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# A Multimodal Analysis of Resource Allocation Across U.S. Cancer Registries

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## Abstract

This study assessed resource allocation among registry activities, which may provide insight for efficient collection of high-quality cancer incidence data. We used a multimodal approach and purposively sampled 21 participating population-based cancer registries in the United States to ensure variation across several registries. The registries reported prospective staffing data and retrospective costing data, completing data collection from October 2021 to September 2022, reporting retrospective costing data for July 1, 2020, through June 30, 2021. From lessons learned from prior studies, we engaged participating registries early and throughout the study, ensuring the collection of meaningful, accurate quantitative data, as well as insights not captured quantitatively. Case volume is a major driver of registry costs. (On average, high-volume registries outspend low-volume registries by nearly 3x, annually). Upon examination of registry activities by case volume, we found that the two most resource-intensive registry activities are data acquisition and data processing, which may be addressed by innovations, such as electronic reporting and automation. Innovative data transfer and processing approaches could increase timeliness of data collection and reduce the labor resources required to process manually collected data. Registries adopting these innovations might achieve cost savings, which could make resources available to support other registry activities.

### Keywords

cancer; cancer registry; National Program of Cancer Registries; NPCR; registry activities; activity-based cost; electronic reporting; registry staffing; efficiency

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## 1. Introduction

With more than 1.6 million new cancer diagnoses and over 600,000 cancer deaths, cancer was the second leading cause of death in the United States in 2020 (US Cancer Statistics Working Group, 2023). Finding that the cancer burden varies by geographic location and that prevention and early detection efforts are best addressed locally by state or territorial health departments or organizations, Congress established the National Program of Cancer Registries (NPCR) in 1992 through the Cancer Registries Amendment Act (Public Law 102–15). Funded by the Centers for Disease Control and Prevention (CDC), NPCR supports population-based cancer registries in 46 states, the District of Columbia, and 3 US territories.

These cancer registries provide data on new cancer cases, including the type, stage, and location of the cancer, as well as treatment and outcomes. Registries, public health departments, and CDC use these data for the following: to monitor cancer trends over time; to determine cancer patterns in various populations; to guide planning and evaluation of cancer control programs; to help set priorities for allocating health resources; to advance clinical, epidemiologic, and health services research; and to provide information for a national database of cancer incidence (NPCR, 2023).

### 1.1 Context

Since its establishment, NPCR has played a lead role in advancing optimal approaches and standards to improve cancer registry data collection through efforts, such as the Electronic Pathology (ePath) Implementation Project, by which CDC has facilitated electronic reporting of anatomic pathology reports from national and regional laboratories to central cancer registries (Jones, Alimi, Pordell, Tangka, Blumenthal, et al., 2021; Pollack, Jones, Blumenthal, Alimi, Jones, et al., 2020). Accurate, timely cancer incidence data are critical to informing local and national cancer prevention and control efforts (Weir, Thompson, Soman, Møller, Leadbetter, 2015; White, Babcock, Hayes, Mariotto, Wong, et al., 2017). Innovative data transfer and processing approaches could increase timeliness of data collection and reduce the labor resources required to process manually collected data. As part of CDC's broader Data Modernization Initiative (DMI), NPCR is focused on adoption of feasible data modernization approaches, such as electronic reporting and automation (CDC's DMI, 2023; NPCR Data Modernization, 2023). As part of this effort, CDC is testing its Cancer Surveillance Cloud-based Computing Platform (CSCBCP) with selected central cancer registries, intending to make it more widely available to NPCR-funded registries in 2024 (NPCR CSCBCP, 2023).

Although prior studies have systematically evaluated the economics of cancer registries, these studies did not specifically assess innovative data transfer and processing approaches and their impact on cancer registry costs and resource allocation (Cole Beebe, Subramanian, Tangka, Weir, Babcock, et al., 2018; Subramanian, Tangka, Cole Beebe, Trebino, Weir, et al., 2016; Tangka, Subramanian, Cole Beebe, Weir, Trebino, et al., 2015). Formative research has provided insight into barriers and facilitators to adoption of electronic data reporting but has not assessed how resource use may vary across registries (Tangka, Edwards, Pordell, Wilson, Blumenthal, et al., 2021). This information is required to inform

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data collection and identify better practices, which may provide key resource use metrics to monitor implementation. These metrics are especially important as innovative approaches become more established and are adopted into the general core operations of cancer registries.

### 1.2 Aims

CDC initiated the current study in 2019 to assess the resource requirements of the process steps and activities, which led to the efficient collection of high-quality cancer incidence data, as electronic reporting evolves. This article provides a detailed overview of the methodological approach and shares findings on population-based cancer registry activity-based costs, which were explored by using prospective and retrospective data collection approaches. The information provided will support CDC in evaluating the efficiency of cancer registry operations and planning the implementation of data modernization approaches, such as electronic reporting and automation. Other stakeholders, such as the cancer registries, evaluators of similar programs or those operationalizing them, and those establishing new programs, may also benefit from the findings of this study. For example, findings from prior evaluations have informed efforts by the World Health Organization to support the establishment and growth of registries in low- and middle-income countries (de Vries, Pardo, Arias, Bravo, Navarro, et al., 2016).

## 2. Methods

### 2.1 Overview and Cancer Registry Selection

We conducted a comprehensive evaluation of the cancer registry activities and associated resource requirements for 21 of the 46 state-based registries in NPCR. Registries completed data collection from October 2021 to September 2022 and reported retrospective costing data for the period July 1, 2020, through June 30, 2021. The participating registries were purposively selected to ensure a balanced representation of registry attributes across several dimensions, including the following: case volume; region; size of area served; rurality; sources of additional (non-NPCR) funding, such as state or National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) Program funding; and data quality attainment. Participating registries reported on resource use in terms of labor (from time spent on each activity by staff member) and other costs associated with registry activities.

Among our sample, we identified registry locations based on the four US census regions (Midwest, Northeast, South, and West). We defined registries based on one of three case volume categories: low volume (registries reporting fewer than 10,455 cases per year), medium volume (registries reporting 10,455 to 26,558 cases per year), or high volume (registries reporting more than 26,558 cases per year). Registries were identified as fitting into one of three sizes of area served: small (less than 44,453 square miles), medium (44,453 to 70,684 square miles), or large (more than 70,684 square miles). We identified registries as fitting into one of three categories that are based on the presence of rural areas within the area served: low (more than 147 residents per square mile), medium (58 to 147 residents per square mile), or high (fewer than 58 residents per square mile). We determined that registries were in one of three quality attainment categories by using the most recently

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available data at the start of the study: always (registries that met the 12-month standard for all years [2014–2017]), sometimes (registries that met the 12-month standard at least once in 2014–2017 and met 24-month standards for all years [2014–2017]), or seldom/never (registries that did not meet 24-month standards for all years [2014–2017]).

Using multiple modalities, we collected activity and costing data, which facilitated a comprehensive understanding of resource use for each registry. Prior studies have found that registry engagement is critical to ensuring the collection of high-quality data (Cole Beebe, Subramanian, Tangka, Weir, Babcock, and Trebino, 2018). To that end, we engaged participating registries early in the research process and throughout to ensure that data collection tools were appropriately tailored to each registry while retaining sufficient standardization to allow for meaningful comparisons across registries.

## 2.2 Data Collection Approach

Building on prior studies, we refined our study approach, developed a draft list of registry activities, and developed draft data collection tools (Cole Beebe, Subramanian, Tangka, Weir, Babcock, et al., 2018; Subramanian, Tangka, Cole Beebe, Trebino, Weir, et al., 2016; Tangka, Subramanian, Cole Beebe, Weir, Trebino, et al., 2015). Figure 1 provides a high-level illustration of our approach to engaging registries and collecting data. Our data collection modalities included registry interviews, prospective staffing surveys, and retrospective costing data collection. We held conference calls with each registry to provide an overview of the study goals and methodology and a draft activities list. These calls also included interviews during which registries shared insights about their data collection processes, data sources, as well as barriers and facilitators of quality case reporting. As a next step, we collaborated iteratively with each registry to finalize a tailored list of registry activities. Using these lists, our team refined both data collection instruments (i.e., prospective staffing survey and retrospective costing tool).

This study is unique because the timing of data collection overlapped with the COVID-19 public health emergency (PHE). Our approach to collaborating with registries during study design and throughout data collection allowed us to identify early a new activity category related to COVID-19 research and support activities.

**2.2.1 Prospective Staffing Survey:** We collected Microsoft Excel–based prospective staffing surveys from staff in roles related to data management, data acquisition and data processing, quality control, education and training, and computers or IT. Each survey represented a prospective snapshot of a 2-week period. During the period, registry staff recorded hours (rounded to the nearest half hour) worked each day on various registry activities by using the prospective staffing survey tool. We provided each registry and its participating staff with a copy of the data collection instrument and a document with descriptions of all registry activities; both items were tailored to the registry. In addition to reporting time spent on each registry activity, survey participants had the opportunity to provide clarifying comments or other information to provide further detail. Before the start of the data collection period, we met with registry staff to provide training and answer questions. We also provided support, as needed, during each 2-week data collection period.

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Accounting for the cyclical nature of some cancer registry activities, registry staff completed three snapshots, resulting in a total of 18 prospective data submissions per registry. To minimize burden during busy periods, registries varied in the timing and spacing of the 2-week snapshots, which were, in some cases, affected by staff being deployed to support COVID efforts. Registry costs range from fixed to variable depending on the activity associated with the cost. Examples of fixed costs include those associated with management/administration activities, setting up data acquisition, or developing analytic files. Variable costs vary with case/record volume as well as the number of reporting sites and include those associated with active data collection, data validation/quality assurance, performing data linkages. Table 1 presents a standardized list of registry activities.

**2.2.2 Retrospective Costing Tool:** Each participating registry submitted a retrospective costing survey, which included seven modules to capture information on registry funding sources; personnel activities and expenditures; costs associated with computers, travel, training, or other materials; costs associated with software licensing; and overhead or indirect costs. Registries reported information on costing data elements and allocated these costs to specific cancer registry activities.

In addition to the tailored Excel-based costing tool, each registry received a user's guide and training before the start of data collection and technical assistance (as needed) during the data collection process. This tool collects information on a standardized set of costing data elements and allocates costs to specific cancer registry activities. Registries reported on the period July 1, 2020, through June 30, 2021.

The *Funding Sources* data module collected information on total funds received that were expended during the reporting year, including all funding sources. Registries were instructed to report funding information for the reporting year and not budget figures. The *Registry Personnel* data module collected information on the personnel expenditures related to the registry activities, including job titles, full-time equivalents, and salaries. The *Retrospective Staffing* module collected information on the estimated percentage of time spent on various registry activities in the past year by each of the registry staff identified in the Registry Personnel module. The *Consultants* module collected information on the job titles, annual payments, and activities performed by consultants (defined as individuals with whom the registry had a formal agreement to perform registry activities) or other personnel who are not employed by the registry. In addition, we asked recipients to include any contractual expenditure not reported elsewhere. The *Computers, Travel, Training, and Other Materials* module collected information on the costs associated with computers, travel, and training. The *Software* module collected information on the costs associated with software licensing used by registries and amount paid during the reporting year. The *Overhead* module collected information from the registries on indirect costs, the types of costs included in the overhead or indirect cost categories, and amount of such costs paid during the reporting year.

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### 2.3 Data Analysis

We reviewed each data submission and worked iteratively with registry staff to update or clarify data reported, as necessary. Our goal was to capture data that accurately reflected the operations of each individual registry while maintaining the ability to roll data up to standardized categories to ensure meaningful cross-registry comparisons. Registries varied in their use of the open comment fields within the data collection tools, which often provided insight that enriched our understanding of registry operations and barriers or facilitators to high-quality cancer data collection.

After finalizing each registry's data submissions, we analyzed data for each prospective staffing snapshot and compared resource allocation with the retrospective costing data. We shared summarized and registry-specific data with each participant for their review. Given the cyclical nature of some registry activities and the variation in timing of snapshots across registries, we performed a quarterly analysis based on timing of each snapshot submission. We did not find substantial variation in activity patterns across quarters and therefore opted to analyze prospective staffing data collectively and report aggregate results. Building on findings from prior analyses showing that case volume is a major driver of registry cost, we present total registry funding and activity-based costs by case volume (Tangka, Subramanian, Cole Beebe, Weir, Trebino, et al., 2015).

## 3. Results

Table 2 summarizes characteristics of the 21 registries in NPCR participating in this study. Of the 21 participating registries, 29% were classified as high volume, 43% were classified as medium volume, and 29% were classified as low volume. Participating registries were geographically situated in the Midwest (29%), Northeast (19%), South (24%), and West (29%) regions of the United States. Of the 21 registries, 38% served large areas, 38% served medium-sized areas, and 24% served small areas. Sources of registry funding were limited. Most registries (86%) received only state funding in addition to NPCR funds, whereas 14% received other federal funding (typically from NCI SEER). Participating registries primarily served areas with a low presence of rurality (43%), whereas 24% served areas of medium rurality, and 33% served areas of high rurality. Among the participating registries, 38% always met quality attainment, 29% sometimes met quality attainment, and 33% seldom or never met quality attainment.

Table 3 compares reported resource allocation from prospectively reported staffing data and retrospectively reported costing data. Our analysis shows that the individual 2-week snapshots of how registry staff distributed time across registry activities provided a reasonable reflection of overall registry resource allocation when considering all registry costs for a 1-year period. In the prospectively and retrospectively reported data, the top four activity groups represented 80% and 79% of registry resources in the aggregate prospective staffing and retrospective costing data, respectively. The plurality of registry resources was allocated to data processing (44% and 38%, respectively), followed by data acquisition (19% and 20%, respectively), management/administration (11% in both the prospective and retrospective data), and data reporting (6% and 10%, respectively). Given the consistency

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between the prospective and retrospective data, we focus on the retrospective costing data for the remainder of this article.

Figure 2 presents total costs by case volume. On average, registry spending increased with case volume, with low-volume registries spending on average $591,423 per year, medium-volume registries spending $1,592,365 per year, and high-volume registries spending $1,741,131 per year for the reporting period from July 1, 2020, through June 30, 2021. Relative to registries with a medium case volume, low- and high-volume registries have a narrower, less skewed distribution. This same pattern tends to hold for individual activities or activity groups, as well.

Figure 3 shows the distribution of registry resources across registry activity groups by case volume. The data processing category represents the largest share of registry activities across all three case volume groups, with high-volume registries allocating the highest percentage (44%) of resources followed by low-volume (37%) and medium-volume (32%) registries. High-volume registries spend more annually (see Figure 2), but activities that are more likely associated with fixed costs may not vary significantly by case volume. For example, registries regardless of size tended to spend similar amounts on management and administrative activities, but those activities represented a smaller share of overall spending for high-volume registries, as seen in Figure 3.

The next largest share of registry resources was allocated to data acquisition activities (see Figure 3). Medium-volume registries allocated the largest share (24%) of total registry resources to data acquisition relative to high-volume (18%) and low-volume (17%) registries. Although high-volume registries allocated the next largest percentage of registry funds (8%) to data reporting activities, low- and medium-volume registries spent a larger share of resources on management and administrative activities (14% and 12%, respectively). Across volume categories, registries allocated a relatively small portion of resources to IT support activities (5%, 4%, and 6% for high-, medium-, and low-volume registries, respectively).

Figure 4 presents the distribution of registry resources allocated within data acquisition activities by case volume. The percentages reported represent the percentage of spending on data acquisition activities. Registries spent more resources on case finding and data abstraction of non-hospital records (35%, 36%, and 34% by high-, medium-, and low-volume registries, respectively) than any other data acquisition activity. This was followed by activities performed to set up data acquisition (20%, 16%, and 19% for high-, medium-, and low-volume registries, respectively) and monitoring of registry data or conducting follow-back activities for missing information (18% for high- and medium-volume registries and 14% for low-volume registries). Active data collection represented 17% of spending on data acquisition activities among low-volume registries, compared with 5% and 1% for medium- and high-volume registries, respectively.

Figure 5 presents the distribution of registry resources allocated within the data processing activity group by case volume. The percentages reported represent the percentage of spending on data processing activities. Activities associated with performing data edits and

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case consolidation consistently represented the largest share of registry resources allocated to data processing, with an average share of 52% for low-volume registries, 36% for medium-volume registries, and 61% for high-volume registries. Data validation and quality assurance activities consistently represented the second largest share of resources devoted to data processing activities, with high-, medium-, and low-volume registries allocating 17%, 22%, and 26% of data processing resources, respectively.

## 4. Discussion

Our analysis of the retrospective costing data aligns with findings from previous studies, which identified registry case volume as a significant driver of registry expenditures and resource allocation, suggesting economies of scale in high-volume registries (Tangka, Subramanian, Cole Beebe, Weir, Trebino, et al., 2015). Although high-volume registries have higher annual expenditures, they spend similar dollar amounts on activities with substantial fixed costs (e.g., management and administrative activities). Consequently, those activities represent a smaller share of overall spending for high-volume registries. Although activities associated with data processing, followed by data acquisition, require the most registry resources, regardless of case volume, high-volume registries spend more on these activities, followed by medium- and low-volume registries.

The most resource-intensive activities include data edits and case consolidation, data validation and quality assurance, case finding and data abstraction of non-hospital records, monitoring of registry data, and conducting follow-back activities for missing information. We previously found similar patterns of resource allocation across all registries in NPCR (Cole Beebe, Subramanian, Tangka, Weir, Babcock, et al., 2018). Unlike high- and medium-volume registries, low-volume registries allocate a substantial portion of their data acquisition resources on active data collection, which includes acquiring data actively via registry staff who directly visit the source to obtain data, actively acquiring data through remote access to a database of the source, or acquiring data through mailed records. Direct IT services (those provided by IT staff or consultants) represent a relatively small portion of activities across all registries.

### 4.1 Lessons Learned

Case volume continues to drive registry spending overall and among registry activities associated with variable costs (typically labor-intensive activities), suggesting opportunities for cost savings with the adoption of data modernization approaches. Manual data collection and validation costs vary with case volume. While all registries receive at least some data electronically, variation exists in the quality of data reported electronically. Increasing availability and accessibility of standardized reporting and common data standards are necessary. Advances in automation of data collection and validation through electronic reporting and data checks and moving to the cloud will reduce the impact of case volume on costs. Our findings also indicate that retrospective costing data collection using a tailored approach can yield accurate information because we were able to validate our retrospective data collection with prospective data obtained for selected periods. This finding will inform

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future studies, which may reduce burden for study participants if prospective data collection is eliminated.

Active registry engagement is a critical component of priority NPCR evaluation activities. This study has benefitted from input from registry staff throughout the process. Many contextual factors, such as quality of reporting sources and historic processes, impact registry operations, and feedback from registry staff is essential to understanding the impact of these factors on activity-based cost. Any future work in this space, or similar work with other disease registries or related entities, should consider incorporating feedback and knowledge sharing from the registries or similar entities.

### 4.2 Limitations

The analysis presented here is based on a subset of central cancer registries that were selected to capture a variety of registry characteristics and does not consider potential interactions among characteristics. The small sample size is more sensitive to outliers, which can shift calculated averages. Data reported prospectively represented 2-week snapshots, which may result in some cyclical registry activities not being captured in any prospective staffing survey. Retrospective costing data were reported for a prior year-long period and are subject to recall bias. We designed and planned this study before the COVID-19 PHE, which was in effect during the data collection period. Many registries had to shift staffing resources to support COVID-19 response, potentially disrupting normal registry operations. Without registry input and feedback, the impact of the unprecedented COVID-19 PHE on operations of some registries may have been underestimated. Our study results may not be illustrative of non-PHE times. Further, we have yet to understand the persistent effects of the pandemic on how we will work going forward, so although the data may not be entirely reflective of historical (pre-PHE) experience, that experience may also look different from post-PHE experience.

## 5. Conclusion

Our analysis continues to show that case volume can be a driver of registry costs and factors into how registry resources are allocated. The increasing adoption of health IT by health care providers in the form of electronic medical records (EMRs) may facilitate innovative cancer data transfer and processing approaches, which may increase timeliness of data collection and reduce the labor resources required for processing manually collected data. Real-time data can provide a better understanding of the disease and treatment, which can direct better care for patients. Surveillance strategies, such as electronic reporting and automation (e.g., the Association of Public Health Laboratories [APHL] Informatics Messaging Services [AIMS] platform, which allows laboratories to report electronically through one connection that includes data checks), may result in high-quality case consolidation and reduce costs associated with data acquisition and processing. External factors influence the pace at which individual registries may adopt innovations like health IT. Future analyses of registry operations considering electronic reporting and timeliness and quality of registry data may provide insight into how registries with early adoption of electronic reporting are adapting operations to maximize efficiency for resource use and data quality. Maximum efficiency

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is vital because real-time cancer data acquisition is the primary goal of data modernization strategies implemented by NPCR, states, hospitals, and other entities participating in a technologically evolving health information exchange.

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## Abbreviations

| | |
|---|---|
| **DMI** | Data Modernization Initiative |
| **PHE** | Public Health Emergency |

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## Highlights

- Opportunities for cost savings with the adoption of data modernization approaches by U.S. cancer registries.
- Registry engagement throughout the course of the study is critical.
- Case volume drives cost and efficiencies in variable-cost activities may avail resources for other registry activities.
- Data acquisition and data processing (both variable-cost) are the two most resource-intensive cancer registry activities.
- Retrospective costing data collection can yield accurate information as evidenced by alignment with prospective data.

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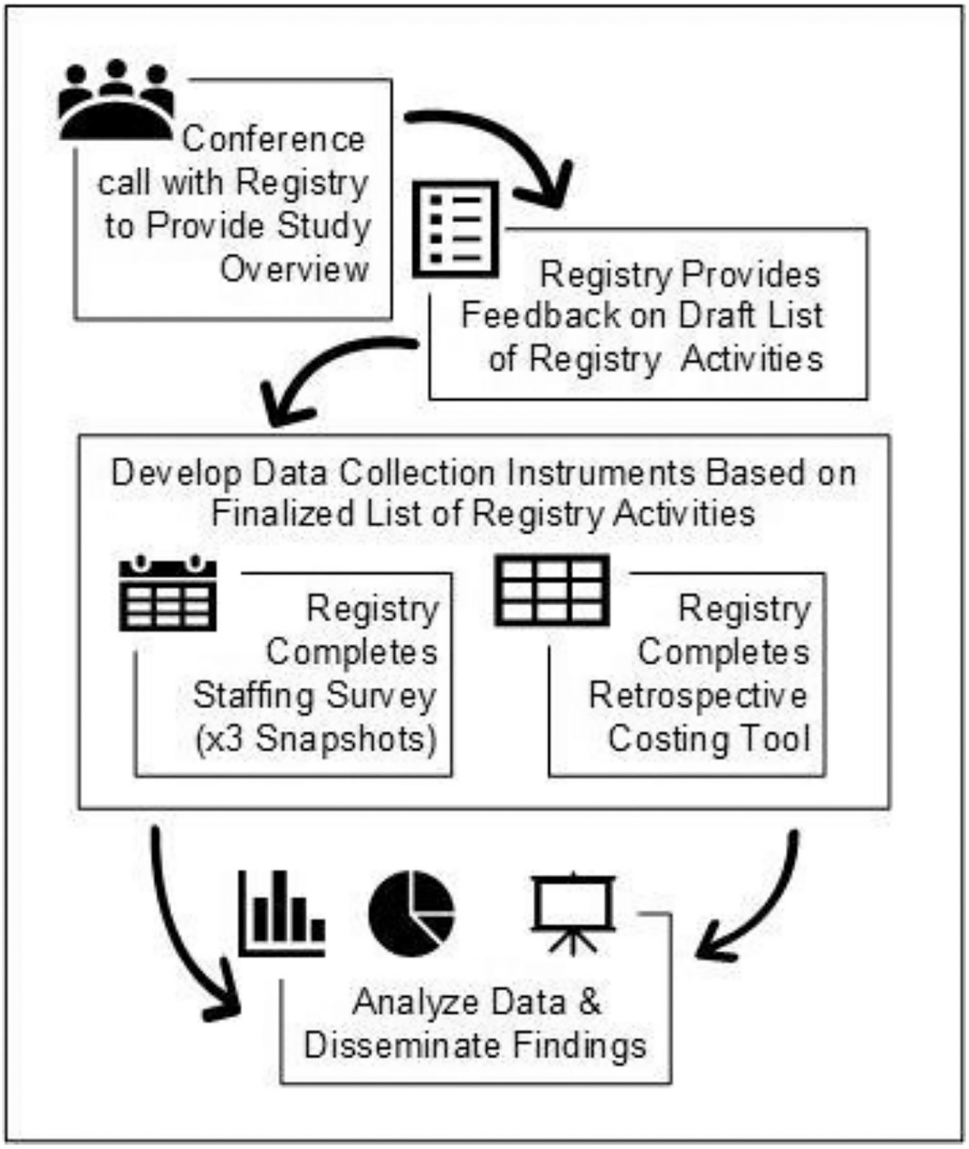



**Figure 1.**
Registry engagement, data collection, and analysis.

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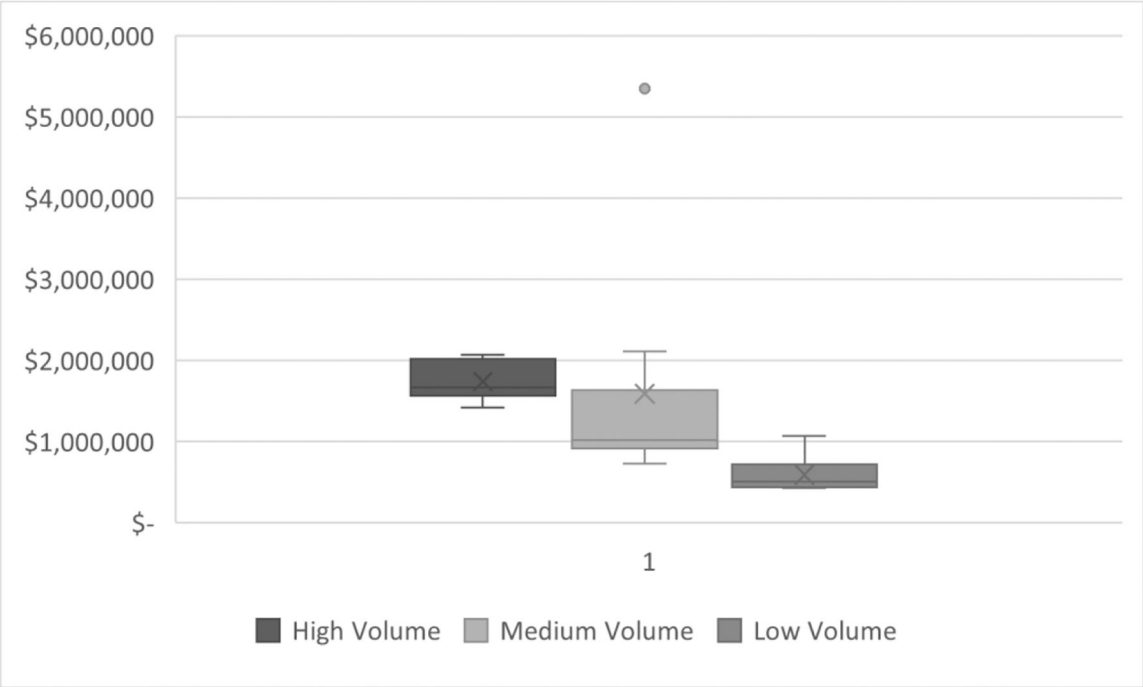



**Figure 2.**

Total registry expenditures, by case volume: July 2020–June 2021.

Note: High-volume registries report >26,558 cases per year, medium-volume registries report 10,455 to 26,558 cases per year, and low-volume registries report <10,455 cases per year.

Source: RTI and CDC analysis of NPCR COPE retrospective costing data for the period from July 1, 2020, through June 30, 2021.

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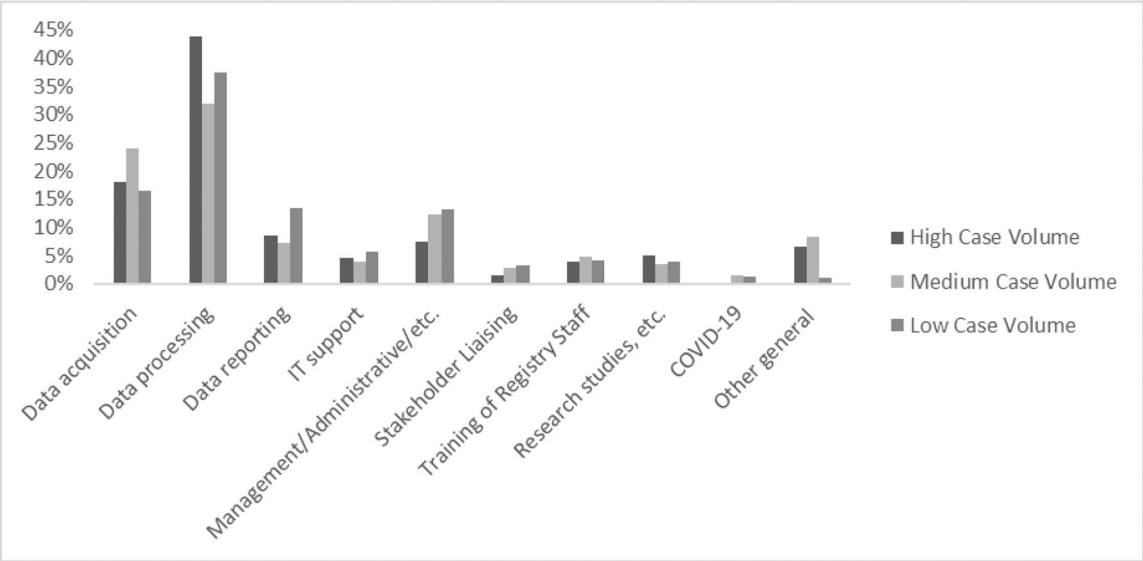



**Figure 3.**

Distribution of registry resources across activities, by case volume: July 2020–June 2021.

Note: "Registry resources" refers to the total value of staffing and non-staffing expenditures.

Source: RTI and CDC analysis of NPCR COPE retrospective costing data for the period from July 1, 2020, through June 30, 2021.

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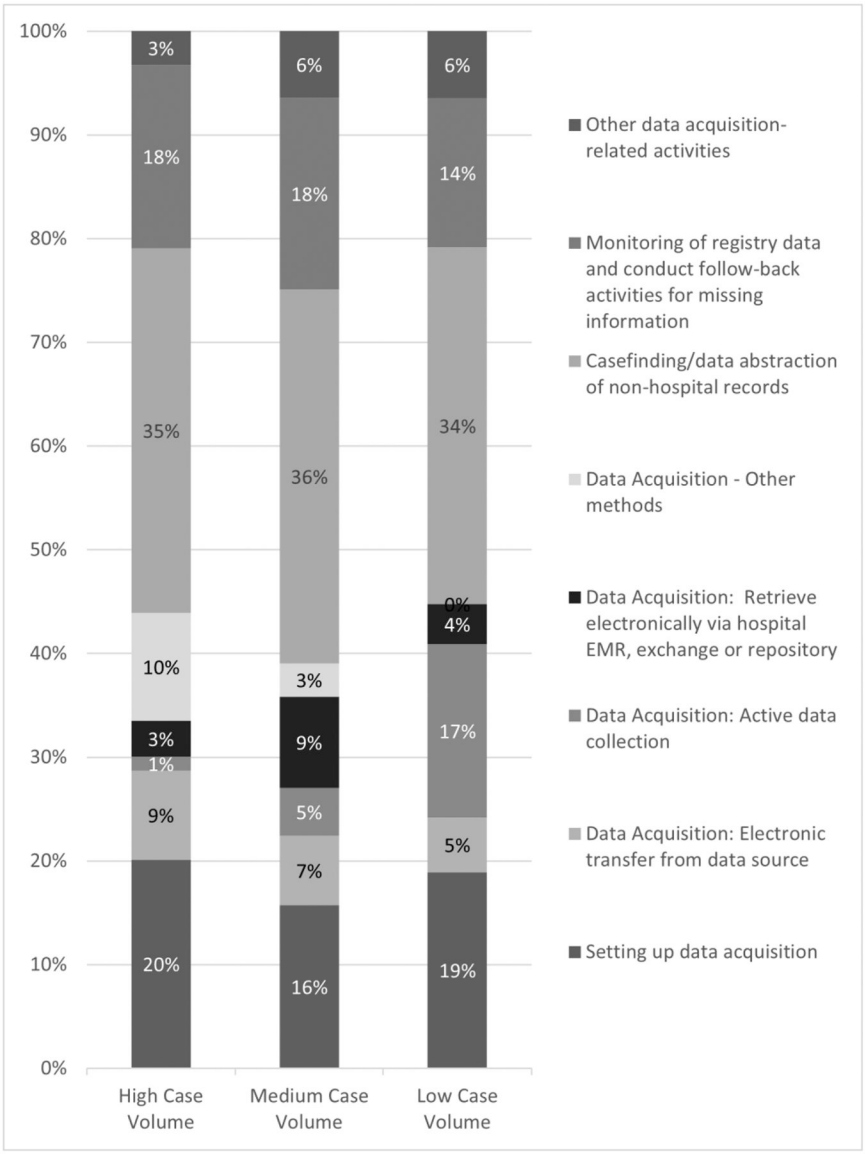



**Figure 4.**

Distribution of registry resources within data acquisition activities, by case volume: July 2020–June 2021.

Note: “Registry resources” refers to the total value of staffing and non-staffing expenditures.

Source: RTI and CDC analysis of NPCR COPE retrospective costing data for the period from July 1, 2020, through June 30, 2021.

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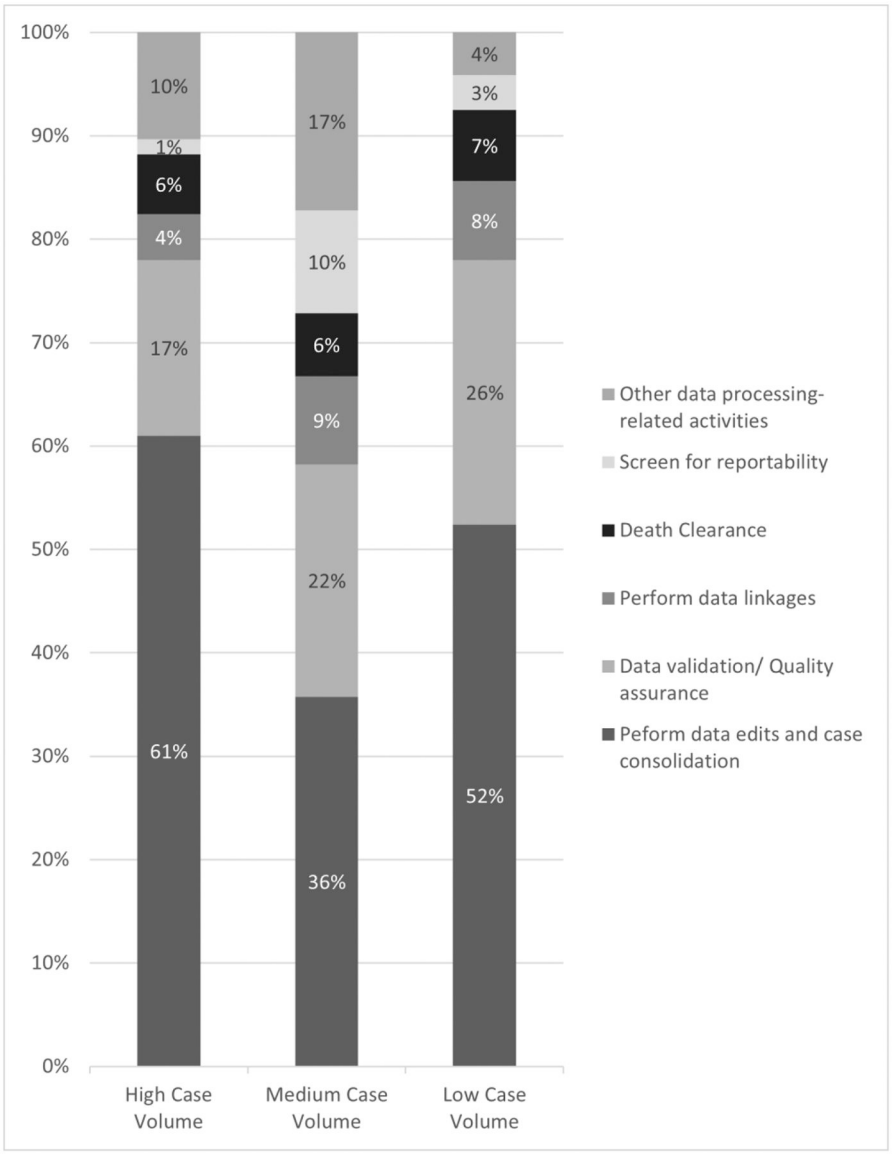



**Figure 5.**

Distribution of registry resources within data processing activities, by case volume: July 2020–June 2021.

Note: “Registry resources” refers to the total value of staffing and non-staffing expenditures.

Source: RTI and CDC analysis of NPCR COPE retrospective costing data for the period from July 1, 2020, through June 30, 2021.

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**Table 1.**

Standardized list of registry activities.

| Activity group | Registry activities |
|---|---|
| Data acquisition | Setting up data acquisition |
| | Data acquisition: Electronic transfer from data source |
| | Data acquisition: Active data collection |
| | Data acquisition: Retrieve electronically via hospital electronic medical record, exchange, or repository |
| | Data acquisition: Other methods |
| | Case finding/data abstraction of non-hospital records |
| | Monitoring of registry data and conducting follow-back activities for missing information |
| | Other data acquisition–related activities |
| Data processing | Perform data edits and case consolidation |
| | Data validation/quality assurance |
| | Perform data linkages |
| | Death clearance |
| | Screen for reportability |
| | Other data processing–related activities |
| Data reporting | Develop analytic files, analyze data, generate reports, and report data |
| | Support data requests for research or special studies |
| | Other data reporting–related activities |
| General | IT support |
| | Management/administrative/document policies and procedures |
| | Partnerships and collaborations |
| | Training of registry staff |
| | Research studies, advanced analysis, publications, or websites |
| | COVID-19 (including deployment to front-line COVID-19 response teams) |
| | Other general activities |

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**Table 2.**

Overview of registry attributes.

| **Registry attributes** | **N (%)** | | **N (%)** |
|---|---|---|---|
| Total | 21 (100) | | 21 (100) |
| Case volume | | Sources of additional funding | |
| High (>26,558 cases) | 6 (29) | Other federal (SEER) and state | 3 (14) |
| Medium (10,455 to 26,558 cases) | 9 (43) | State | 18 (86) |
| Low (<10,455 cases) | 6 (29) | | |
| Region | | Quality attainment | |
| Midwest | 6 (29) | Always | 8 (38) |
| Northeast | 4 (19) | Sometimes | 6 (29) |
| South | 5 (24) | Seldom/never | 7 (33) |
| West | 6 (29) | | |
| Size of area covered by registry | | Prescence of rural areas | |
| Large (>70,684 square miles) | 8 (38) | Low (>147 residents per square mile) | 9 (43) |
| Medium (44,453 to 70,684 square miles) | 8 (38) | Medium (58 to 147 residents per square mile) | 5 (24) |
| Small (<44,453 square miles) | 5 (24) | High (<58 residents per square mile) | 7 (33) |

Notes: Some categories may not sum to 100% because of rounding. For "Quality attainment," *Always* refers to registries that met the 12-month standard for all years (2014–2017), *Sometimes* refers to registries that met the 12-month standard at least once in 2014–2017 and met 24-month standards for all years (2014–2017), and *Seldom/never* refers to registries that did not meet 24-month standards for all years (2014–2017).

Source: RTI and CDC analysis of NPCR Cost Optimization and Process Efficiency (COPE) registry database.

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**Table 3.**

Comparison of registries' prospectively and retrospectively reported distribution of staffing resources, by registry activity group: 2020–2021.

| Registry activity group | Prospective round 1 | Prospective round 2 | Prospective round 3 | Prospective average | Retrospective |
|---|---|---|---|---|---|
| Data acquisition | 18% | 18% | 19% | 19% | 20% |
| Data processing | 47% | 43% | 42% | 44% | 38% |
| Data reporting | 6% | 6% | 6% | 6% | 10% |
| IT support | 3% | 3% | 4% | 4% | 5% |
| Management/administration, etc. | 11% | 11% | 10% | 11% | 11% |
| Partnerships and collaborations | 2% | 3% | 3% | 3% | 2% |
| Training | 5% | 5% | 6% | 5% | 4% |
| Research studies, advanced analysis, publications, websites | 2% | 2% | 2% | 2% | 4% |
| COVID-19 | 2% | 1% | 2% | 2% | 1% |
| Other general | 3% | 6% | 7% | 5% | 6% |

Source: RTI and CDC analysis of NPCR COPE prospective staffing and retrospective costing data. Prospective staffing data were reported during 2020–2021, with exact timing varying by registry. Retrospective costing data were reported for the period from July 1, 2020, through June 30, 2021.