_k\_e.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_snf_deficiency_indices_k_e.csv)

* + - File: [VA\_Population\_Resilience\_Index\_Census\_Tract.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses)

Output: [census\_tract\_population\_resilience\_index\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_resilience_index_choropleth.pdf)

Output: [va\_census\_tract\_population\_resilience.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_census_tract_population_resilience.csv)

* File: [VA\_Population\_Resilience\_Index\_County.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses)

Output: [county\_population\_resilience\_index\_with\_gini\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_population_resilience_index_with_gini_choropleth.pdf)

Output: [county\_population\_indicator\_resilience\_box\_plots.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/visualizations/county_population_indicator_resilience_box_plots.pdf)

Output: [va\_county\_population\_resilience.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_county_population_resilience.csv)

* + - File: [VA\_Probability\_of\_Getting\_to\_SNF.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses/VA_Probability_of_Getting_to_SNF.R)

Output: [va\_snf\_estimated\_average\_daily\_nursing\_staff\_during\_extreme\_flood\_event.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_snf_estimated_average_daily_nursing_staff_during_extreme_flood_event.csv)

Output: [snf\_estimate\_daily\_nursing\_staff\_during\_climate\_event.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/snf_estimate_daily_nursing_staff_during_climate_event.pdf)

* File: [County\_Assets\_Workers.R](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/source_code/analyses/County_Assets_Workers.R)

Output: [county\_health\_professional\_shortage\_area\_choropleth.pdf](file:///Users/vicki/Documents/Counting%20People/Paper/county_health_professional_shortage_area_choropleth.pdf)

* File: [County\_Assets\_Infrastructure.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/analyses/County_Assets_Infrastructure.R)

Output: [county\_shelter\_facilities\_and\_emergency\_service\_provider\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_shelter_facilities_and_emergency_service_provider_choropleth.pdf)

Output: [va\_county\_shelter\_and\_emergency\_facility\_resilience\_index.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_county_shelter_and_emergency_facility_resilience_index.csv)

* File: [Richmond\_Population\_Resilience\_Index.R](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/source_code/analyses/Richmond_Population_Resilience_Index.R)

Output: [file:///Users/vicki/Documents/Counting People/Paper/county\_health\_professional\_shortage\_area\_choropleth.pdf](file:///Users/vicki/Documents/Counting%20People/Paper/county_health_professional_shortage_area_choropleth.pdf)[census\_tract\_richmond\_population\_resilience\_index\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_richmond_population_resilience_index_choropleth.pdf)

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* Subfolder: **Products** 
  + Subfolder: **Visualizations**
    - File: [census\_tract\_population\_16\_and\_over\_unemployed\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_16_and_over_unemployed_choropleth.pdf)
    - File: [census\_tract\_population\_no\_hs\_diploma\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_no_hs_diploma_choropleth.pdf)
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    - File: [census\_tract\_population\_resilience\_index\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_population_resilience_index_choropleth.pdf)
    - File: [census\_tract\_richmond\_population\_resilience\_index\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/census_tract_richmond_population_resilience_index_choropleth.pdf)
    - File: [county\_health\_professional\_shortage\_area\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_health_professional_shortage_area_choropleth.pdf)
    - File: [county\_old\_age\_dependency\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_old_age_dependency_choropleth.pdf)
    - File: [county\_population\_indicator\_resilience\_box\_plots.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_population_indicator_resilience_box_plots.pdf)
    - File: [county\_population\_resilience\_index\_with\_gini\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_population_resilience_index_with_gini_choropleth.pdf)
    - File: [county\_shelter\_facilities\_and\_emergency\_service\_provider\_choropleth.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/county_shelter_facilities_and_emergency_service_provider_choropleth.pdf)
    - File: [eda\_emergency\_preparedness\_deficiency\_index.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/eda_emergency_preparedness_deficiency_index.pdf)
    - File: [eda\_fire\_life\_safe\_code\_deficiency\_index.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/eda_fire_life_safe_code_deficiency_index.pdf)
    - File: [snf\_estimate\_daily\_nursing\_staff\_during\_climate\_event.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/visualizations/snf_estimate_daily_nursing_staff_during_climate_event.pdf)
  + Subfolder: **Processes**
  + Subfolder: **Commute Vulnerability**
    - File: [algorithm.md](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/commute_vulnerability/algorithm.md)
  + Subfolder: **Derived Variables**
    - File: [va\_census\_tract\_population\_resilience.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_census_tract_population_resilience.csv)
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    - File: [va\_county\_shelter\_and\_emergency\_facility\_resilience\_index.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_county_shelter_and_emergency_facility_resilience_index.csv)
    - File: [va\_snf\_deficiency\_indices\_k\_e.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_snf_deficiency_indices_k_e.csv)
    - File: [va\_snf\_estimated\_average\_daily\_nursing\_staff\_during\_extreme\_flood\_event.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/blob/main/documents/products/processes/derived_variables/va_snf_estimated_average_daily_nursing_staff_during_extreme_flood_event.csv)
    - File: [va\_snf\_prob\_worker\_not\_getting\_to\_work.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/processes/derived_variables/va_snf_prob_worker_not_getting_to_work.csv)
  + Subfolder: **Synthetic Information** 
    - File: [snf\_to\_si\_location\_mapping.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/processes/derived_variables/synthetic_information/snf_to_si_location_mapping.csv)
    - File: [snf\_flood\_risks.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/processes/derived_variables/synthetic_information/snf_flood_risks.csv)
  + Subfolder: **Data Tables**
  + Subfolder: SNF
    - File: [va\_snf\_data\_dictionary.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/data_tables/skilled_nursing_facility/va_snf_data_dictionary.csv)
    - File: [va\_snf\_table.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/data_tables/skilled_nursing_facility/va_snf_table.csv)
  + Subfolder: Community
    - File: [va\_county\_city\_data\_dictionary.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/data_tables/community/va_county_city_data_dictionary.csv)
    - File: [va\_county\_city\_data\_table.csv](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/data_tables/community/va_county_city_data_table.csv)
  + Subfolder: **Presentations and Reports**
    - File: [UVA\_CENSUS\_Demo\_2022OCT31.pptx](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/presentation_reports/UVA_CENSUS_Demo_2022OCT31.pptx)
    - File: [UVA\_FCSM\_2022OCT27.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/products/presentation_reports/UVA_FCSM_2022OCT27.pdf)
    - File:
* Subfolder: **Literature**
  + Subfolder: **Deficiencies**
    - File: [Castle\_2011.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/deficiencies/Castle_2011.pdf)
    - File: [Harrington\_2012.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/deficiencies/Harrington_2012.pdf)
    - File: [Li\_2015.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/deficiencies/Li_2015.pdf)
    - File: [OIF\_Trends in SNH Deficiencies\_2019.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/deficiencies/OIF_Trends%20in%20SNH%20Deficiencies_2019.pdf)
    - File: [REPORT-Nursing-Facilities-Staffing-Residents-and-Facility-Deficiencies-2009-2016.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/deficiencies/REPORT-Nursing-Facilities-Staffing-Residents-and-Facility-Deficiencies-2009-2016.pdf)
  + Subfolder: **Emergency Preparedness**
    - File: [Laditka\_2008.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/%20Laditka_2008.pdf)
    - File: [Benevolenza\_2019.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/Benevolenza_2019.pdf)
    - File: [Brunkard\_2013.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/Brunkard_2013.pdf)
    - File: [Dosa\_2006.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/Dosa_2006.pdf)
    - File: [GAO\_2006.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/GAO_2006.pdf)
    - File: [HHS\_2006.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/HHS_2006.pdf)
    - File: [HHS\_2012.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/HHS_2012.pdf)
    - File: [Willoughby\_2017.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/Willoughby_2017.pdf)
    - File: [cms\_federal\_government\_emergency\_preparedness\_for\_ltc.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/cms_federal_government_emergency_preparedness_for_ltc.pdf)
    - File: [fcc\_ndms\_guide\_2018-06.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/emergency_preparedness/fcc_ndms_guide_2018-06.pdf)
  + Subfolder: **Staffing Levels** 
    - File: [Harrington\_2020.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/nurse_staffing_levels/%20Harrington_2020.pdf)
  + Subfolder: **Resilience**
    - File: [Keim\_2008.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/resilience/Keim_2008.pdf)
    - File: [fema\_community-resilience-indicator-analysis\_2020.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/resilience/fema_community-resilience-indicator-analysis_2020.pdf)
  + Subfolder: **Ownership** 
    - File: [Pradhan\_2014.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/%20Pradhan_2014.pdf)
    - File: [Bos\_2017.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/Bos_2017.pdf)
    - File: [Braun\_2020.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/Braun_2020.pdf)
    - File: [Braun\_2021.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/Braun_2021.pdf)
    - File: [Gupta\_2021.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/Gupta_2021.pdf)
    - File: [americans\_for\_financial\_reform\_2020.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/ownership/americans_for_financial_reform_2020.pdf)
  + Subfolder: **Quality**
    - File: [Li\_2020.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/quality/Li_2020.pdf)
    - File: [NAS\_2022.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/quality/NAS_2022.pdf)
    - File: [FACT SHEET\_ Protecting Seniors by Improving Safety and Quality of Care in the Nation’s Nursing Homes \_ The White House.pdf](https://github.com/uva-bi-sdad/census_cde_demo_2/raw/main/documents/literature/quality/FACT%20SHEET_%20Protecting%20Seniors%20by%20Improving%20Safety%20and%20Quality%20of%20Care%20in%20the%20Nation%E2%80%99s%20Nursing%20Homes%20_%20The%20White%20House.pdf)