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Abbreviations:
AAP, American Academy of Pediatrics; AHRF, Area Health Resources Files; API, Application Programming Interface; ASPR, Assistant Secretary for Preparedness and Response; CAHMI, Child & Adolescent Health Measurement Initiative; CHR&R, County Health Rankings & Roadmap; COE, Center of Excellence; CYSHCN, Children and youth with special health care needs; ED, Emergency department; EIIC, EMSC Innovation and Improvement Center; EMSC, Emergency Medical Services for Children; FEMA, Federal Emergency Management Agency; HRSA, Health Resources and Services Administration; HVA, Hazard Vulnerability Analysis; IRB, Institutional Review Board; NPRP, National Pediatric Readiness Project; PsSTART, Psychological Simple Triage and Rapid Treatment; RAPT, Resilience Analysis and Planning Tool; REDCap, Research Electronic Data Capture; SME, Subject matter expert

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A Pediatric-Focused Self-Assessment Tool on Vulnerabilities to Aid Regional Disaster Planning

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Abstract

Objective: A significant number of disaster and emergency victims are children. Yet, many hospitals are ill-prepared to care for these patients during disasters, as identified by the National Pediatric Readiness Project's survey of hospital pediatric disaster plans. The Region V for Kids Center of Excellence created a self-assessment tool to help regions identify vulnerabilities and ways to enhance care for vulnerable children and families.

Methods: Region V for Kids identified 9 key domains (eg, infrastructures and support mechanisms) that are important to safeguard children's and families' care during disasters. A self-assessment tool to assess these domains was distributed to 24 regional health care coalitions along with a 9-question usefulness survey. The self-assessment tool addressed 3 of the original domains, which have regional or national open-source databases and datapoints that health care coalitions can access for their responses.

Results: The survey received a 50% response rate. Approximately 40% of respondents indicated they were "somewhat likely" to make changes based on data gathered by the tool. The original self-assessment tool was revised to create an expanded web-based version.

Conclusions: Health care coalitions and localities can use this tool to evaluate pediatric preparedness, identify needed improvements, and improve outcomes for children, families, and communities.

Throughout its history, the United States has endured numerous disasters—including the recent coronavirus disease (COVID-19) pandemic—which highlight the need for a robust, well-prepared emergency management system. Such a system is essential in regions and for communities' ability to prepare for and respond to disasters and other emergencies. Yet, in these situations, health care systems often serve adults much better than children, despite the fact that children comprise more than 20% of the US population and 25–30% of all individuals injured or affected by disasters.[1,2]

Health care systems and other stakeholders are often unaware that their preparedness plans do not fully encompass children's needs. Gaps in the capacity to respond to pediatric emergencies in typical environments translate to reduced preparedness and worse outcomes when disasters occur.[3] Alarmingly, the 2013 National Pediatric Readiness Project (NPRP) survey found that about 1/2 of US hospitals lack a pediatric-specific disaster plan.[1,3] Given that the majority of children (80%) present to a general emergency department (ED)—rather than a pediatric-specialized ED—children risk being cared for in environments that could be severely challenged during a disaster.[3]

To address this need, the US Assistant Secretary for Preparedness and Response (ASPR) has engaged in multiple capacity-building efforts to ensure that the health care system is better prepared to take care of pediatric patients—in both normal and disaster conditions. Preparedness includes the ability to address the significant differences in anatomy, physiology, developmental, and medical needs associated with caring for children.[1,4,5] Preparedness requires proper training for ED staff as well as access to pediatric-appropriate equipment, medication, and supplies in both the prehospital and hospital settings.[3]

To further these efforts, in 2019, ASPR funded Region V for Kids (formerly, the Eastern Great Lakes Pediatric Consortium for Disaster Response), 1 of 2 Pediatric Disaster Centers of Excellence (COE). The COE seek to identify best practices and raise situational awareness about pediatric needs during disasters and other emergencies. They also strive to ensure everyday readiness in order to improve disaster preparedness for children and their families.

One important strategy to achieve everyday pediatric readiness, ensure disaster preparedness, and mitigate the disaster cycle is to use standardized metrics to assess the available responses and resources in a given region. A regional approach to pediatric preparation and response is essential to meeting a given community's needs. Some disasters are similar regardless of where they occur—such as school shootings or terrorist attacks. Yet, many disasters are characterized by the region in which they occur, as well as by variations in the

region's ability to respond. For example, with respect to natural disasters, regions on the West Coast should prepare for earthquakes and wildfires, whereas those in the Southeast should prepare for hurricanes. Likewise, more populated, urban regions have different resources and challenges compared to less populated, rural regions.

Region V for Kids seeks to address the significant fact that most Hazard Vulnerability Analysis (HVA) tools that are used to understand and prepare for children's health care needs—including disaster- and emergency-related risks and challenges—only address adults' needs. There is a pressing need for tools to help identify pediatric health care vulnerabilities before disasters and other emergencies to enhance readiness and ensure that their needs are better addressed when a crisis occurs.[6] To advance this goal, Region V for Kids identified key domains (eg, infrastructures and support mechanisms) that can help regional health care coalitions and other stakeholders better prepare for disasters and meet the needs of vulnerable children and families during disasters and other emergencies. It is hoped that the creation and distribution of this tool will raise regional awareness about children's and families' needs both on a day-to-day basis and when emergencies occur.

Methods

Development of the Self-Assessment Tool

Region V for Kids created a generalizable self-assessment tool that regional health care coalitions and other stakeholders can use to identify vulnerabilities for children and families, identify needed improvements that can lead to better preparedness, facilitate rapid recovery after emergencies and disasters, and improve outcomes for children, families, and the community.

A modified Delphi process was used to develop the self-assessment tool. This group consensus strategy involves using a variety of tools to reach agreement on a specific topic—in this case, pediatric disaster preparedness. The Delphi process included a literature review, assessment of the available data, solicitation of stakeholder opinions, and the judgment of 12 pediatric disaster subject matter experts (SMEs). These SMEs represented the 2 COEs, the Emergency Medical Services for Children's Innovation and Improvement Center (EMSC EIIC) Disaster Domain, and the American Academy of Pediatrics' (AAP) Council on Children and Disasters.

The SMEs identified 9 domains that have particular importance to children and families in the disaster cycle. These domains capture information that can help regions understand vulnerabilities within their communities and create appropriate mitigation strategies.[7] In the SMEs' opinions, self-assessment of these specific domains can help health care coalitions understand the infrastructures and support mechanisms that are available and/or lacking for children within their specified region. The domains describe availability of health care resources, supportive programs for children, and other social and physical determinants of health that impact pediatric well-being.

The 9 domains are:

1. *Health care expertise available within a region*: assesses the availability of health care professionals who have pediatric training and provide care to the pediatric population, including children and youth with special health care needs (CYSHCN). This domain supports the development of pediatric expertise.
2. *Mental health considerations:* assesses the availability of behavioral and mental health professionals and resources that can meet pediatric needs.
3. *Community resiliency*: assesses the community's ability to use its assets to strengthen public health and health care systems and improve the community's physical, behavioral, and social health to withstand, adapt to, and recover from disasters.
4. *Early education and schools*: assesses the availability of instructional and/or supervised facilities that are open on a daily basis and exist outside of the child's home.
5. *Transportation services*: assesses the availability of prehospital and specialized transport assets in the region, medical and non-medical transportation resources serving children, and public transportation.
6. *Public health jurisdiction*: identifies all public health programs that have pediatric experience.
7. *Shelters and sheltering in place*: assesses the availability of established plans to provide shelter services in educational, child care, and community settings.
8. *Supply chain and patient tracking*: assesses the availability of supply chains that deliver items both needed to adequately care for children and that are unique to children's needs.
9. *Reunification and evacuation*: assesses the availability of plans and processes to assist unaccompanied minors who are separated from their family during a disaster.

Pediatric disaster experts conducted an extensive database review with supporting literature and data elements to identify and assess resources that could inform quality measures within these 9 domains. The review indicated that only 3 domains were associated with open access data elements that were widely available for use by those seeking to assess the domain's characteristics (this included regional and national databases). These domains were health care expertise available within a region, mental health considerations, and community resiliency. The SMEs developed classifications, measures, and datapoints for these 3 domains.

Based upon the results of the Delphi process and the available databases, Region V for Kids created a self-assessment tool for use by regional health care coalitions. The self-assessment tool includes 16 questions about the domains: 4 regarding expertise available in the region, 3 about mental health considerations, and 9 assessing community resiliency. Each domain-related question includes links to national open-source databases that can help complete the self-assessment (Table 1).

Pilot Testing and Evaluating the Self-Assessment Tool

Region V for Kids piloted the self-assessment tool among 24 regional health care coalitions in 3 states (Ohio, Michigan, and Missouri) to assess community-level awareness about factors that are important for children and families during the disaster cycle.

In addition, Region V for Kids sought to evaluate the self-assessment tool's value to these regional health care coalitions. To this end, an Institutional Review Board (IRB) approved a 9-question usefulness survey that was provided in conjunction with the self-assessment tool, to gather feedback about its ease of use, the domains assessed by the tool, and perceived gaps in the self-assessment information.

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Table 1. Domains, datapoints, and available databases for the 3 domains included in the self-assessment tool

Domain	Datapoint	Database and source
Expertise in the region	Number of children per health care professional by county	Health Resources and Services Administration (HRSA) Area Health Resources Files (AHRF): https://data.hrsa.gov/topics/health-workforce/ahrf
	Number of advanced practice registered nurses with a national provider identifier	Health Resources and Services Administration (HRSA) Area Health Resources Files (AHRF): https://data.hrsa.gov/topics/health-workforce/ahrf
	Number of health-diagnosing and treating practitioners per 1000 population	Federal Emergency Management Agency's (FEMA) Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Number of hospitals in the region with any of the following designations: American College of Surgeons—Committee on Trauma Verification; American College of Obstetricians and Gynecologists—Levels of Maternal Care; AAP NICU Verification—Level of Neonatal Care	American College of Surgeons, directory of verified trauma centers: https://www.facs.org/search/trauma-centers
Mental health considerations	(Ratio) percentage of mental health professionals with valid certifications and licenses who are practicing within a region	County Health Rankings & Roadmaps' (CHR&R) County Health Rankings: https://www.countyhealthrankings.org/explore-health-rankings/measures-data-sources/county-health-rankings-model/health-factors/clinical-care/access-to-care/mental-health-providers
	Estimated percentage of children with a mental, emotional, developmental, or behavioral problem	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health (2016 to present): https://www.childhealthdata.org/browse/survey
	Percentage of children, age 3-17 years, with difficulties obtaining mental health care among those who received or needed care during the past 12 months	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health (2016 to present): https://www.childhealthdata.org/browse/survey
Community resiliency	Percentage of owner-occupied housing units	Federal Emergency Management Agency's (FEMA) Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Percentage of single-parent households	FEMA Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Number of hospitals per 10 000 people	FEMA Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Number of public schools per 5000 population	FEMA Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Rental vacancy rate of total housing units (%)	FEMA Resilience Analysis and Planning Tool (RAPT): https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6
	Number of children living in "working poor" families	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health: https://www.childhealthdata.org/browse/survey
	Family resilience	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health: https://www.childhealthdata.org/browse/survey
	Percentage of families with food insufficiency	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health: https://www.childhealthdata.org/browse/survey
	Number of families that have received food or cash assistance	Child & Adolescent Health Measurement Initiative (CAHMI) Data Resource Center for Child & Adolescent Health, National Survey of Children's Health: https://www.childhealthdata.org/browse/survey

The self-assessment tool and usefulness survey were distributed via REDCap, a secure web application for building and managing online surveys and databases.[a]

[a]Developed by Vanderbilt University, Research Electronic Data Capture (REDCap) is an online electronic data collection software used to design clinical and translational research databases. See: https://www.redcapcloud.com/.

Results

Self-Assessment Tool

Of the 24 regional health care coalitions that received the pilot test, half (12) completed the usefulness survey, a 50% response rate. Respondents ranked the 3 domains in the self-assessment tool by importance. Both "health care expertise available within a region" and "mental health considerations" were assessed by 42% as "very

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Figure 1. Domains included in the regional metrics self-assessment tool, ranked in order of importance to health care coalitions in the usefulness survey.

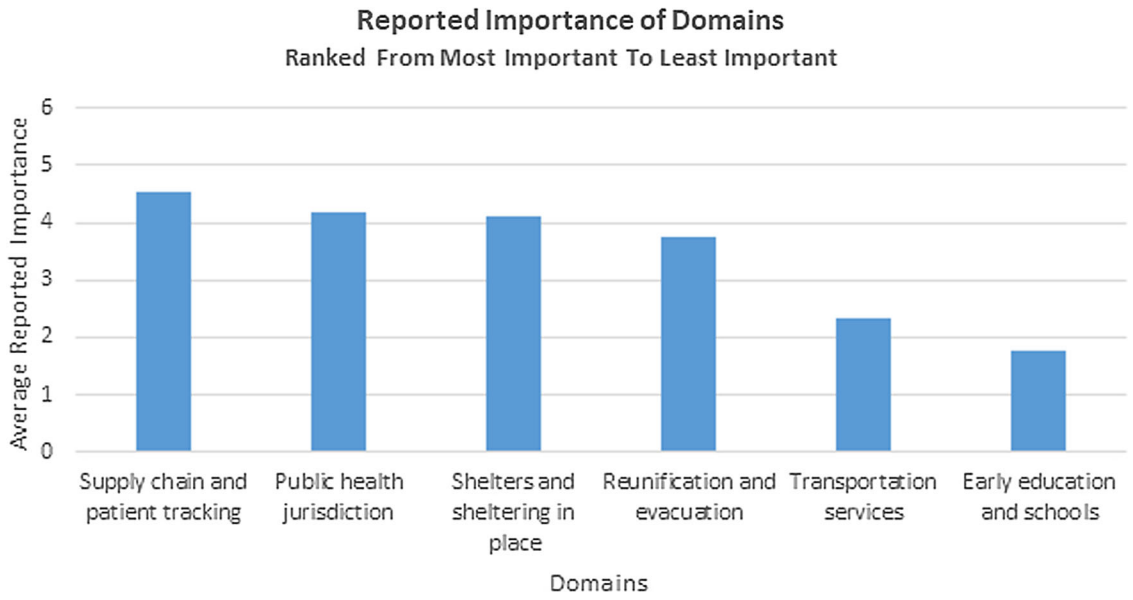

Figure 2. Six domains not included in the regional metrics self-assessment tool, ranked by importance to health care coalitions when considering children and families in the disaster cycle.

useful"; 17% assessed "community resilience" as "very useful") (Figure 1).

Usefulness survey

The usefulness survey indicated that users found the tool time-consuming to complete. Two-thirds (66.7%) of the responding regional health care coalitions reported that they had difficulty interpreting the information from the databases provided in the tool; of those, two-thirds (66.7%) did not know whom to ask for help to complete the self-assessment tool. This finding highlights the challenges stemming from the lack of centralized information on the myriad factors that impact children's health and pediatric readiness, including social and physical determinants of health.

Despite these challenges, 42% of respondents indicated they were "somewhat likely" to make changes based on the data elicited from the tool. Another 42% said they were "not likely" to make changes. None (0%) said they were "very likely" to make changes based on the tool. Open-ended feedback about the assessment tool suggested that health care coalitions are excited about this tool and its implications but struggled with interpreting the self-assessment.

Although the 6 other domains were not included in the self-assessment tool, the usefulness survey asked respondents to rank those domains in terms of their importance to pediatric readiness (from most to least important). Supply chain and patient tracking were deemed to be most important, followed by public health jurisdiction (Figure 2).

Refinement of the self-assessment tool

Region V for Kids next created a revised version of the self-assessment tool in order to help answer users' questions about

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the domains, alleviate ambiguity about the questions, and increase the tool's accuracy. The revision is available online and provides additional context about each domain to help users understand the significance of the data. In addition, resources were added to the web-based version to assist users with developing effective mitigation strategies. The revised version enables regional coalitions to access regional- and county-level data from national, open-source databases. The web-based tool mitigates the need for users to search for data on the domains and provides access to information needed to complete the self-assessment tool.

Discussion

Self-assessment tools, such as HVAs, help regional health care coalitions, hospitals, community hospitals, and other organizations to understand risks and challenges associated with caring for patients, including during disasters and other emergencies. Although such tools are a widely used and standard practice to inform disaster planning efforts, they do not typically include an assessment of specific and/or vulnerable populations—including children. As examples, the Threat Hazard Identification and Risk Assessment, often used by emergency management, does not address children's unique needs during disasters, and Kaiser Permanente's HVA does not include children.

This lack of pediatric assessment and planning is problematic, since children (who comprise more than 20% of the US population) are disproportionately impacted by disasters and other emergencies that lead to ED visits. As an indicator of the scope of need, 22% of ED visits in 2019 were children under 17 years of age.[8] Approximately 10% of all 911 calls are for children, making pediatric readiness a key concern for prehospital providers (eg, Emergency Medical Services), as well as hospitals.[9]

Region V for Kids sought to address this need and build capacity for pediatric disaster planning, by developing a generalizable self-assessment tool on pediatric health care vulnerabilities. The tool is designed to help health care coalitions and localities better incorporate children into regional and hospital pediatric readiness and emergency preparedness efforts.[10] It helps communities assess their health care infrastructure and community supports that impact children's well-being, including assessing the impact on social disparities of health.

Regional health care coalitions, constituents, and other stakeholders can use the information gathered to build mitigation strategies that target identified gaps—before disaster strikes. For example, data about the number of mental health practitioners in a community may reveal a lack of area providers during a crisis (as has been seen during COVID-19). Mitigation strategies could include identifying resources outside of community that could be offered by expanding telehealth options, expanding Psychological Simple Triage and Rapid Treatment (PsSTART) training for health care workers, expanding the workforce through recruitment in conjunction with local training organizations, and so forth.

Next steps include distributing the web-based version of the self-assessment tool to aid health care coalitions, communities, and/or regions to gain a clearer vision of children's and families' vulnerabilities. Following this step, Region V for Kids will broadly disseminate and promote the tool. The organization will also work with federal entities to encourage a regional collection of data that are specific to children and families in disasters, and for the use of these data to inform mitigation strategies.

Moving forward, it will be interesting to note how different US regions perceive the importance of the domains. To date, Region V for Kids has not identified other open-source databases that can provide national data to support the other 6 domains. As the importance of pediatric disaster preparedness is better recognized, it is hoped that additional domains will be supported with new open-source databases, to improve the ability of health care coalitions and communities to assess their readiness across additional domains.

Limitations

Limitations of this study include the small sample size: Only 24 regional health care coalitions from 3 states participated in the pilot test. In addition, coalitions that participated in the usefulness survey were all located in the Midwest region of the United States. It is not known how the collected data will impact future health care coalition practices.

One factor influencing the response rate and willingness to implement changes based on the findings was the fact that the project occurred during the COVID-19 pandemic. Health care coalitions were focused (and often overwhelmed), understandably, by the pressing need to respond to the public health emergency.

Finally, because the self-assessment tool was created for use by the specific health care coalitions, and data on the tool were not collected, no comparison can be made at this time between the coalitions. The self-assessment tool did not include resources or feedback on how responding health care coalitions could make improvements if they discovered deficiencies in any specific domain.

Conclusion

Use of a generalizable self-assessment tool on pediatric vulnerabilities identifies gaps that are likely to affect a community's children and families during disasters and other emergencies. When used at least annually, Region V for Kids self-assessment tool can inform where improvements and further attention are needed to better prepare for future disasters and improve outcomes for children, their families, and the entire community.

This self-assessment tool on pediatric vulnerabilities meets the pressing need for a tool that can be used by stakeholders to ensure that their communities are planning for and able to respond to children's everyday needs, and during disasters and other emergencies. Closing gaps for this vulnerable population is an important step for communities to work to ensure their disaster recovery and mitigation strategies meet the needs of children and families.

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References

1. **Chiu M, Goodman L, Palacios CH, Dingeldein M.** Children in disasters. *Semin Pediatr Surg.* 2022;31(5):151219.
2. **National Commission on Children and Disasters:** 2010 Report to the President and Congress. Agency for Healthcare Research and Quality (AHRQ Publication No. 10-M037). Published October 2010. Accessed February 2024. https://archive.ahrq.gov/prep/nccdreport/nccdreport.pdf.

3. **Remick K, Gausche-Hill M, Joseph MM, *et al.*** Pediatric readiness in the emergency department policy statement. *Pediatrics*. 2018;142(5):e20182459.
4. **American Academy of Pediatrics Disaster Preparedness Advisory Council; Committee on Pediatric Emergency Medicine**. Ensuring the health of children in disasters. *Pediatrics*. 2015;136(5):e1407-e1417.
5. **Disaster Technical Assistance Center Supplemental Research Bulletin:** Behavioral Health Conditions in Children and Youth Exposed to Natural Disasters. Substance Abuse and Mental Health Administration (SAMHSA). Published 2018. Accessed February 2024. https://www.samhsa.gov/sites/default/files/srb-childrenyouth-8-22-18.pdf.
6. **Kappy B, Parish A, Barda A, *et al.*** Pediatric-specific hazard vulnerability analysis: the missing component of regional and hospital-based preparedness. *Disaster Med Public Health Prep*. 2022;17:e199.
7. **Region V for Kids Regional Metrics Workgroup**. Metrics Domain White Paper. EMSC Improvement Center website. Published 2021. Accessed February 2024. https://media.emscimprovement.center/documents/Regional_Metrics_Workgroup_Final.pdf.
8. **Estimates of Emergency Department Visits in the United States**, 2016-2019. Centers for Disease Control and Prevention, National Center for Health Statistics. Published 2022. Accessed February 2024. https://www.cdc.gov/nchs/dhcs/ed-visits/index.htm.
9. **Owusu-Ansah S, Moore B, Shah MI, *et al.*** Pediatric readiness in emergency medical services systems. *Pediatrics*. 2020;145(1):e20193308.
10. **Region V for Kids**, Hazard Vulnerability Assessment. EMSC Improvement Center website. Published 2022. Accessed February 2024. https://emscimprovement.center/domains/preparedness/asprcoe/eglpcdr/hva/.

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