

# County of Isabella

510 W. Pickard St., Mt. Pleasant, MI 48858

E-mail: [admin@isabellacounty.org](mailto:admin@isabellacounty.org)

## Opioid Settlement Funds Request for Funding Proposal

### Overview

Isabella County invites business, organization, government or tribal entities addressing opioid prevention, harm reduction, treatment and recovery to apply for funding to support development, implementation, enhancement or expansion of programs. This includes programs addressing substance use disorders, polysubstance use and co-occurring mental health and substance use disorders. While the selection process will utilize a competitive Request for Proposals (RFP) process, the number of awards will be dependent on the amount of funds available for annual allocation. The amount of funds available will differ annually and proposals will be accepted annually beginning in June, 2026.

### Background

Nationally, over \$57 billion in nationwide settlements have been reached to resolve litigation brought by states and local political subdivisions against opioid-related distributors, marketers, manufacturers and pharmacies.

The total estimated funds to be received across Michigan are approximately \$1.8 billion with an estimated state share of \$1 billion and an estimated local government share of \$800 million.

The national agreement also requires significant industry changes that will help prevent this type of crisis from ever happening again.

Isabella County is projected to receive estimated payments in the amount of \$4.411 million by the end of the 18-year settlement payment period.

Due to funding amounts changing annually, funds available each year for opioid remediation activities may differ. It is the intention of the Isabella County Board of Commissioners to place settlement funding it receives in a restricted dedicated fund and to maintain the fund in perpetuity. Annual interest revenues the fund generates will be made available to finance grants for opioid remediation activities for Isabella County residents. As of April 30, 2026, Isabella County has received settlement payments in the amount of \$1,358,718.70. Interest earned from those payments since October 2023 amounts to \$120,503.67. It is this interest amount that is available for grant awards in 2027.

## Goal

The goal of this opportunity is to serve Isabella County residents through development, implementation, enhancement or expansion of evidence-based strategies or promising practices to prevent and address the adverse impacts of the drug overdose epidemic.

## Eligibility

For-profit businesses, non-profit organizations, local government and tribal agencies addressing opioid prevention, harm reduction, treatment and recovery are eligible for funding to support development, implementation, enhancement or expansion of programs. This includes programs addressing substance use disorders, polysubstance use and co-occurring mental health and substance use disorders.

## Availability of Funds

The number of awards will be dependent on the amount of funds available for annual allocation. The amount of funds available will differ annually. Proposals will be accepted between June 1, 2026 and July 31, 2026.

The contract performance period will be from January 1, 2027 through December 31, 2027

## Requirements

### Proposal Priorities

- Utilize funds to serve residents of Isabella County
- Focus on individuals and communities most profoundly impacted by opioid use disorder (OUD) and co-occurring substance use disorder/mental health conditions (SUD/MH)

Organizations awarded funding are required to:

- Utilize funds within the 2027 calendar year
- Ensure funds are used in addition to, not instead of, existing funding
- Ensure all funds are used in alignment with Exhibit E and the definition of opioid remediation
- Ensure indirect costs do not exceed ten percent (10%)
- Provide data on program outputs, outcomes, impact and effectiveness, following agreed upon metrics with the Isabella County Opioid Advisory Committee
- Complete required quarterly and annual reports

### Reporting Requirements

- Grant recipients shall provide quarterly reports by the final business day of April, July and October
- Annual report to be provided following project close by January 31, 2028. Include:
  - Metrics to gauge outputs, outcomes, impact and effectiveness as determined through scope of work and agreed upon with the Isabella County Opioid Advisory Committee
- Quarterly and annual reports shall utilize the provided *Opioid Settlement Funds Grantee Reporting Form*. All reports shall be submitted to Isabella County Administration by USPS mail, hand delivery or e-mail (contact information given on the top of page 1 of this document)

## **Allowable Uses of Funds & Funding Restrictions**

Funds must be spent on Opioid Remediation, defined as:<sup>1</sup>

Care, treatment, and other programs and expenditures designed to (1) address the misuse and abuse of opioid products, (2) treat or mitigate opioid use or related disorders, or (3) mitigate other alleged effects of, including on those injured as a result of, the opioid epidemic.

Activities must meet the definition of opioid remediation, be evidence-based strategies<sup>2,3</sup> or promising practices and align with allowable uses outlined by Exhibit E.<sup>4</sup> These strategies include:

### **1.) Core Strategies**

- Naloxone or other FDA-approved drug to reverse opioid overdoses
- Medication-assisted Treatment (MAT) distribution and other opioid-related treatment
- Address the needs of pregnant and postpartum women
- Expanding treatment for Neonatal Abstinence Syndrome (NAS)
- Expansion of warm hand-off programs and recovery services
- Treatment for incarcerated population
- Prevention programs
- Expanding syringe service programs
- Evidence-based data collection and research analyzing the effectiveness of the abatement strategies within the state

### **2.) Approved Uses - Prevention**

- Prevent over-prescribing and ensure appropriate prescribing and dispensing of opioids
- Prevent misuse of opioids
- Prevent overdose deaths and other harms (harm reduction)

### **3.) Approved Uses - Treatment**

- Treat Opioid Use Disorder (OUD)
- Support people in treatment and recovery
- Connect people who need help to the help they need (connections to care)
- Address the needs of criminal justice-involved persons

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<sup>1</sup> <https://nationalopioidsettlement.com/>

<sup>2</sup> <https://www.lac.org/assets/files/TheOpioidEbatement-v3.pdf>

<sup>3</sup> <https://www.cdc.gov/drugoverdose/pdf/pubs/2018-evidence-based-strategies.pdf>

<sup>4</sup> <https://www.attorneygeneral.gov/wp-content/uploads/2021/12/Exhibit-E-Final-Distributor-Settlement-Agreement-8-11-21.pdf>

- Address the needs of pregnant or parenting women and their families, including babies with NAS

**4.) Approved Uses – Other Strategies**

- Supporting first responders
- Leadership, planning and coordination
- Training
- Research

Indirect costs may not exceed ten percent (10%) of funds.

**Selection and Award Process**

All proposals submitted should include the completed Request for Proposals document below, resume or biography of the project director, any optional documents and the provided budget template.

Proposals will be reviewed and scored by the Isabella County Opioid Advisory Committee.

Proposals are due to Isabella County Administration, 510 W. Pickard Street, Mt. Pleasant, MI 48858, by USPS mail, personal delivery or e-mail at [admin@isabellacounty.org](mailto:admin@isabellacounty.org) by July 31, 2026. Late proposals will not be considered. Notice of award is expected to occur by October 2026. Following the notice of award, recipient organizations will meet with the Isabella County Opioid Advisory Committee to discuss the contract process and specific metrics for the project identified. The period of funding will be January 1, 2027 through December 31, 2027.

With questions related to this funding opportunity, please contact Jerry Jaloszynski at [jjaloszynski@isabellacounty.org](mailto:jjaloszynski@isabellacounty.org) or by phone at (989) 330-4890

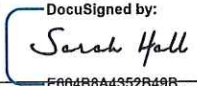
**Request for Proposals**

Isabella County Opioid Settlement Funds – FY 2026

|                                |                               |
|--------------------------------|-------------------------------|
| RFP Posted                     | May 2026                      |
| Proposals Due                  | July 31, 2026                 |
| Anticipated Notice of Award    | October 2026                  |
| Anticipated Performance Period | January 1 - December 31, 2027 |
| Questions to: Jerry Jalszynski | jjaszynski@isabellacounty.org |

**To Be Completed by Entity Submitting Proposal:**

(Note: Boxes will expand vertically to accommodate responses.  
If necessary, supplemental pages may be attached to this application form)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Organization Information</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                             |
| Organization Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Central Michigan University                                                                                                                 |
| Street Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1200 S. Franklin Street, Mount Pleasant, MI 48859-0001                                                                                      |
| Email Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <a href="mailto:ORSP@cmich.edu">ORSP@cmich.edu</a>                                                                                          |
| Phone Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 989-774-6777                                                                                                                                |
| Name of Project Director                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Dr. Preshit Ambade                                                                                                                          |
| Title of Project Director                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Assistant Research Professor                                                                                                                |
| Name of Authorized Representative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sarah C. Hall                                                                                                                               |
| Title of Authorized Representative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Executive Director, Office of Research and Innovation                                                                                       |
| Signature of Authorized Representative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <div>DocuSigned by:</div>  <div>E004B8A4352B49B...</div> |
| Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7/31/2026                                                                                                                                   |
| <b>2. Organization Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                             |
| <p>Covenant HealthCare College of Medicine at Central Michigan University is located in Mount Pleasant, in the heart of Isabella County. Being physically based in the county, the college and its faculty work alongside the same residents this project intends to serve. The college has strong ties with the local community via several public-facing programs, including Isabella County hunger response, free counseling services via the Center for Community Counseling &amp; Development, primary care availability via health clinics, and rehabilitation services available via the Carls Center for Clinical Care</p> |                                                                                                                                             |

and Education. Street Medicine is a medical student initiative providing mobile medical clinic services to underserved, homeless, and rough-sleeping communities in Isabella and surrounding communities. These programs are prime examples of the university's commitment to Isabella County residents and the surrounding region.

The Principal Investigator is Dr. Preshit Ambade, a faculty member at the college and a co-developer of the Augusta+ scale, an instrument that measures workplace mental health and well-being using the five essentials of the U.S. Surgeon General's Framework for Workplace Mental Health & Well-Being.<sup>1-3</sup> The instrument was built and validated by a Michigan-based research team, so the measurement approach proposed here is local in origin and delivery. **Dr. Ambade also oversees the Otago-Fit program that offers free supervised fall prevention exercise classes to older adults in Isabella County and the surrounding region across seven counties.**

The project partners 1) Mid Central Regional Area Health Education Center (MCAHEC) [Annual Opioid Summit Partner], 3) Ten16 Recovery Network; 4) Workforce Ready Solutions Hub, which have a strong presence in the community. The project also partners with state-level organizations like Michigan HIDTA; and Recover Friendly Workplace Program MPH. The supporting letters from these organizations are attached.

### 3. Project Description Including Project Objectives

The project's overall goal is to lay a foundation for a sustainable service for Isabella residents with a history of substance use disorders (SUD), including opioids, in their employment efforts during the recovery phase. It further aims to complement ongoing efforts to create recovery-friendly workplaces by blending workplace wellbeing concepts into such initiatives. To do so, working with a strong network of local community organizations, we aim to empower jobseekers with a history of SUDs by sharing knowledge on recovery-friendly workplaces along with core employee wellbeing concepts. We will pilot a blended recovery-friendly and workplace wellbeing approach-based training to maximize the employment potential of Isabella residents with SUD history and use the local opioid summit to highlight the successes and challenges of this approach and maintain sustainability.

**Phase 1:** The training curriculum blends two established frameworks: the components of the **Recovery Friendly Workplace** approach, which is specific to employment and recovery from SUDs, and the five domains of the **U.S. Surgeon General's Framework for Workplace Mental Health & Well-Being**: protection from harm, connection and community, work-life harmony, mattering at work, and opportunity for growth. The Recovery Friendly Workplace frames the opioid/recovery focus; the five domains provide the structure underneath it. The training development team includes: 1) technical experts from the recovery-friendly workplace initiative having experience of implementing it across several employers in Michigan, including Isabella County; 2) experts in the positive psychology framework with extensive experience delivering workplace wellness training; 3) public health experts who have validated instruments using the U.S. Surgeon General's Framework for Workplace Mental Health & Well-Being, having experience in leadership, research, and content design. **Training materials worth 3-4 hrs. of training will be developed.** Local volunteers, support staff, and recovery coaches (at least two) will be trained with a **train-the-trainer** approach. **A half-day**

**training session will be organized to train the master trainers.** Trainers will learn to use the Augusta+ scale (developed by the project director's research team) as a practical measure of workplace well-being for participants who are employed, and the project will develop a simple pre/post measure to gauge whether the training changes participants' knowledge, confidence, and workplace well-being.

**Phase 2:** The trainers will deliver a **3-4 hr.** practical training to job-seeking/employed county residents with a history of SUD (**roughly 4 training sessions with 5 participants each**). Participants will learn to navigate a recovery-supportive workplace, manage stress and relapse triggers on the job, understand disclosure and accommodations, and connect to local recovery supports. Potential sources of the referrals for the training could be the local organizations and stakeholders such as Isabella County Public Health Agency, Saginaw Chippewa Indian Tribe, Mt. Pleasant Area Chambers of Commerce, and other community organizations that work with people with SUDs. The knowledge gained from the training will be assessed through pre- and post-training assessments. A separate readiness screen for job seekers will be identified in the evaluation section. The learnings from the pilot trainings will inform revisions of the materials and scaling up the project in the future years. The learnings from the pilot project will be made available to the Isabella County Health Department, Isabella County Opioid Advisory Committee, and other community stakeholders in the form of a completion report. Findings from the project will also be presented and published in scientific meetings and journals.

#### **Connection to the local opioid summit**

The project director learned about the recovery friendly workplace framework at the local opioid summit in 2025. Knowing this summit is a convention of all regional stakeholders working on SUD, if the approval is granted by the summit organizing committee, the project findings will be presented at the 2027 summit collaborating with partner organizations. Opportunity for cosponsoring will be checked. The project participants and partner organizations will be also encouraged to attend the summit by supporting their attendance cost (~\$100 per participant).

#### **Objectives**

- **Objective 1.** Recruit and train [2] local direct care workers as trainers by **March 31, 2027**, using the blended Recovery Friendly Workplace / Surgeon General curriculum.
- **Objective 2.** Deliver the training to [20] Isabella County residents with SUD history who are employed or seeking employment, across [4] sessions, between April and October 2027.
- **Objective 3.** Develop and administer a pre/post measure for every participant and report aggregate change in knowledge, confidence, and (for employed participants) workplace well-being.
- **Objective 4.** Present the project's results there, reaching approximately 300 attendees (subjected to approval).
- **Objective 5.** Leave behind a trained, local trainer workforce and a reusable curriculum so the training can continue past the 2027 funding cycle.

#### 4. Populations Served/Target Population and Geographic Area Served

**Primary participants:** Isabella County residents (adults over the age of 18 yrs.) who have a history of opioid or other SUD and who are currently employed or seeking employment. At least 20 participants will be recruited.

**Trainers:** Local volunteers, support staff, and recovery coaches who are trained as trainers. They are county residents delivering the training to their neighbors. At least two trainers will be recruited.

**Geographic area:** Isabella County, including the city of Mount Pleasant and the county's surrounding rural areas. Through the SUD use disorder history may be referred into the training, extending reach to a population the settlement framework specifically prioritizes for culturally appropriate services.

#### 5. Data to Support Need for Project

Between January and July 2026, eight Isabella County residents died of a fatal overdose, a rate of 11 per 100,000 residents.<sup>4</sup> In 2024, the county's overdose death rate was 13.8 per 100,000, compared with 19.1 per 100,000 statewide.<sup>5</sup> On the other side, treatment admissions data show methamphetamine use rising in the county while other substance use trends decline.<sup>6</sup> Even though the overdose death rate is low in the county, it is more vulnerable, has fewer resources, and is under economic pressure. The county is 12<sup>th</sup> in social vulnerability, among the highest in the state.<sup>5</sup> When substance use burden is set against social vulnerability, the dashboard classifies Isabella County as **most vulnerable**. Meaning, the conditions that drive substance use problems are strongly present here, while the capacity to respond is not. **31.8%** of county residents live below 150% of the federal poverty level, against **22.4%** statewide.<sup>5</sup> Work has become harder to hold. Comparing 2020 Census data with 2010, the county's employment rate **fell by 23.1%** even as the population grew by 2%.<sup>7</sup>

Local initiatives to support employment efforts for individuals in recovery when the county's employment rate is falling do exist. For example, the Recovery Friendly Workplace Initiative has two organizations/employers (Peer 360 Recovery Alliance and Ten16 Recovery Network) trained under their program working in the county.<sup>8</sup> Ten16 Recovery Network reported that in 2024, 19 participants attended their five or more recovery coaching sessions, with a similar number attending fewer than five sessions.<sup>9</sup> However, these efforts are solely recovery-focused and may not comprehensively cover the entire gamut of workplace wellbeing.

Employment is not a side benefit of recovery. In fact, it can motivate people to enter and stay in treatment for opioid and other substance use disorders and is associated with better treatment outcomes (U.S. Department of Labor workforce/opioid literature review), while unemployment among adults with SUD is linked to worse outcomes.<sup>10,11</sup> A recent program from New Jersey has shown promising results of providing job-readiness and "soft skills" training that starts with the fundamentals: arriving on time, dressing appropriately, handling workplace conflict, communicating respectfully, and understanding employer expectations.<sup>12</sup>

The point is not that existing providers are falling short, instead it is that current capacity reaches relatively few residents, leaving clear room for added support that does not duplicate what already exists. Realizing this need, this project would add capacity alongside existing services by developing a workplace and recovery-support model that not only focuses on transferring knowledge on creating a

recovery-friendly environment but also empowering those who are recovering on other aspects of workplace wellbeing such as safety from physical and psychological harm, connection and community, work-life harmony, mattering at work, and opportunity for growth.

#### 6. Project Timeline Overview

- **Jan–Mar 2027 (Q1):** Review the 2026 summit evaluation; finalize the blended curriculum and the pre/post measure; recruit and train local volunteers, support staff, and recovery coaches as trainers.
- **Apr–Jun 2027 (Q2):** Begin delivering training sessions to participants; collect pre/post data. Quarterly report due on the last business day of April.
- **Jul–Sep 2027 (Q3):** Continue training delivery and data collection. Quarterly report due on the last business day of July.
- **Oct–Dec 2027 (Q4):** Complete final sessions; analyze results; co-sponsor and present at the November 2027 opioid summit (subject to approval by the organizing committee). Quarterly report due on the last business day of October.
- **By Jan 31, 2028:** Submit the annual report on the provided Grantee Reporting Form.

#### 7. Scope of Work

| Activity                                                                   | Outputs                                              | Outcomes                                                                                            | Timeline   |
|----------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|
| Finalize curriculum and pre/post measure; incorporate 2026 summit findings | Curriculum finalized<br>Pre/post tool ready          | Training grounded in community-identified priorities                                                | Q1 2027    |
| Train local volunteers, support staff, and recovery coaches as trainers    | [ 2 ] trainers trained<br>Training materials issued  | Durable local training capacity<br>Trainers demonstrate competency                                  | Q1 2027    |
| Deliver training to residents with SUD history (employed or job-seeking)   | [ 20 ] participants served<br>[ 4 ] sessions held    | Gains in knowledge & confidence (pre/post)<br>Workplace well-being change for employed participants | Q2–Q4 2027 |
| Co-sponsor Nov 2027 summit and present results                             | Workplace-recovery session held<br>Results presented | Findings shared with the community<br>Awareness of the program raised                               | Q4 2027    |

### 8. Success – How will success be measured?

Success will be measured with countable figures the committee can verify, plus a simple before-and-after measure. Specifically:

- **Blended Training Material prepared:** the training material blending recovery friendly workplace and US Surgeon General's Framework for Workplace Mental Health and Wellbeing is ready
- **Trainers trained:** the number of local volunteers, support staff, and recovery coaches who complete training and demonstrate they can deliver it.
- **Residents served:** the number of Isabella County residents with a substance use disorder history who complete the training, and the number of sessions held.
- **Knowledge and confidence:** change from the pre/post measure across participants.
- **Dissemination:** results presented at the November 2027 summit or any other relevant avenues.

### 9. Sustainability – How will the project be sustained after funding cycle?

Sustainability is built into the design rather than added on. Because the project trains **local** community members as trainers, the capacity to deliver the training stays in Isabella County after 2027 at no additional settlement cost. The curriculum and pre/post materials remain available for reuse. If needed, a refresher training for the trainers will be offered using developed materials. The feasibility of creating AI-based training material (e.g. chatbots) to deliver refresher training will also be assessed. We will also explore potential engagement with CMU's Center for Community Counseling and Development, which offers no-cost counseling services to the county residents. We will work with existing recovery-related community projects operational in the county (e.g., Ten16 Recovery Network, Workforce Ready Solutions Hub) to encourage further uptake of the training, helping individuals with SUD history navigate employment. The local annual opioid summit provides a recurring platform to keep the work visible and to refresh it against community priorities each year. Additional funding from other sources will be sought to scale the project, incorporating learnings from this pilot.

|                                                  |                    |
|--------------------------------------------------|--------------------|
| <b>10. Budget – Total grant amount requested</b> | <b>\$55,249.00</b> |
|--------------------------------------------------|--------------------|

### 11. Budget Narrative – How will funds be used to meet project goals?

#### Overview

All line items map to a named opioid-remediation use under Exhibit E, and each is tagged in the budget template with its Exhibit E reference and strategy category. Spending concentrates in three areas: building a local training curriculum, delivering the training to Isabella County residents in recovery, and evaluating and sharing the results.

**Preshit Ambade, DrPH, Project Director**– (5% effort = \$ 3,851 + Benefits (48.27%) = \$1,876, **Total = \$5,727**). Dr. Ambade will serve as the lead on the project on behalf of CMU. The responsibilities include co-leading training material development, implementing training and data collection; contributing to recruitment, data collection, and synthesis of findings; leading community and stakeholder engagement; and working on dissemination and sustainability of the project in collaboration with the funding agency. Estimates are based on Dr. Ambade's approved 2026-2027

calendar year salary.

**Neil MacKinnon, Ph.D., Co-Principal Investigator**– (0.20% effort = \$ 1011 + Benefits (24.70%) = \$250, **Total = \$1,261**). The responsibilities include co-leading the project, participating in community and stakeholder engagement, providing feedback on training development, and facilitating dissemination and sustainability of the project in collaboration with the funding agency. Estimates are based on Dr. MacKinnon's approved 2026-2027 calendar year salary.

**Dr. Kimberly O'Brien, Ph.D. Organizational Psychology Consultant**– (1 Summer Week effort = \$ 2880 + Benefits (17.65 %) = \$508, **Total = \$3,388**). This includes compensation for the time and effort of the Organizational Psychology consultant. Estimates are based on Dr. O'Brien's approved 2026-2027 academic year salary with a modest cost of living increase of 2% in future years.

**Graduate Hourly Research Assistants**– (TBD; Masters level student, summer hourly wages: 200 hours x \$15/hour = **\$3000**). The responsibilities include day-to-day support of the project activities that include, but are not limited to, organizing meetings, stakeholder liaison, data collection facilitation, program management, material development, compliance reporting, and any other incidental tasks. Estimates are based on CMU's approved institutional hourly rate for graduate students with requisite knowledge and experience.

**Travel (Total - \$1,000)**

Domestic – includes mileage, rental, airfare reimbursements, accommodations, food, and other ancillary items related to travel for project-related meetings, conferences, seminars, and workshops for senior personnel and student research assistants.

**Other Direct Costs**

**Materials and Supplies: Training Coordination and Arrangements**– (Total \$3,000). Costs include supplies, fees, and material development for event hosting, registration, and development of training materials for dissemination. The costs include, but are not limited to, training session recording and any incidental expenditures.

**Materials and Supplies: Training Fidelity and Refresher**– (Total \$1,000). Costs include supplies, fees, and material development for event hosting, registration, and development of training materials for refresher training, including tentative cost for AI-integrated chatbot development (TBD). The costs include, but are not limited to, training session recording, and any incidental expenditures.

**Materials and Supplies: Opioid Summit 2027**– (Total - \$10,000). Includes co-hosting commitment and attendance fees payment (~\$100 per participant) for the Opioid 2027 summit that will be coordinated with the support of Central and Western Area Health Education Centers (subject to the approval by the organizing committee).

**Human Subject Payments/Incentives– (Total \$1850).** It includes gift cards for 2 trainers and 20 participants who will participate in activities. For 2 trainers, one 4-hr training session to get trained and deliver a 3-hr session (total 4 sessions) @\$36.73/hr, calculated as the living wage required for a family of two adults with 1 child. For 20 participants, for 3 hrs. of a training session @\$22.07/hr, calculated as the living wage for a family of one adult with 0 children. Source Website: <https://livingwage.mit.edu/states/26>.

**Outside Services: Ms. Nicki Gabel, Consultant Recovery Friendly Workplace Program MPHI– (Total Costs = \$10,000).** This includes compensation for the time and effort of the Recovery Friendly Workplace Program consultant with expertise in community outreach, stakeholder engagement, program design, and implementation.

**Outside Services: Dr. Kathy Snyder, Consultant PERMA or Positive Psychology Framework, Midland Area Wellbeing Coalition MAWC– (Total Costs = \$10,000).** This includes compensation for the time and effort of the PERMA and Positive Psychology framework consultant with expertise in community outreach, stakeholder engagement, program design, and implementation, as well as imparting training based on the US Surgeon General’s Framework for Workplace Mental Health and Wellbeing.

**Total Direct Costs – (Total - \$50,226).** Total direct costs for the project include costs for personnel (salary and fringe), travel, and other direct costs.

**Indirect Costs – (Total - \$5,023).** CMU will abide by the Isabella County Opioid Settlement Funds’ indirect cost limit of 10% of total direct costs.

**Total Request**

The total request over the one-year project for Central Michigan University is **\$55,249**.

|                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>12. New or Existing Project – Check one</b>                                                                                                   | <input type="checkbox"/> - Existing <input checked="" type="checkbox"/> - New                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>12.a. If existing, how many unique individuals are served annually by the current project?</b>                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>12.b. If new, is the project evidence-based or based on promising practices? (Check one and provide link to information on evidence base)</b> | <input checked="" type="checkbox"/> - Yes <input type="checkbox"/> - No<br><br>Link: 1) US Surgeon General’s Framework for Workplace Mental Health and Wellbeing: <a href="https://www.hhs.gov/surgeongeneral/reports-and-publications/workplace-well-being/index.html">https://www.hhs.gov/surgeongeneral/reports-and-publications/workplace-well-being/index.html</a><br>2) Recovery Friendly Workplace Project: <a href="https://recoveryfriendlymi.com/">https://recoveryfriendlymi.com/</a><br>3) Augusta+ Scale Validation Paper: <a href="https://www.sciencedirect.com/science/article/pii/S2542454824000602">https://www.sciencedirect.com/science/article/pii/S2542454824000602</a><br>3) Positive Psychology Based Workplace Training: <a href="https://midlandareawellbeing.org/training/">https://midlandareawellbeing.org/training/</a> |
| <b>13. Attachments – Supporting Documents</b>                                                                                                    | <ul style="list-style-type: none"> <li>• Resume and/or biography of project director</li> <li>• Completed budget template (provided)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|  |                                                                                                                                                                                                                                                      |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• Letters of support from partner organizations (optional)</li><li>• Materials demonstrating experience, organizational impact and/or commitment to addressing the drug overdose epidemic (optional)</li></ul> |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Logic Model

| Logic Model for the "Recovery At Work: Isabella County Trainer Initiative" Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                       |
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| Resources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Strategies/Initiatives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Outputs                                                                                                                                                                                          | Outcomes                                                                                                                                                                                                                                                                                                              |
| <p><b>Lead Organizations</b></p> <ul style="list-style-type: none"><li>• Covenant HealthCare College of Medicine at Central Michigan University</li><li>• Mid Central Regional Area Health Education Center (MCAHEC)</li><li>• Midland Area Wellbeing Coalition</li><li>• Recover Friendly Workplace Program MPHII</li></ul> <p><b>Community Partners</b></p> <ul style="list-style-type: none"><li>• Workforce Ready Solutions Hub, CVP</li><li>• Ten16 Recovery Network</li></ul> <p><b>Other Partners</b></p> <ul style="list-style-type: none"><li>• Michigan HIDTA</li><li>• Office of Rural Prosperity, Michigan Department of Labor and Economic Opportunity</li></ul> <p><b>Consultants</b></p> <ul style="list-style-type: none"><li>• Dr. Kimberly O'Brien</li></ul> <p><b>Training Resources</b></p> <ul style="list-style-type: none"><li>• Positive Psychology Framework</li><li>• US Surgeon General's Framework for Workplace Mental Health and Well-being</li><li>• Trauma Informed Approach</li><li>• US Department of HHS Workplace Well-Being Resources</li><li>• The CDC's National Institute for Occupational Safety and Health's (NIOSH) resources</li></ul> | <p><b>Phase 1</b></p> <ul style="list-style-type: none"><li>• Consult field experts for the training content</li><li>• Develop a Workshop Module with the help of field experts</li><li>• Train at least 2 trainers with half day training session</li></ul> <p><b>Phase 2</b></p> <ul style="list-style-type: none"><li>• Conduct 4 workshops on the train-the-trainer mode for at least 20 participants</li><li>• Conduct pre- and post-workshop assessments to check the effectiveness</li><li>• Disseminate the results in local and national conferences/summits</li></ul> | <ul style="list-style-type: none"><li>• Develop blended training material</li><li>• Train at least 2 trainers</li><li>• Provide training to at least 20 participants across 4 sessions</li></ul> | <ul style="list-style-type: none"><li>• Blended training material available for further uptake</li><li>• Increased awareness of workplace mental health among participants</li><li>• Improved understanding of trauma-informed leadership practices</li><li>• Pilot training module completed and evaluated</li></ul> |

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## Proposed Scope of Work

The Midland Area Wellbeing Coalition (MAWC) will serve as the project's Workplace Wellbeing and Recovery-Friendly Training Partner, supporting the adaptation, implementation, and sustainability of the **Recovery at Work** initiative. Working collaboratively with Covenant HealthCare College of Medicine at Central Michigan University and community partners, MAWC will help integrate workplace wellbeing principles with Recovery Friendly Workplace practices to prepare individuals in recovery for successful employment while strengthening community capacity through a train-the-trainer model.

Building upon the U.S. Surgeon General's Framework for Workplace Mental Health and Well-Being and Recovery Friendly Workplace principles, MAWC will develop practical, evidence-informed training that supports individuals with a history of substance use disorder as they prepare to enter or re-enter the workforce. This work aligns with the project's goal of strengthening employment readiness, promoting workplace wellbeing, and expanding local capacity to provide recovery-supportive training.

---

### Guiding Principles

The Coalition will conduct this work using an approach that is:

- Evidence-informed and grounded in workplace wellbeing and positive psychology
- Collaborative and responsive to community partners
- Practical and implementation-focused
- Strengths-based
- Capacity-building
- Adaptable to local workforce and recovery settings
- Designed for sustainability beyond the grant period

---

### Phase 1

#### Curriculum Adaptation and Trainer Preparation

During the initial phase, MAWC will collaborate with Covenant HealthCare College of Medicine and project partners to adapt training materials that combine Recovery Friendly Workplace concepts with workplace wellbeing practices. Training resources will be designed for use within a train-the-trainer model that prepares local volunteers and support staff to deliver future trainings.

Activities may include:

- Participating in project planning meetings
- Reviewing existing Recovery Friendly Workplace resources
- Adapting workplace wellbeing content for the target audience
- Developing facilitator guides and participant materials
- Creating practical activities and discussion exercises



- Preparing implementation guidance for local trainers

### **Expected Outcomes**

- Adapted curriculum
  - Facilitator guide
  - Participant workbook
  - Trainer resources
  - Implementation plan
- 

## **Phase 2**

### **Train-the-Trainer Implementation**

MAWC will facilitate preparation of local trainers and provide technical support as community-based training begins.

Activities may include:

- Delivering train-the-trainer sessions
- Providing facilitation coaching
- Supporting participant engagement strategies
- Coordinating with project partners
- Gathering participant and trainer feedback
- Identifying opportunities for improvement

### **Expected Outcomes**

- Two to three trained community trainers
  - Technical assistance documentation
  - Training observations
  - Recommendations for refinement
- 

## **Phase 3**

### **Refinement and Sustainability**

Following initial implementation, MAWC will refine training resources and prepare materials that support continued local use.

Activities may include:

- Updating curriculum based on feedback
- Refining facilitator resources
- Preparing sustainability recommendations
- Assisting with project reporting
- Supporting dissemination planning as appropriate



### **Expected Outcomes**

- Final training curriculum
  - Updated facilitator materials
  - Sustainability recommendations
  - Lessons learned summary
- 

### **Deliverables**

1. Project planning and implementation work plan
  2. Adapted Recovery at Work training curriculum
  3. Facilitator guide and participant workbook
  4. Train-the-trainer workshop for 2–3 community trainers
  5. Technical assistance during initial implementation
  6. Curriculum refinement based on participant and trainer feedback
  7. Sustainability recommendations
  8. Final summary of implementation activities and lessons learned
-



## Budget Narrative

### Proposed Contract Amount

**Estimated Total: \$10,000**

The Midland Area Wellbeing Coalition proposes a \$10,000 subcontract to serve as the project's Workplace Wellbeing and Recovery-Friendly Training Partner. This budget reflects the personnel, expertise, and project support necessary to adapt workplace wellbeing resources, prepare local trainers, support implementation, and provide technical assistance throughout the project period.

The proposed budget supports expertise in workplace wellbeing, positive psychology, curriculum adaptation, facilitation, project coordination, and administrative support. Kathy Snyder, Director, will serve as Project Lead, providing leadership in curriculum adaptation, facilitation strategy, partner collaboration, quality assurance, and implementation support. Additional Coalition staff may assist with project coordination, resource preparation, communications, scheduling, and administrative functions.

| Category                                     | Amount          |
|----------------------------------------------|-----------------|
| Project Leadership & Curriculum Adaptation   | \$3,500         |
| Train-the-Trainer Facilitation               | \$2,000         |
| Participant Materials & Training Resources   | \$1,000         |
| Project Coordination & Partner Collaboration | \$1,250         |
| Evaluation, Documentation & Reporting        | \$1,000         |
| Administrative Support                       | \$1,250         |
| <b>Total</b>                                 | <b>\$10,000</b> |

### Budget Flexibility

The proposed budget represents MAWC's anticipated scope of work for this initiative. If the final subcontract amount differs from the proposed budget, MAWC will work collaboratively with Covenant HealthCare College of Medicine to align the scope of work with available resources while maintaining the project's primary objectives.



Depending on available funding, adjustments may include modifying the amount of curriculum customization, reducing the number of technical assistance sessions, or scaling follow-up support after the train-the-trainer workshops. This flexible approach allows the partnership to maintain the quality of core project activities while ensuring responsible stewardship of grant resources.

### **Letter of Support**

Dear Members of the Review Committee,

July 22, 2026

On behalf of the Midland Area Wellbeing Coalition (MAWC), I am writing to express our strong support for Covenant HealthCare College of Medicine at Central Michigan University's application for Isabella County Opioid Settlement funding for the Recovery at Work: Isabella County Trainer Initiative.

The Midland Area Wellbeing Coalition promotes wellbeing, fosters meaningful connections, and provides practical tools that help individuals, organizations, and communities feel good, struggle well, and function effectively. Through our work in workplace wellbeing, organizational development, positive psychology, and community education, we partner with healthcare organizations, employers, nonprofits, educational institutions, and community agencies to strengthen wellbeing across Michigan. We recognize that meaningful employment is an important part of recovery and that workplaces can play a valuable role in supporting individuals as they build healthy, productive lives.

If funded, MAWC will serve as the project's Workplace Wellbeing and Recovery-Friendly Training Partner. Working closely with Covenant HealthCare College of Medicine and community partners, we will adapt workplace wellbeing resources, support the development of trainer materials, facilitate train-the-trainer sessions, and provide implementation guidance that blends Recovery Friendly Workplace principles with the U.S. Surgeon General's Framework for Workplace Mental Health and Well-Being. Our role will help build local capacity so that community trainers can continue providing practical, recovery-supportive workplace education beyond the grant period.

This project reflects a thoughtful approach to strengthening recovery through employment while building sustainable community capacity. By preparing local trainers and integrating practical workplace wellbeing strategies with recovery-supportive practices, the initiative has the potential to improve employment readiness, strengthen workplace success, and expand local resources for individuals affected by substance use disorder.

The Midland Area Wellbeing Coalition appreciates the opportunity to partner with Covenant HealthCare College of Medicine on this initiative and is committed to contributing our expertise to support successful implementation and long-term sustainability.

Sincerely,

*Kathy Snyder*



**Kathy Snyder**

Director, Midland Area Wellbeing Coalition

EdD in Community Leadership, MAPP

## **MPHI/Michigan Recovery Friendly Workplace Statement of Work**

### **Recovery at Work: Isabella County Trainer Initiative**

**MI RFW consultative role:** Given the limited allocation across the three-month curriculum development period, the Michigan Recovery Friendly Workplace initiative will serve in a targeted consultative and technical assistance role rather than as the primary curriculum developer or training implementer. MI RFW will provide recovery-friendly workplace subject matter expertise to help ensure the training materials are accurate, practical, non-stigmatizing, and aligned with core RFW principles. While MI RFW is designed primarily to support employers in creating recovery-friendly workplace policies, practices, and cultures, the concepts reflected in its materials may also support employees by promoting shared understanding, reducing stigma, and strengthening access to supportive workplace resources. Consultation may include reviewing curriculum outlines, advising on key messages related to substance use disorder, recovery, employment, workplace supports, and stigma reduction, and offering feedback on facilitator guidance, participant materials, and train-the-trainer readiness expectations. After the initial development period, MI RFW involvement will be limited to light fidelity monitoring, such as reviewing a simple fidelity checklist, trainer feedback, or delivery concerns to help ensure the curriculum continues to reflect RFW principles without requiring ongoing intensive support.

- Provide employer-focused subject matter expertise during Months 1–3 by reviewing draft curriculum content for alignment with RFW principles, identifying stigmatizing language, and recommending practical concepts that support both employers and employees. MI RFW may also share existing training materials as concept resources and invite participants to attend monthly RFW trainings for continued learning and alignment.
- Complete up to two rounds of written review and feedback on curriculum outlines, facilitator guidance, participant materials, and train-the-trainer expectations, with feedback focused on accuracy, clarity, key messages, and readiness for implementation.
- Support limited post-development fidelity monitoring by reviewing a simple fidelity checklist, summarizing trainer feedback or delivery concerns, and recommending minor adjustments to help ensure ongoing alignment with RFW principles.
- Upon request, participate in the Train-the-Trainer session to help ensure alignment with MI RFW principles and fidelity to the initiative.

**Summary:** MI RFW will provide targeted, employer-focused consultation and technical assistance to support curriculum alignment with recovery-friendly workplace principles, while sharing concepts that can strengthen understanding and support for both employers and employees. The proposed budget for these services is \$10,000 which includes salaries, fringe, supplies, other and indirect.



2436 Woodlake Circle, Okemos, MI 48864  
Phone: (517) 324-8300 | Fax: (517) 381-0260  
www.MPHI.org

July 30, 2026

Dr. Preshit N. Ambade, DrPH, PNAP  
Assistant Research Professor  
Covenant HealthCare College of Medicine  
Central Michigan University

**RE:** Letter of Support - Recovery at Work: Isabella County Trainer Initiative

Dear Dr. Preshit N. Ambade:

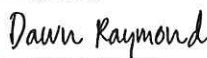
The Michigan Public Health Institute (MPHI), through the Michigan Recovery Friendly Workplace (MI RFW) Initiative, is pleased to support the Recovery at Work: Isabella County Trainer Initiative led by the Covenant HealthCare College of Medicine at Central Michigan University. This project aligns with our mission to reduce stigma, increase recovery supports, and strengthen workforce participation for individuals affected by substance use disorders.

The proposed training thoughtfully combines Recovery Friendly Workplace principles with workplace well-being concepts to help individuals in recovery successfully navigate employment while building long-term recovery and career success.

MI RFW will serve in a targeted consultative and technical assistance role by providing recovery-friendly workplace expertise, reviewing curriculum materials, and helping ensure content is accurate, practical, non-stigmatizing, and aligned with established RFW principles.

We believe this initiative will build local capacity, support Isabella County residents in recovery, and create sustainable resources that can continue beyond the grant period. We strongly support funding for this proposal and look forward to contributing to its success.

Sincerely,

Signed by:  
  
181A7DDB91C34D9...  
Dawn Raymond

Finance & Budget Manager

July 28, 2026

Dr. Preshit Ambade  
Covenant HealthCare College of Medicine  
Central Michigan University  
Mount Pleasant, MI 48859

Dear Dr. Ambade,

On behalf of the Workforce Ready Solutions Hub, I am pleased to offer our support for *Recovery at Work: Isabella County Trainer Initiative*. The proposed project addresses an important need at the intersection of recovery and employment by helping people with a history of substance use disorder enter, navigate, and sustain employment in workplaces that support both well-being and recovery.

The Workforce Ready Solutions Hub is a statewide initiative supported through the Michigan Department of Health and Human Services' State Opioid Response (SOR) Grant and is operated by Customer Value Partners, (CVP). We help provider organizations (e.g., community mental health entities, recovery community organizations, outpatient treatment providers) integrate employment as a core part of recovery through training, technical assistance, practical tools, and partner collaboration. Having been introduced through our shared partnership with the Michigan Public Health Institute and the Recovery Friendly Workplace Initiative, I can see clear alignment between our efforts.

The train-the-trainer model proposed in this project complements our statewide training and technical assistance (TTA) work well, and we would welcome the opportunity to help disseminate findings and tools developed through this initiative to providers across Michigan. In addition, as a state-funded TTA provider, we can offer relevant training and resources to support the initiative at no cost to the project. This includes contributing employment-support expertise and helping align the curriculum with recovery-oriented practice, the evidence-based practice of Individual Placement and Support principles, and strategies for long-term employment success.

The Workforce Ready Solutions Hub is pleased to support this proposal and look forward to collaborating with Covenant HealthCare College of Medicine and Isabella County partners on its successful implementation.

Sincerely,

*Amy Miller*

Amy Miller, SHRM-SCP  
Project Director  
Workforce Ready Solutions Hub





To the members of the Isabella County Opioid Advisory Committee –

On behalf of Ten16 Recovery Network, I am pleased to support the Central Michigan University College of Medicine's proposed Isabella County Recovery At Work project.

Ten16 provides substance use disorder treatment, recovery coaching, and community-based recovery supports throughout mid-Michigan, including Isabella County. Ten16 also serves as a regional trainer for Michigan's Recovery-Friendly Workplace initiative, helping employers reduce stigma, adopt supportive practices, and create workplace cultures in which employees affected by substance use disorder can succeed.

Employment support is an important component of Ten16's work with people in recovery. Through recovery coaching and a supported-employment pilot based at our Midland Recovery Community Center, we help participants prepare for, obtain, and sustain employment. On the employer side, our Recovery-Friendly Workplace work helps organizations develop the understanding, policies, and supervisory practices needed to support and retain employees in recovery.

The proposed CMU project intersects with both areas of our work. Its distinctive contribution could be the intentional integration of the Surgeon General's five domains of workplace well-being into a practical training curriculum. These concepts could provide an additional framework for helping individuals understand what a healthy workplace looks like and how they can protect their recovery while navigating workplace challenges.

The train-the-trainer model offers a practical way to build local capacity and sustain this knowledge within Isabella County. We also support the project's intention to learn from the county's annual opioid summit and return to a future summit to share outcomes and participant experiences.

As the project develops, Ten16 would be willing to help publicize the training and refer appropriate Isabella County residents, provide input to support alignment with established Recovery-Friendly Workplace and supported-employment efforts, and explore opportunities to host or support a training session. We welcome continued coordination to ensure that this project adds value to existing community resources and avoids unnecessary duplication.

Ten16 supports the intent of this proposal and welcomes CMU's collaboration in strengthening the connection between recovery, workplace well-being, and sustainable employment in Isabella County.

Sincerely,

President & CEO  
Ten16 Recovery Network



ADMIN - 133 N SAGINAW RD, MIDLAND, MI 48640 P: 989-631-0241 F: 989-835-9963

RESIDENTIAL RECOVERY HOUSING OUTPATIENT PEER SUPPORT COLLEGIATE RECOVERY OUTREACH PREVENTION

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Dr. Preshit N. Ambade, DrPH, PNAP  
Assistant Research Professor  
Covenant HealthCare College of Medicine at Central Michigan University  
Foust Hall 007  
Central Michigan University

July 21, 2026

Dear Dr. Ambade,

I am pleased to write in support of Covenant HealthCare College of Medicine's ***Recovery at Work: Isabella County Trainer Initiative***.

As Executive Director of the Michigan High Intensity Drug Trafficking Areas (HIDTA), a program of the Office of National Drug Control Policy, I have seen firsthand the positive impact that successful recovery-ready workplace programs can have on local communities. In fact, one of the Action Items in President Trump's [2026 National Drug Control Strategy](#) is to "Increase the Number of State and Local Recovery-Ready Workplace Programs, and Nationally-Certified Recovery-Ready Workplaces," through the following efforts:

"The Administration will partner with States, local governments, Tribal organizations, and other stakeholders to increase the number of recovery-ready community certification programs and state or local recovery-ready workplace programs. The Administration will promote the development of recovery-ready family and faith group initiatives and will build upon existing community certification initiatives to increase recovery ecosystems at the municipal and county levels."

Covenant HealthCare's ***Recovery at Work: Isabella County Trainer Initiative*** project will provide needed support and coping mechanisms for Isabella County residents to be successful in their employment, a key factor in achieving and maintaining their SUD recovery, as well as benefitting the local economy by providing productive employees.

Sincerely,

  
Rinaldo (Ray) Ollie  
Executive Director  
Michigan HIDTA



July 30, 2026

**Isabella County Opioid Advisory Committee**

Isabella County Administration  
510 W. Pickard Street  
Mt. Pleasant, MI 48858

**Re: Letter of Support for the Central Michigan University Opioid Settlement Fund Proposal**

Dear Members of the Isabella County Opioid Advisory Committee:

I am pleased to provide this letter of support for Central Michigan University's proposal, led by Dr. Preshtit Ambade, entitled *"A Recovery-Friendly Workplace and Workplace Well-Being Training Program for Isabella County Residents in Recovery."* As Executive Director of the Central & Western Area Health Education Center (AHEC), I strongly support this innovative initiative and its goals to strengthen recovery outcomes through workforce development, education, and community engagement.

For many years, our organization has worked to improve health outcomes across central and western Michigan by developing community partnerships, supporting healthcare workforce initiatives, and addressing behavioral health and substance use challenges. We have witnessed firsthand the significant barriers individuals in recovery often face when seeking employment and long-term economic stability. The proposed project addresses a critical gap by combining Recovery Friendly Workplace principles with evidence-based workplace well-being strategies to help participants successfully navigate employment while maintaining their recovery.

This project is especially compelling because it takes a sustainable, community-centered approach. By training local recovery coaches, support staff, and volunteers to deliver the curriculum, the project will build local capacity that remains in Isabella County long after the grant period ends. The emphasis on creating a reusable training model, measuring participant outcomes, and sharing lessons learned with community stakeholders demonstrates thoughtful planning and a commitment to long-term impact.

The Central & Western AHEC has been a partner in the annual Opioid Summit and recognizes the importance of bringing together healthcare providers, public health professionals, recovery organizations, employers, and community members to address substance use disorders. We believe this project complements existing recovery services while introducing a unique focus on workplace success, mental well-being, and employment readiness. The proposed dissemination of findings through the annual Opioid Summit will further strengthen community awareness and encourage adoption of successful practices throughout the region.

We are particularly supportive of the project's commitment to serving Isabella County residents with a history of substance use disorder who are employed or seeking employment. Stable employment is a key social

determinant of health and an important factor in sustaining recovery. By helping participants develop workplace skills, increase confidence, understand recovery-supportive work environments, and connect with community resources, this program has the potential to create meaningful and lasting benefits for participants, employers, and the broader community.

On behalf of the Central & Western Area Health Education Center, I enthusiastically support this proposal and respectfully encourage its favorable consideration for funding through the Isabella County Opioid Settlement Fund. We look forward to continuing our collaboration with Central Michigan University and community partners to advance recovery, workforce development, and community well-being throughout Isabella County.

Thank you for your consideration.

Sincerely,

**April Osburn**

**April Osburn**

Executive Director

Central & Western Area Health Education Center (AHEC)

Mount Pleasant, Michigan



The Lancet Regional  
Health - Americas  
2025;45: 101075  
Published Online xxx  
<https://doi.org/10.1016/j.lana.2025.101075>

# Spatiotemporal analysis of substance use disorder mortality in the United States: an observational study of emerging hotspots and vulnerable populations (2005–2020)

Santiago Escobar,<sup>a</sup> Neil J. MacKinnon,<sup>b</sup> Preshit Ambade,<sup>b</sup> Zach Hoffman,<sup>b</sup> and Diego F. Cuadros<sup>a,\*</sup>

<sup>a</sup>Digital Epidemiology Laboratory, Digital Futures, University of Cincinnati, Cincinnati, OH, USA

<sup>b</sup>College of Medicine, Central Michigan University, Mount Pleasant, MI, USA

## Summary

**Background** The escalating substance use disorder (SUD) crisis in the contiguous United States (US), with rising mortality since 1999, necessitates a spatiotemporal analysis to identify high-risk areas and vulnerable populations. This study examines the geospatial distribution and clustering patterns of SUD mortality, assessing disparities by race and urban-rural status.

**Methods** We analyzed county-level ecological data on SUD-related deaths from the Centers for Disease Control and Prevention (CDC) from 2005 to 2020. Using spatial scan statistics, we identified significant clusters of elevated SUD mortality and assessed shifts over time. The analysis stratified results by race (White and Black subpopulations) and urban-rural classification to explore disparities.

**Findings** Among 3142 U.S. counties, we identified 27 significant spatiotemporal clusters of elevated SUD mortality, primarily emerging post-2013 and persisting until 2020. The epidemic's epicenter shifted from the western to the eastern U.S. around 2016. Clusters in the White population ( $n = 26$ ) had an estimated mortality rate of 28.42 per 100,000 person-years (95% confidence interval [CI]: 28.30–28.54), compared to 14.83 per 100,000 person-years (95% CI: 14.74–14.92) outside clusters. For the Black population ( $n = 17$ ), the mortality rate was 33.16 per 100,000 person-years (95% CI: 32.80–33.51) within clusters, versus 13.36 per 100,000 person-years (95% CI: 13.14–13.59) outside. Clusters in the Black population emerged later, mostly after 2013, while White clusters followed a pattern similar to the general population. The urban SUD mortality rate was 1.30 per 10,000 per year, while the rural mortality rate was 1.03 per 10,000 per year. Within clusters, urban counties had a mortality rate of 1.61 per 10,000, compared to 0.97 per 10,000 outside. Rural counties had 1.43 per 10,000 in clusters, while non-clustered rural areas had 0.81 per 10,000.

**Interpretation** The shifting geographic and racial patterns of SUD mortality underscore the need for targeted, region-specific interventions. The increasing impact on Black populations and urban centers in the East highlights the importance of equitable access to treatment and harm reduction services. Real-time surveillance and tailored urban-rural strategies are essential to mitigate the evolving crisis.

**Funding** None.

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**Keywords:** Spatiotemporal clustering; Substance use disorder mortality; Overdose; Addiction; Scan statistics; Spatial epidemiology; Longitudinal studies

## Introduction

Substance use disorder (SUD) is defined as a treatable mental disorder that affects a person's ability to control their use of substances, understood as compounds that can potentially be abused for recreational purposes due to their psychoactive nature.<sup>1</sup> This condition has been

rising for over three decades, claiming over 900,000 lives in the United States (US) since 1999 and constituting a national epidemic.<sup>2</sup> Deaths from SUD have increased more than any other cause of death in this period, with SUD-related deaths surpassing motor vehicle traffic as the most frequent unintentional injury-

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E-mail address: [diego.cuadros@uc.edu](mailto:diego.cuadros@uc.edu) (D.F. Cuadros).

### Research in context

#### Evidence before this study

We conducted a comprehensive literature review to assess the current state of research on the spatiotemporal dynamics of substance use disorder (SUD) in the US. Sources included PubMed, Google Scholar, and relevant epidemiological and public health journals. Our search criteria focused on studies published between January 2000 and December 2022, examining the spatial distribution and temporal trends of SUD-related mortality, with particular attention to the impact on different racial and demographic groups. Key references included analyses of opioid overdose trends, racial disparities in SUD outcomes, and urban-rural differences in substance use patterns. We identified significant gaps in understanding the evolving geographical epicenter of the SUD epidemic and the need for fine-scale temporal and spatial analyses to inform public health interventions.

#### Added value of this study

This study advances the existing evidence by providing a detailed spatiotemporal analysis of SUD-related mortality in the US from 2005 to 2020. Applying spatial scan statistics, we identified 27 significant spatiotemporal clusters of elevated mortality rates, highlighting a dynamic shift in the epicenter of the epidemic from the western to the eastern US around 2016. Our findings underscore significant racial disparities,

with the black subpopulation emerging as a newly vulnerable group with increasing mortality rates since 2013.

Furthermore, we documented distinct urban-rural variations, particularly noting that rural areas in the West are more likely to form clusters compared to their eastern counterparts. These insights offer a granular understanding of the progression of the epidemic and the demographic groups most at risk, informing targeted public health strategies.

#### Implications of all the available evidence

The evolving and highly dynamic nature of the SUD epidemic highlights the need for continuous surveillance and adaptive public health responses. As the epidemic shifts to the eastern U.S. and disproportionately impacts Black populations, interventions must be region-specific and equity-focused. Expanding harm reduction and treatment services in newly affected urban areas is critical, alongside addressing systemic healthcare disparities and improving culturally competent care for Black communities. The distinct urban-rural disparities call for tailored strategies, particularly in rural areas with limited healthcare access and high prescription opioid use. Integrating real-time mortality tracking and advanced surveillance systems will enhance the timely identification of emerging hotspots, allowing public health efforts to remain proactive and responsive to the shifting epidemic landscape.

related death cause in 2012 and staying on top ever since.<sup>3</sup> The spatial distribution of the SUD epidemic has shown a heterogeneous pattern, with some areas exhibiting increased risk. The West and Midwest regions of the US have shown clusters of SUD mortality,<sup>4</sup> with temporal and social dynamics showing regional differences accounting for the local variation of the national epidemic.

Temporarily, there are four distinct but overlapping waves of the epidemic.<sup>5</sup> The first wave, characterized by prescription opioids, occurred between 2000 and 2016. A rise in heroin-related deaths marked the second wave, beginning in 2007 and surpassing prescription-related deaths in 2015. The third wave is linked to synthetic opioids, which exhibited a steady increase from 2013 to 2018. The fourth wave is associated with a rise in polydrug use following the COVID-19 pandemic and could be considered to still be ongoing.

The racial differences are prominent in SUDs, with higher overall mortality among whites but with a sharp rise among black males post-2014.<sup>6</sup> In addition, the urban-rural divide has also created geographical differences: rural areas present a higher percentage of the white population, higher unemployment rates, and a greater percentage of specialized opioid prescribers, such as surgeons and oncologists,<sup>7</sup> while lacking resources to treat SUD.<sup>8</sup> These differences observed in the SUD epidemic can be attributed to supply and demand:

the availability of certain substances over limited geographical areas may have caused variations in the observed mortality trends over time.<sup>9</sup>

Previous studies,<sup>4</sup> conducted a spatial analysis of the data up to 2017, highlighting geospatial hotspots emphasizing vulnerable populations. Extending this analysis further, this research seeks to explore the temporal dynamics of the spatial structure of the SUD crisis by examining the spatiotemporal dynamics of SUD mortality rates, including data until 2020.

The aim of this study is to analyze the spatiotemporal dynamics of SUD mortality in the U.S. from 2005 to 2020, identifying evolving geographic patterns and racial disparities. Using spatiotemporal clustering analysis, we seek to detect high-risk areas, characterize emerging local micro-epidemics, and assess the shifting epicenter of the crisis over time. This study provides insights into how SUD mortality has evolved across racial groups and geographic landscapes, informing targeted public health interventions.

## Methods

### Study design

Institutional review board approval and informed consent were not necessary for this cross-sectional study because all data were deidentified and publicly available (Common Rule 45 CFR §46). This study follows the

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline. A longitudinal ecological study was conducted to identify the spatiotemporal dynamics of SUD mortality across the contiguous U.S from 2005 to 2020. By employing retrospective spatiotemporal scan statistics, this study sought to identify the spatial and temporal structure followed by the SUD epidemic, analyzing the behavior of SUD—related deaths across the general population, as well as across the White, Black, Rural, and Urban subpopulations.

#### Data sources

SUD mortality data was collected from the US Vital Statistics System restricted-use micro-data mortality files for the period of January 2005 to December 2020,<sup>10</sup> the filtered data included date and county of deaths coded as unintentional acute poisoning events, decedent's demographic characteristics (sex and race) and the International Classification of Diseases, 10th Revision (ICD-10) code for the cause of death.<sup>11</sup> Individuals aged 5–84 years were included, and drug overdoses were identified as those with ICD-10 codes indicating unintentional substance poisoning (cause of death codes: X40, X41, X42, X43, X44) to estimate SUD mortality rates. These ICD-10 codes included deaths caused by the following substances: heroin, methadone, cocaine, other opioids, synthetic narcotics, and unspecified narcotics. Chronic deaths related to the long-term effects of substance use (e.g., liver disease or cardiovascular complications) were not included in the scope of this analysis. This approach ensures that the study focuses specifically on the acute mortality burden directly attributable to SUD. Using this definition, the sample size for this study included all SUD mortality cases reported in the contiguous United States between 2005 and 2020, totaling 665,341 deaths. This comprehensive approach ensures that the analysis captures the full extent of the epidemic's dynamics, maximizing the statistical power necessary to detect significant spatiotemporal clusters.

Population at risk was estimated by using the latest county-level population estimates from the U.S Census Population and Housing Unit Estimates Tables for each of the years of our study period.<sup>12</sup> Data was filtered by subpopulation, obtaining yearly population estimates by demographic characteristics (sex and race). Further, counties were classified as urban or rural following the National Center for Health Statistics (NCHS) 2013 Urban-Rural classification schemes<sup>13</sup>: Large central metro, Large fringe metro, Medium metro, and Small metro counties were considered urban, while Metropolitan and Noncore counties were considered rural.

To delineate the heterogeneity in the estimates, county-level mortality rates are reported for the general population, encompassing the three racial categories reported in the mortality files of White, Black, and

Others. Further, separate estimates for White, Black, Urban, and Rural subpopulations are also reported.

#### Spatiotemporal clustering analysis

A county-level spatiotemporal clustering analysis was conducted to identify geographical clusters of high numbers of SUD-related deaths that persist for at least two or more years using Kulldorff's spatial scan statistics<sup>14</sup> implemented in the SaTScan software. The unit of analysis in this study is the county, as mortality data were aggregated at the county level. Clusters represent groups of neighboring counties with significantly elevated SUD mortality during specific time periods.

The analysis was performed for the general population, as well as for the White and Black subpopulations. Scan statistics are widely used for cluster detection in epidemiology,<sup>15–18</sup> social sciences,<sup>19</sup> crime mapping,<sup>20</sup> and, very recently, in mental health,<sup>21</sup> among other applications. We applied a Poisson likelihood function, which is suitable for count data, to model the occurrence of SUD mortality events in relation to the population at risk within each county. To estimate statistical significance of the clusters detected, SaTScan estimates p-values using a Monte Carlo hypothesis testing approach within the framework of the spatial scan statistic. Specifically, for the discrete Poisson model, SaTScan first computes the likelihood ratio test (LRT) statistic for each scanning window, comparing the observed number of cases within the window to the expected number under the null hypothesis of spatial randomness. The window with the maximum likelihood ratio is identified as the most likely cluster. To assess statistical significance, SaTScan generates multiple random datasets under the null hypothesis by distributing cases according to a Poisson process that maintains the overall distribution of the population at risk. For each simulated dataset, the likelihood ratio is recalculated, forming a reference distribution of test statistics under the null hypothesis. The p-value for an observed cluster is then estimated as the proportion of Monte Carlo replicates that yield a likelihood ratio at least as large as that of the observed cluster. This approach accounts for multiple testing inherent in scanning multiple potential cluster locations and sizes. Clusters with p-values below  $\alpha = 0.05$ , are considered statistically significant. A detailed description of the spatial scan statistics is provided elsewhere.<sup>14,17</sup> Likewise, a detailed description of the SaTScan methodology implemented and the assumptions for the Poisson model, confidence interval estimations, and sensitivity analysis of model assumptions can be found in [Supplementary Methods](#) and [Supplementary Figure S1 in Supplementary Materials](#).

After a cluster was identified, the strength of the clustering was estimated using the relative risk (RR) of cases within the cluster versus outside the cluster. The number of SUD-related deaths from the complete

dataset (2005–2020) was analyzed at the county level using Kulldorff's spatial scan statistics with a Poisson model with the overall population size by county included as an offset. SUD mortality rates are reported as the number of deaths per 10,000 people. Sensitivity analyses were performed to assess the robustness of the findings, including variations in Monte Carlo replications and outlier exclusions, and are detailed in [Supplementary Methods](#) in [Supplementary Materials](#).

### Analyzing the urban and rural divide in the epidemic

To assess the distribution of the epidemic across urban and rural areas, bivariate choropleth maps were produced for the urban/rural status of a county and if it was classified as a cluster for the general population at some point in the study period. To illustrate the statistical relationship established between these variables and their differences in the East and West of the country, proportionate bar graphs were produced using the R package *ggplot2*.<sup>22</sup> Lastly, contingency tables were created for the urban/rural status of a county and whether it was classified as a cluster for the general population at some point in the study period, these tables were used to estimate the RR for a rural county being classified as a cluster compared to an urban county. RRs for rural counties compared to their urban counterparts were estimated for the whole country, as well as counties to the East and to the West of the country.

### Temporal dynamics across subpopulations

Mean mortality values were estimated across the country by year for the general population, as well as for the White, Black, Urban, and Rural subpopulations. The mean mortality estimates were used to produce temporal line graphs representing the variability in mortality trends across time by subpopulation.

### Role of the funding source

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. The authors had full access to all data in the study and had final responsibility for the decision to submit for publication.

## Results

### General results

Deaths by unintentional drug overdose in the contiguous U.S. from 2005 to 2020 resulted in 665,341 cases. The estimated average SUD mortality rate during this period in the total population was 13.36 per 100,000 person-years (95% CI –13.32 to 13.40). The state with the highest mortality rate during this period was West Virginia, with a mortality rate of 28.5 per 100,000 person-years (95% CI 27.64–28.88), followed by

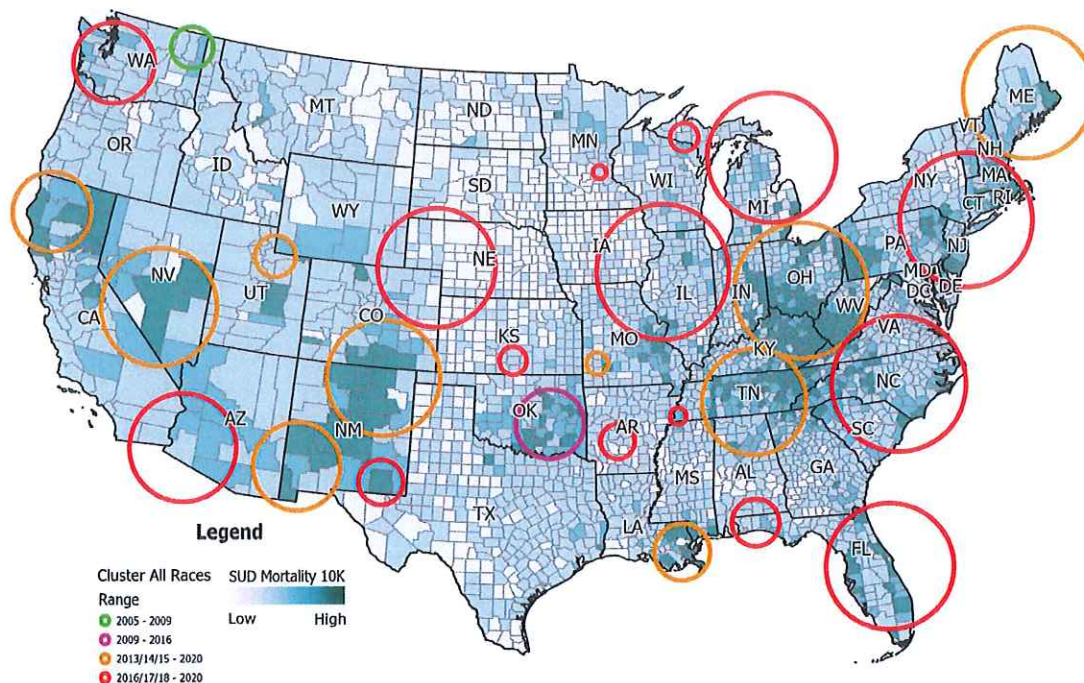
Kentucky (22.26 per 100,000 person-years; 95% CI 21.91–22.61), New Mexico (20.69 per 100,000 person-years; 95% CI 20.21–21.18), District of Columbia (20.64 per 100,000 person-years; 95% CI 19.77–21.55), and Delaware (19.53 per 100,000 person-years; 95% CI 18.83–20.26). The estimated SUD mortality rate in the White subpopulation was 14.11 per 100,000 person-years (95% CI 14.06–14.16), whereas the mortality rate in the Black subpopulation was 12.54 per 100,000 person-years (95% CI 12.46–12.62). [Supplementary Table S1](#) in [Supplementary Materials](#) summarizes General estimations for the total population and the Black and White populations, and [Supplementary Figure S2](#) illustrates the temporal trend of the mortality rate for the total, Black and White populations from 2005 to 2020.

### Spatiotemporal clustering analysis for the general population

Spatiotemporal SaTScan analysis identified 27 statistically significant spatiotemporal clusters that started emerging in 2005 ([Fig. 1](#)). Summary of the description of the clusters identified, including p values, are reported in [Supplementary Table S2](#) in [Supplementary Materials](#). The estimated mortality rate within the clusters was 25.94 per 100,000 person-years (95% CI 25.83–26.04) compared with a mortality rate of 13.61 per 10,000 person-years (95% CI 13.53–13.69) estimated in the areas outside of the identified clusters. One cluster emerged in the state of Washington in 2005, lasting until 2008 (average mortality rate 18.25 per 100,000 person-years; 95% CI 14.67–24.83), a second early cluster emerged in the state of Oklahoma in 2009, lasting until 2016 (average mortality rate 18.22 per 100,000 person-years; 95% CI 16.62–19.81). The 25 remaining clusters are divided into two main temporal groups: ten clusters starting from 2013 to 2015 and lasting until the end of the study period, and 15 clusters starting from 2016 to 2018 and lasting until the end of the study period. Broadly, most of the clusters emerging before 2016 were in the western part of the country, whereas most of the clusters emerging after 2016 were in the eastern part of the country. [Supplementary Table S2](#) in [Supplementary Materials](#) summarizes the main analysis outcomes from SaTScan for the general population.

### Spatiotemporal clustering analysis for the subpopulations

Spatiotemporal clusters of high SUD mortality were also detected for the White and Black subpopulations, using the same analysis and parameters. For the White subpopulation, 26 significant clusters were reported. Summary of the description of the clusters identified, including p values, are reported in [Supplementary Table S3](#) in [Supplementary Materials](#). The spatial distribution of these clusters exhibits similar structure as



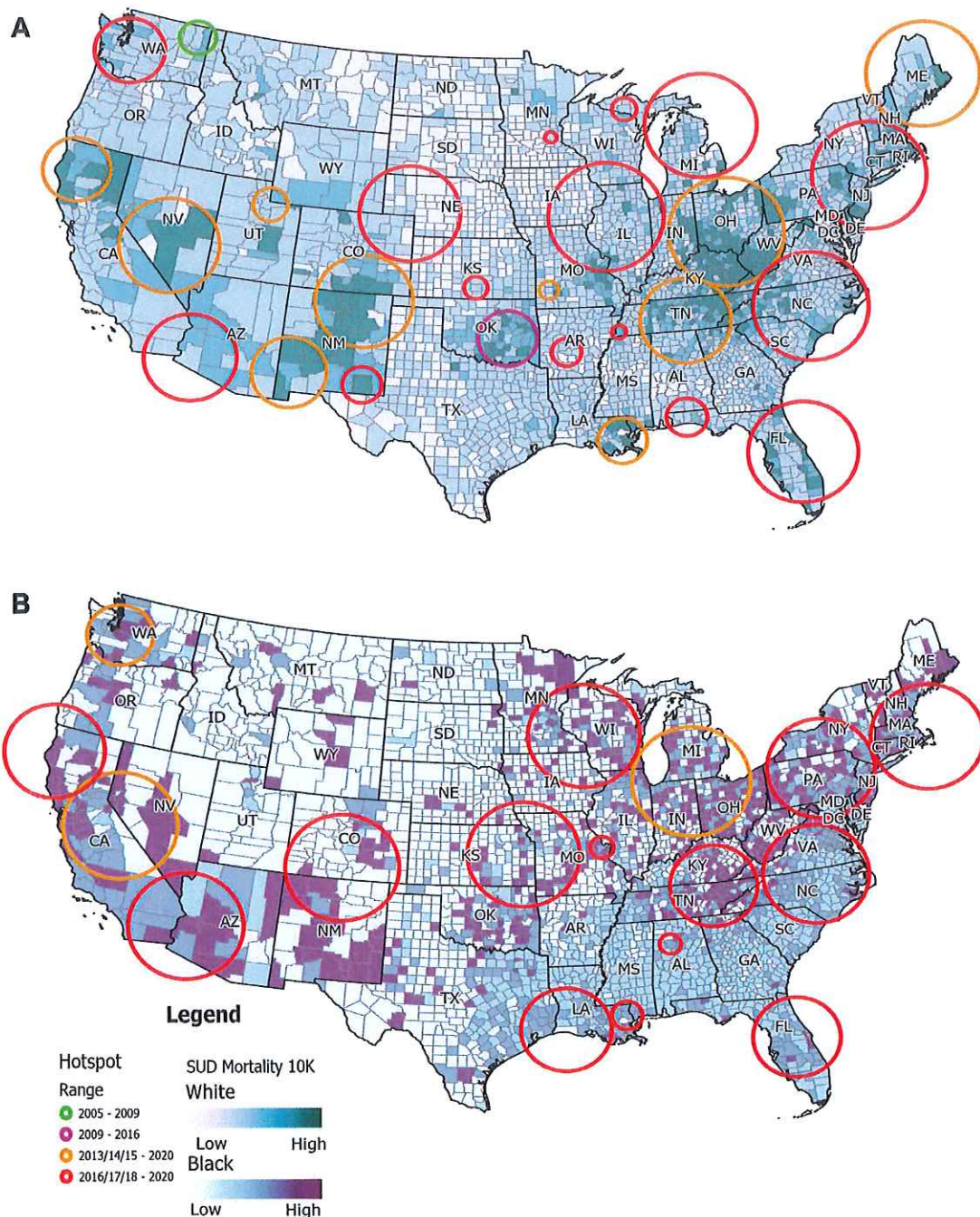
**Fig. 1: Spatiotemporal clustering of SUD-related deaths in the contiguous United States (2005–2020).** This map shows significant spatiotemporal clusters of SUD-related deaths in the contiguous United States from 2005 to 2020, identified using Kulldorff's spatial scan statistics. Early clusters appeared in Washington (2005–2009) and Oklahoma (2009–2016). From 2013 onward, clusters emerged in the western US, shifting to the eastern US post-2016. The estimated mortality rate within the clusters was 25.94 per 100,000 person-years (95% CI 25.83–26.04) compared with a mortality rate of 13.61 per 10,000 person-years (95% CI 13.53–13.69) estimated in the areas outside of the identified clusters.

observed for the general population (Fig. 2A). The estimated mortality rate within the clusters was 28.42 per 100,000 person-years (95% CI 28.30–28.54) compared with a mortality rate of 14.83 per 100,000 person-years (95% CI 14.74–14.92) estimated in the areas outside of the identified clusters. One cluster emerged in the state of Washington between the years 2005 and 2008 (average mortality rate of 19.43 per 100,000 person-years; 95% CI 15.53–23.32), two more early clusters showed up in the states of California and Oklahoma from 2009 to 2016 (average mortality rate of 25.83 and 20.37 per 100,000 person-year respectively). Eleven clusters starting from 2013 to 2015 and lasting until the end of the study period were reported, and 12 clusters starting from 2016 to 2018 and lasting until the end of the study period. Similar to the results reported for the general population, most of the clusters pre-2016 emerged in the western part of the country, whereas the clusters post-2016 emerged in the eastern part of the country. Supplementary Table S3 in Supplementary Materials summarizes the main analysis outcomes from SaTScan for the White population.

For the Black subpopulation, 17 significant clusters were identified, all of which started between 2013 and

2018 and continued to 2020 (Fig. 2B). Summary of the description of the clusters identified, including p values, are reported in Supplementary Table S4 in Supplementary Materials. The mortality rate estimated inside of the counties identified as clusters was 33.16 per 100,000 person-years (95% CI 32.80–33.51), while in the counties outside of clusters the estimated mortality rate was 13.36 per 100,000 person-years (95% CI 13.14–13.59). Only three clusters were reported between 2013 and 2015, while the remaining 14 clusters were reported as emerging after 2016. These SUD clusters for Black subpopulation were predominantly located in the eastern part of the country. Supplementary Table S4 in Supplementary Materials summarizes the main analysis outcomes from SaTScan for the Black population.

Supplementary Figure S3 in Supplementary Materials summarizes the notable temporal dynamics and racial disparities in SUD-related mortality, with high-risk clusters emerging later among the Black population compared to the general and White populations. Starting around 2015, high-risk clusters in Black communities show elevated RR, often exceeding those seen in earlier clusters among other groups. This delayed but intensified emergence suggests a recent and



**Fig. 2: Spatiotemporal clusters of SUD mortality by race in the US (2005–2020).** This figure displays spatiotemporal clusters of SUD-related deaths by race in the contiguous United States from 2005 to 2020. A) Clusters for the White subpopulation. A total of 26 significant clusters were identified. Early clusters appeared in Washington (2005–2009) and Oklahoma (2009–2016), with additional clusters emerging in California. Post-2013, clusters proliferated in the western US, with a shift to the eastern US post-2016. The mortality rate within clusters for the White population 28.42 per 100,000 person-years (95% CI 28.30–28.54) compared with a mortality rate of 14.83 per 100,000 person-years (95% CI 14.74–14.92) estimated in the areas outside of the identified clusters. B) Clusters for the Black subpopulation. Seventeen significant clusters were identified, all emerging between 2013 and 2018 and continuing until 2020. These clusters were predominantly located in the eastern US. The mortality rate estimated inside of the counties identified as clusters was 33.16 per 100,000 person-years (95% CI 32.80–33.51), while in the counties outside of clusters the estimated mortality rate was 13.36 per 100,000 person-years (95% CI 13.14–13.59). This reflects a later but rapid emergence of clusters in the Black subpopulation compared to the White subpopulation.

concentrated impact of the SUD epidemic in Black communities, indicating potentially heightened vulnerability or exacerbated risk factors in recent years.

We assessed the stability of cluster detection using different Monte Carlo replications (999, 4999, and 9999). Clusters for the general (0% misclassification) and Black populations were stable across all levels, indicating robust results. The White population showed minor variation, with a southeastern New Mexico cluster appearing only at the standard level (999 replications), resulting in a slightly higher misclassification rate of 0.3%.

An additional outlier exclusion analysis, which removed counties in the 98th percentile of SUD-related deaths, demonstrated consistent cluster patterns across populations, with only minor shifts. Misclassification rates remained low at 15% for the general population and were 28% and 36% for White and Black populations, respectively, indicating expected variability without systematic bias. Sensitivity analyses conducted are summarized in [Supplementary Tables S4–S7](#) and [Supplementary Figures S4–S9](#) in [Supplementary Materials](#).

#### SUD mortality in urban and rural areas

The estimated average SUD mortality rate for the study period was 1.30 per 10,000 people per year in the urban areas, compared to 1.03 per 10,000 people per year in the rural areas. The average mortality rate in urban counties classified as clusters was 1.61 per 10,000 people per year, while in urban counties not classified as clusters it was 0.97 per 10,000 people per year. For rural counties classified as clusters the average mortality rate was 1.43 per 10,000 people per year, while rural counties not classified as clusters had an average mortality rate of 0.81 per 10,000 people per year. It is important to note that due to the nature of the analysis, clusters can contain both urban and rural counties, but as it can be observed in [Fig. 3](#), clusters located to the West of the country are predominantly rural, whereas to the East of the country the proportion of urban and rural counties inside of clusters is relatively even.

The analysis of the data for the country in general revealed a RR of 0.73 (95% CI 0.65–0.81) for belonging to a cluster in rural counties compared to urban counties: Rural counties were at decreased risk of being classified as a cluster compared to their urban counterparts, which implies that the presence of urban counties within clusters was greater than that of rural counties. In terms of the urban/rural concentration of counties within a cluster, the East and West regions of the US showed a contrasting picture: Rural counties from the East were less likely to be in a SUD cluster compared to their urban counterparts (RR 0.82 95% CI 0.73–0.92), whereas in the west, the likelihood was higher (RR 1.03 95% CI 0.76–1.40).

#### Temporal dynamics by subpopulation

Cumulative mortality graphs were produced for each subpopulation, contrasting the mortality for the subpopulation, for the counties within the SUD clusters in that subpopulation, and for the counties outside of these clusters in that subpopulation ([Fig. 4](#)). For the general population, there is a clear difference in the mortality observed inside of the clusters versus outside of the clusters, this contrast remains stable over time besides a sudden drop observed in 2008 for the mortality values inside of the clusters. Then, the estimated mortality observed outside of clusters drop below the estimated average mortality for the general population from 2012 onward.

The temporal trend of the SUD-related mortality in the White subpopulation closely resembles the patterns observed for the general population, with a reduction in the estimated SUD-related mortality observed in 2008 within the identified clusters. In contrast, the SUD-mortality in the Black subpopulation showed a different temporal pattern: a homogeneous spatial structure resulted in the absence of clusters until 2013, when we observe the first clusters rapidly emerge across the country. The emergence of these clusters is associated to an increase in SUD-related deaths in the Black subpopulation when compared with the national averages. Likewise, from 2016 onwards, the mortality rate observed in Black surpasses that of the White subpopulation. It became the highest SUD mortality rate among the observed subpopulations, significantly spiking in 2018 and onwards.

A distinct geographical disparity between urban and rural areas was observed in the mortality rates within and outside the identified clusters, exhibiting temporal fluctuations. Yet, urban counties predominantly characterized the clusters over the study period. Urban clusters were identified early in the study timeline, displaying variable mortality rates in relation to urban national averages. In contrast, clusters within rural areas emerged post-2009, consistently demonstrating a stable divergence in mortality rates when juxtaposed against the rural national average.

#### Discussion

The spatiotemporal dynamics of the SUD epidemic in the US reveal the emergence of distinct localized micro-epidemics with unique characteristics. Using spatial scan statistics, clusters of elevated SUD mortality rates that exceeded expected values were identified. Initial clusters were detected in Washington (2005–2009) and Oklahoma (2009–2016). From 2013 to 2016, clusters proliferated in the western US, persisting until 2020, while clusters in the eastern US emerged from 2016 to 2018 and continued through the study period. Within the identified spatiotemporal clusters, the average mortality rate was 25.94 per 100,000 per person-years,

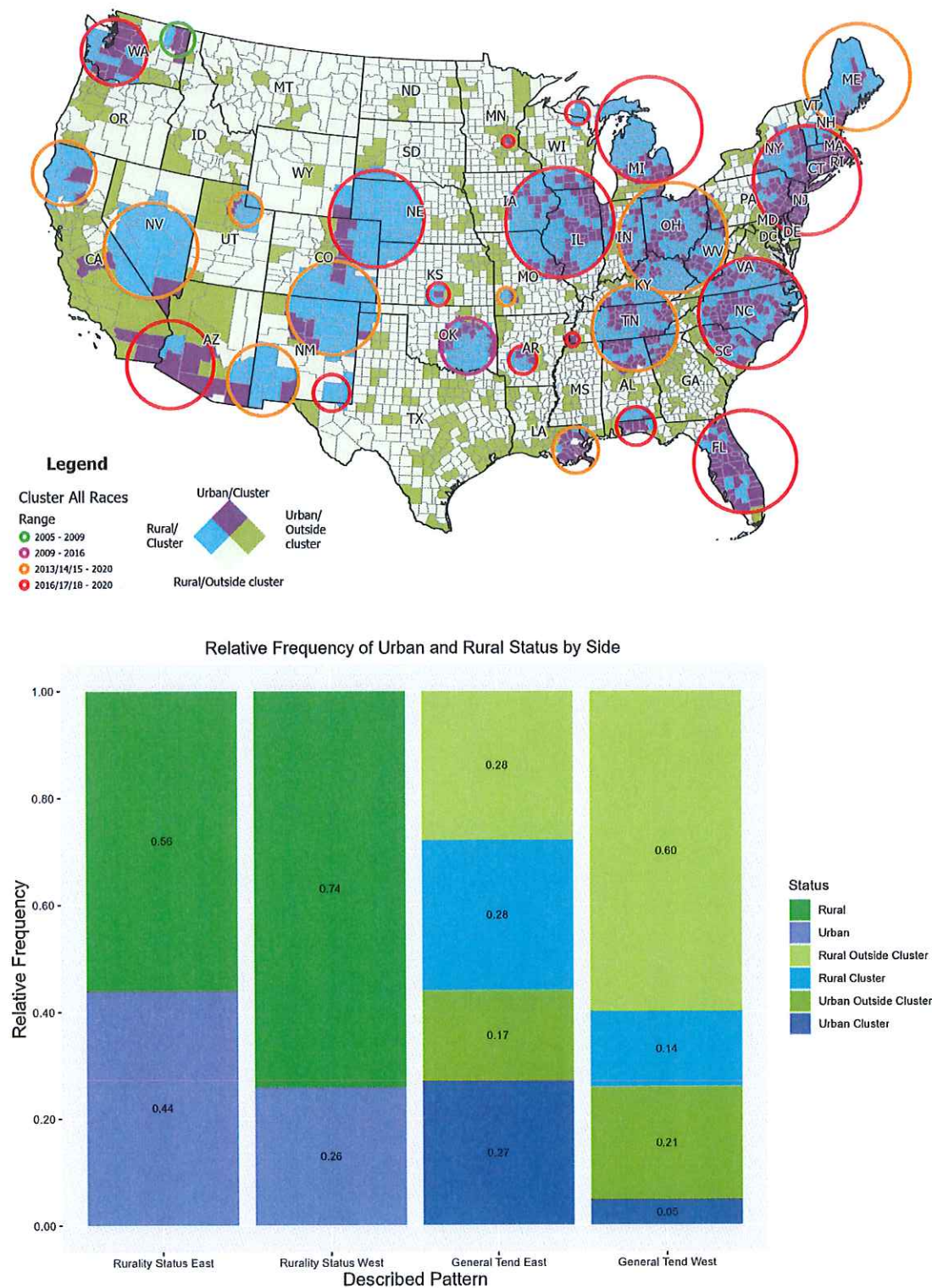
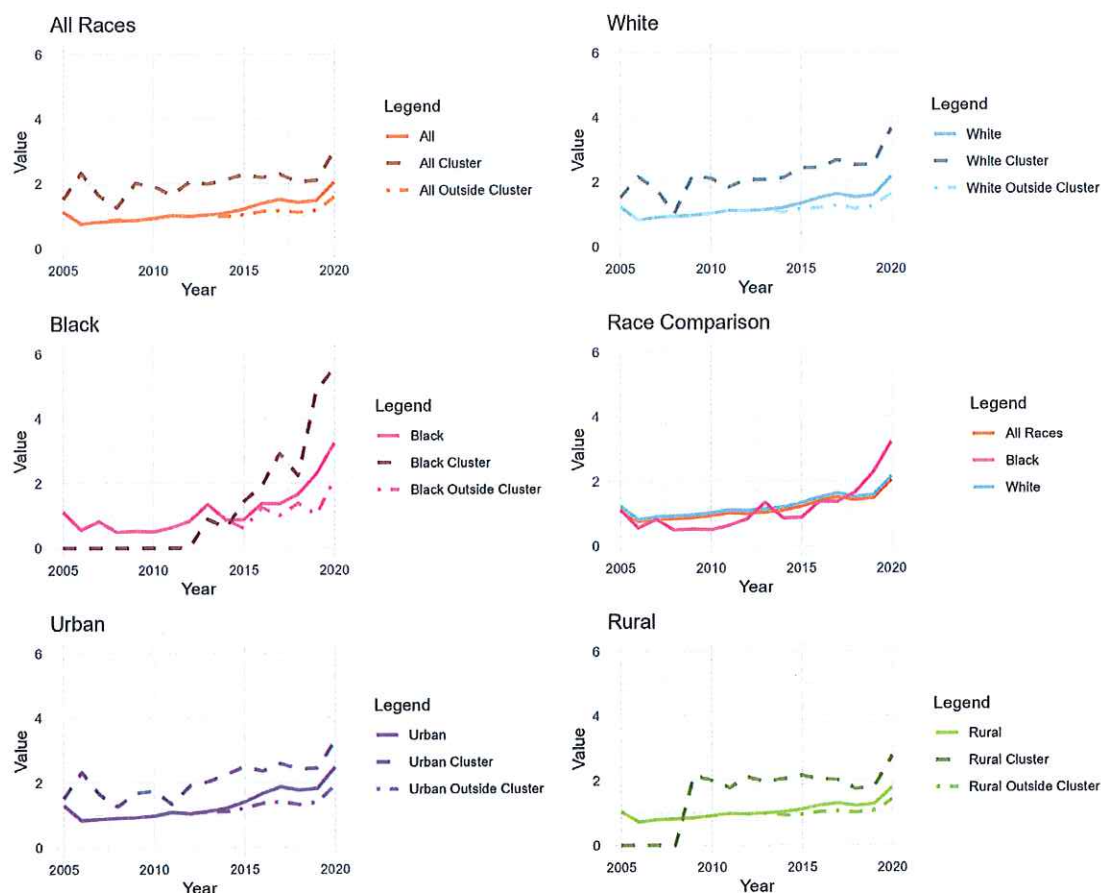


Fig. 3: Urban-rural differences in SUD mortality clusters in the US (2005-2020). This figure illustrates the urban-rural differences in SUD-related mortality clusters in the contiguous United States from 2005 to 2020. A) Bivariate choropleth map showing urban and rural counties



**Fig. 4: Temporal trends in SUD mortality by subpopulation and clusters (2005–2020).** This figure presents the temporal trends in SUD-related mortality across different subpopulations in the contiguous United States from 2005 to 2020. Top panels, cumulative mortality graph for the general population (left), and comparative cumulative mortality across subpopulations (right). “Comparative cumulative mortality” refers to the accumulation of SUD-related deaths over time for specific subpopulations within the identified clusters, expressed as a comparison to the cumulative mortality observed outside of the clusters or the national average for the same subpopulation. This cumulative approach illustrates the differential impact of SUD mortality within clusters over time, showing how certain subpopulations or geographic settings (e.g., rural or urban areas) experience elevated mortality burdens relative to their counterparts. Middle panels, temporal trends for the White subpopulation (right), and temporal trends for the Black subpopulation (right). Bottom panels, temporal trends for the Urban subpopulation (left), and temporal trends for the rural population (right). These temporal graphs illustrate the evolving dynamics of the SUD epidemic, highlighting distinct temporal patterns and the emergence of clusters within different subpopulations over time.

compared to 13.61 per 100,000 per person-years in non-cluster regions, highlighting the need for region-specific public health interventions.

Socioeconomic patterns driving the emergence of these localized micro-epidemics are still under investigation. Studies suggest that different substances targeting specific demographics have initiated distinct

epidemic phases.<sup>4,9,23</sup> The initial phase involved prescription opioid misuse, followed by a surge in heroin-related deaths from 2007. The subsequent phase, characterized by fatalities from fentanyl and other synthetic opioids, marks a transition driven by heroin’s increased availability and the challenges of obtaining prescription opioids. Recently, synthetic opioids

classified as clusters. Urban counties are predominantly found in clusters in the eastern US, whereas clusters in the western US are mostly rural. The map highlights the spatial distribution of high-risk areas, with urban areas showing higher cluster prevalence in the East and rural areas in the West. B) Bar chart depicting the proportion of urban and rural counties within identified clusters across the US. The chart demonstrates a higher likelihood of rural counties being classified as clusters in the western US, while urban counties are more prevalent in clusters in the eastern U.S.

misrepresented as other drugs have caused a spike in fatalities due to their potency heroin distribution in the US shows regional distinctions, with Colombian-sourced heroin prevalent in the East and Mexican “black tar” heroin in the West.<sup>24</sup> Powdered heroin, common in the Northeast and Midwest, is more often adulterated with fentanyl than the solid “black tar” heroin in the West.<sup>25</sup> These patterns illustrate the complex progression of the SUD epidemic, driven by varying supply and demand across different regions.

The spatiotemporal analysis highlights distinct regional patterns in SUD mortality across the United States, with clusters shifting from the West to the East over the study period. While the analysis did not predefine regions such as the West Coast, Central region, and East Coast, the results naturally revealed distinct trends. Early clusters on the West Coast, particularly in Washington, were likely associated with the initial wave of prescription opioids and a subsequent increase in heroin availability. The Central region, including states like Oklahoma and Missouri, showed persistent clusters during the mid-study period, which may correspond to the transition from prescription opioids to heroin and the emergence of fentanyl. The East Coast, encompassing states like Ohio, Pennsylvania, and New Jersey, exhibited later clusters primarily associated with the rapid spread of synthetic opioids, particularly fentanyl.

These regional differences likely reflect variations in drug supply networks, state-level policies, healthcare availability, and socioeconomic conditions. Future analyses could benefit from explicitly dividing the country into these regional categories to further explore the unique characteristics and risk factors influencing the SUD epidemic in each area.

Our analysis revealed distinct SUD mortality patterns among racial subpopulations. Spatiotemporal scan statistics showed that clusters in the white subpopulation appeared early, similar to the general population pattern, while clusters in the black subpopulation emerged later, starting in 2013 and persisting through the study period. Within these clusters, the white subpopulation had a higher mortality rate (28.42 per 100,000 person-years) compared to non-cluster areas (14.83 per 100,000 person-years). For the black subpopulation, the rate within clusters was 33.16 per 100,000 person-years, versus 13.36 per 100,000 person-years outside. Notably, from 2016 onwards, the mortality rate among blacks surpassed that of whites, with a significant spike from 2018 onwards.

The early predominance of white mortality rates is linked to prescription opioid misuse, influenced by disparities in pain management access and systemic healthcare biases affecting black patients.<sup>9,26,27</sup> The later emergence of clusters among blacks aligns with the rise of illicit synthetic opioids, particularly fentanyl, as shown by studies in St. Louis, Missouri, and

Massachusetts, highlighting racial inequities in opioid overdose deaths disproportionately affecting the black population.<sup>28,29</sup> These patterns emphasize the need for further research into the interplay between increased mortality, social determinants of health, and substance availability impacts on these demographic groups.

The estimated average SUD mortality rate during the study period was 1.30 per 10,000 individuals annually in urban areas, compared to 1.03 per 10,000 in rural areas. A segmented analysis between the eastern and western regions reveals a stark contrast: rural counties in the East had a lower likelihood of being classified as clusters compared to urban counties, while in the West, rural counties were more likely to form clusters than their urban counterparts. This analysis highlights a predominantly rural composition of clusters in the West.

This geographic disparity, with the West experiencing a predominantly rural SUD epidemic, can be attributed to several factors. Early cluster formations in the West, accelerated opioid overdose death rates in rural versus urban counties prior to 2010,<sup>30</sup> and higher prescription opioid rates in these rural areas contribute to this trend.<sup>31,32</sup> Rural-urban health disparities, compounded by the demographic and socioeconomic makeup of rural populations, characterized by a higher proportion of older adults with chronic pain and a significant non-Hispanic white demographic with greater access to opioid prescriptions,<sup>33,34</sup> further explain the observed spatial distribution of SUD mortality. These findings underscore the complex interplay between geographic location, demographic characteristics, and access to healthcare resources in the unfolding of the SUD epidemic across the US.

Our research highlights that the national SUD epidemic is shaped by numerous localized micro-epidemics, necessitating targeted local interventions to mitigate the overall national burden. Precise and timely detection using fine spatial and temporal resolution is essential to identify populations at higher risk. These risks involve both demand-side factors, such as socioeconomic status, educational attainment, and employment rates, and supply-side dynamics, including the availability of specific substances. Demand-side factors are generally stable and spatially specific, while supply-side elements are more volatile, often shifting rapidly over time.<sup>9</sup>

The introduction of unregulated substances into the illicit market significantly impacts SUD mortality rates. The infiltration of fentanyl adulterated or substituted heroin (FASH) into the US market has markedly increased mortality, underscoring the critical role of supply dynamics in the epidemic's evolution.<sup>35</sup> The use of spatiotemporal surveillance systems supports the creation of Early Warning Systems (EWS) for populations at increased risk due to demographic characteristics and exposure to new, unregulated substances.

Such systems have been implemented at regional, national, and international levels, with entities like the United Nations Office of Drug and Crime (UNDOC), the Inter-American Drug Abuse Control Commission, and the European Monitoring Centre for Drugs and Drug Addiction providing foundational guidelines for EWS development and implementation.<sup>36</sup>

The National Drug Early Warning System (NDEWS) in the US specializes in disseminating hotspot alerts that identify deviations from expected drug-related incident rates within defined temporal windows. NDEWS, along with the State and National Overdose Web (SNOW) and the Florida Drug-Related Outcomes Surveillance and Tracking System (FROST), exemplifies the US's advanced surveillance efforts to monitor and respond to emerging drug threats.<sup>37,38</sup> Additional early warning programs include DOSE,<sup>39</sup> DAWN,<sup>40</sup> and SUDOR.<sup>41</sup> Despite these advancements, the spatial granularity of reported data often remains suboptimal for detailed risk assessments. Integrating broader datasets, including those from emergency departments, medical examiners, and hospital records, into existing surveillance frameworks can enhance the precision and utility of EWS for effectively addressing the SUD epidemic.

According to the CDC's Guiding Principles, addressing the SUD crisis requires innovative strategies to prevent overdoses and related harms.<sup>42</sup> The SUD epidemic's dynamics are influenced by both demand, driven by socioeconomic factors within communities, and supply, dictated by the availability of controlled substances. Effective interventions must address these socioeconomic determinants and implement strict substance control policies. Additionally, recognizing individual decision-making in substance consumption suggests the need for comprehensive support, including educational initiatives, Naloxone distribution, and the development of surveillance and EWS.

EWS have proven beneficial for both policymakers and individuals directly affected by SUD. In Canada, provinces like British Columbia<sup>39</sup> and Saskatchewan<sup>43</sup> have implemented drug alert systems that provide real-time updates on hazardous substances within localities. These alerts offer detailed information about drugs, including their appearance and recent overdose locations, aiding informed decision-making among substance users. British Columbia also offers Drug Checking services, enabling individuals to test substances for dangerous adulterants like fentanyl and benzodiazepines. These services enhance community safety by providing accurate drug supply information. Although potentially contentious, such approaches emphasize the importance of engaging with communities affected by SUD to mitigate new risks. By analyzing drug testing information, a clearer understanding of the controlled substances market is gained, contrasting significantly with insights from

clinical records. This facilitates targeted interventions at both individual and policy levels, illustrating a holistic approach to addressing the complex challenges of the SUD epidemic.

The identification of spatiotemporal clusters and the differential impact of the SUD epidemic on urban versus rural areas provides critical insights for designing and implementing effective EWS. Understanding the spatiotemporal dynamics and identifying high-risk regions and populations allows EWS to deliver targeted alerts and information, enabling rapid, focused responses. For example, recognizing that rural areas in the West are more likely to form clusters can guide regional strategies such as deploying mobile naloxone units or establishing localized drug checking services. Additionally, temporal analysis offers a framework for predicting potential future outbreaks, facilitating preemptive actions in emerging risk communities.

A detailed understanding of the dynamics of the epidemic supports innovative SUD management and prevention approaches. Policymakers can use our findings on demand and supply characteristics to craft multifaceted strategies addressing both immediate substance availability risks and deeper socioeconomic drivers of substance use. This might involve educational campaigns tailored to specific community needs and contexts, along with policies improving healthcare access and support services. Applying our results to EWS design and other interventions promises a more proactive, informed public health approach, mitigating the impact of the SUD epidemic.

At the local level, our findings highlight the importance of community-specific interventions. For instance, the identification of higher cluster formation in rural areas of the West suggests the need for enhanced resources and services in these regions. Local health departments should consider deploying mobile units for Naloxone distribution and establishing localized drug checking services to reduce overdose fatalities. Additionally, targeted educational campaigns that address the specific needs and contexts of rural populations can raise awareness about the risks of synthetic opioids like fentanyl.

On a national scale, our study supports the integration of advanced surveillance systems, such as FROST, SNOW, DOSE, SUDOR, and DAWN, to provide timely and precise alerts about specific substance threats. These Early Warning Systems can facilitate the rapid deployment of resources to areas identified as high-risk, allowing for a more proactive response to emerging trends in substance use and overdoses. Likewise, our findings on racial disparities in SUD mortality, particularly the late emergence of clusters among the black subpopulation, highlight the need for policies that address systemic biases within healthcare. National interventions should aim to improve access to culturally

competent care and ensure equitable treatment for all demographic groups. This includes expanding access to medication-assisted treatment and other evidence-based therapies that have been shown to be effective in treating SUD.

Analyzing CDC mortality data is crucial for monitoring the SUD epidemic's evolving landscape. This comprehensive data analysis reveals patterns and trends essential for understanding the epidemic's complex dynamics. Future research should include such datasets to track changes in mortality rates, emerging SUD clusters, and demographic impact shifts. Ongoing analysis is vital for identifying new areas of concern, evaluating current intervention effectiveness, and adjusting strategies. As the SUD epidemic evolves, influenced by factors like new synthetic drugs and changing societal conditions, continuous monitoring of CDC mortality data will be invaluable for public health officials, researchers, and policymakers. This vigilance will enable a responsive, data-driven approach, guiding the development of targeted prevention and treatment strategies adaptable to the epidemic's complex dynamics. However, national policies should focus on standardizing substance classification across jurisdictions to ensure accurate and consistent data collection. This would enhance the quality of mortality data and enable more precise identification of spatiotemporal clusters. Furthermore, national strategies should promote the adoption of evidence-based practices in pain management and opioid prescribing to reduce disparities and prevent misuse.

This study has several limitations. First, reliance on ICD-10 codes for unintentional drug poisoning as a proxy for SUD mortality may introduce misclassification errors, as substances involved in deaths may be misidentified or unreported. This highlights the need for standardized substance classification across jurisdictions, particularly for emerging drugs like fentanyl. Second, the ecological and longitudinal nature of our analysis means findings reflect broader trends rather than individual-level associations. While spatial scan statistics effectively capture the spatiotemporal dynamics of SUD mortality, they do not account for substance-specific trends. Future research should explore substance-segregated analyses and assess the impact of local factors such as policy changes, trafficking routes, and healthcare access. Third, our spatiotemporal clustering approach was designed to detect clusters that emerge, persist, or disappear over time, capturing the epidemic's shifting geographic epicenter. The absence of persistent clusters suggests that external factors, including drug supply fluctuations, public health interventions, and regional reporting variability, may influence cluster formation. Further investigation is needed to assess how socioeconomic and healthcare disparities shape these patterns. Fourth, while we identified racial disparities in cluster formation, the

study did not analyze the interaction between race and urban-rural status. Our findings indicate that rural clusters were more common among White populations, whereas the Black population experienced increasing urban clustering. Future studies should explore these intersections, incorporating socioeconomic and healthcare access data for a more comprehensive analysis. Fifth, RR estimates may be subject to bias due to cluster selection based on statistical significance. However, sensitivity analyses, varying Monte Carlo replications and excluding outliers, demonstrated consistent cluster stability, reinforcing the robustness of our findings. Finally, overdispersion remains a potential limitation, particularly in subgroup analyses. Higher misclassification rates in White and Black subpopulations suggest extra-Poisson variability, which the Poisson model in SaTScan may not fully account for. While our sensitivity analyses help mitigate this concern, future research should explore alternative statistical models, such as the negative binomial, to improve precision in heterogeneous populations.

This study reveals the shifting spatiotemporal dynamics of the SUD epidemic in the US, with the epidemic's epicenter transitioning from the western to the eastern US around 2016. We identified 27 significant clusters of elevated SUD mortality, persisting until 2020, with a notable rise in mortality among Black populations from 2013 onward. Rural areas in the West exhibited a higher propensity for clustering, while urban areas in the East became increasingly affected. These findings underscore the need for region-specific, adaptive public health interventions that account for evolving substance use patterns. In the West, sustaining harm reduction efforts such as Naloxone distribution and treatment access remains crucial, while in the East, interventions should focus on synthetic opioid surveillance, increased treatment availability, and harm reduction services. The disproportionate impact on Black communities highlights the urgency of addressing systemic healthcare disparities, ensuring equitable access to medication-assisted treatment (MAT), and strengthening culturally competent care. Real-time surveillance systems and continuous monitoring of SUD mortality trends are essential for early detection of emerging hotspots, guiding targeted interventions to mitigate the evolving crisis.

#### Contributors

SE and DFC performed statistical analyses, data interpretation, and manuscript drafting. SE and DFC prepared figures and conducted data verification. All authors contributed to the study concept and design, data acquisition, and interpretation. All authors critically revised the manuscript for important intellectual content. SE and DFC had access to the raw data and verified the analyses. DFC had final responsibility for the decision to submit for publication. All authors read, reviewed, and approved the final manuscript.

**Access to data and data analysis:** Dr. Diego Cuadros and Santiago Escobar have full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

## Data sharing statement

All data are available in public repositories: <https://www.cdc.gov/nchs/nvss/nvss-restricted-data.htm>.

## Declaration of interests

The authors have no conflicts of interest to declare.

## Acknowledgements

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## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.lana.2025.101075>.

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### Dr. Preshit Ambade Bio

Preshit Ambade, BAMS, MHA, DrPH, PNAP is an Assistant Professor of Research at the College of Medicine at Central Michigan University. He previously served as an interim Director for the Master's and Doctoral Health Administration Program at The Herbert H. and Grace A. Dow College of Health Professions. He has a background in public health policy and physician training in an integrated allopathic and Ayurvedic medicine system. Dr. Ambade obtained his DrPH from the Mel and Enid Zuckerman College of Public Health at the University of Arizona and an MHA from the Tata Institute of Social Sciences in Mumbai, India. He has completed postdoctoral training at the Ottawa Hospital Research Institute in Canada and Augusta University in the USA, focusing on various health policy topics. He has extensive experience working with indigenous, inner-city populations, individuals with lived experiences, unhoused or at risk of becoming unhoused, and a history of substance use disorder. Before moving to North America, he served as a "Prime Minister's Rural Development Fellow," appointed by the Ministry of Rural Development, Government of India, to work in one of the country's development-deficient areas. With extensive academic and non-academic experience in health policy and expertise in applied econometrics, primary and secondary data analysis, and program and economic evaluations, his current research focuses on workplace mental health and well-being, aging-related health policies, healthcare financing models, and global health. He has published his research articles on these topics in several reputed public health journals.

**Preshit Nemdas Ambade, DrPH, PNAP****CURRENT POSITION**

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 Webpage (Office): <https://www.cmich.edu/people/PRESHIT-AMBADE>  
 Website (Personal): <https://www.preshitambade.com>

**A. PROFESSIONAL PROFILE**

An independent health services, health economics, public health policy, and global health researcher with a terminal public health degree (DrPH) and having sound knowledge of applied econometrics, epidemiology, social determinants of health, economic and program evaluations of health programs and services, secondary data analysis, and statistical packages (Stata and R). A physician (Ayurveda and Allopathy) with a master's in health administration and three years of leadership and administrative experience working with local and state governments in a multisectoral environment. A qualified teacher, mentor, and trainer with a certificate in college teaching and experience in teaching and imparting training in academic and non-academic settings.

**B. CONTRIBUTION TO SCIENCE**

- Developed and psychometrically tested, the **Augusta+ Scale**—the first instrument to assess workplace mental health and well-being using the US Surgeon General's framework.
- Elucidated health disparities such as hospital discharge communication, health services utilization, and Advanced Care Planning (ACP) across 11 high-income countries.
- My ORCID: <https://orcid.org/0000-0002-6919-7206>

**C. EDUCATION**

|                                                                                                                     |                              |
|---------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Doctor of Public Health</b> (GPA: 3.96)<br>Mel and Enid Zukerman College of Public Health, University of Arizona | August 2020<br>Tucson, USA   |
| <b>Certificate in College Teaching</b><br>Graduate College, University of Arizona                                   | December 2018<br>Tucson, USA |
| <b>Master of Health Administration</b> (GPA-3.17)<br>Tata Institute of Social Sciences                              | May 2012<br>Mumbai, India    |
| <b>Bachelor of Ayurved Medicine and Surgery</b> (GPA-3.74)                                                          | May 2009                     |

Maharashtra University of Health Sciences

Nashik, India

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**D. PROFESSIONAL AND RESEARCH EXPERIENCE**

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|                       |                                                                                                                                                                                          |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2024 – Present</b> | <b>Assistant Research Professor</b><br>Department of Foundational Sciences, Covenant HealthCare College of Medicine at Central Michigan University, Mount Pleasant, MI                   |
| <b>2025 – 2026</b>    | <b>Interim Program Director (MHA/ DHA)</b><br>Health Administration Division, Herbert H. and Grace A. Dow College of Health Professions, Central Michigan University, Mount Pleasant, MI |
| <b>2022 – 2024</b>    | <b>Postdoctoral Fellow</b><br>School of Public Health, Augusta University, Augusta, GA                                                                                                   |
| <b>2020 – 2022</b>    | <b>Postdoctoral Fellow</b><br>Ottawa Hospital Research Institute, University of Ottawa, Ottawa, ON                                                                                       |
| <b>2019 – 2019</b>    | <b>Summer Intern</b><br>Arizona Governor's Office of Strategic Planning and Budgeting (AZ-OSPB), Phoenix, AZ                                                                             |
| <b>2018 –2019</b>     | <b>Research Technician (Part-Time)</b><br>Center for Population Science & Discovery, University of Arizona, Tucson, AZ                                                                   |
| <b>2012 – 2015</b>    | <b>Prime Minister's Rural Development Fellow (PMRDF)</b><br>CAPART, Ministry of Rural Development Government of India, Rajnandgaon, India                                                |
| <b>2013 – 2014</b>    | <b>Assistant Medical Officer</b><br>Raodeo Nursing Home<br>Dwaraka Polyclinic<br>Chhatrapati Sambhaji Nagar, India                                                                       |

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**E. FELLOWSHIPS**

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|             |                                                                                                                                                                                                                     |
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| <b>2025</b> | <b>2025-26 Digital Learning and Leadership Faculty Fellows</b><br>Central Michigan University, Mount Pleasant, MI                                                                                                   |
| <b>2025</b> | <b>Michigan Integrative Well-Being and Inequality (MIWI) Fellow (6<sup>th</sup> Cohort)</b><br>Center for Social Epidemiology and Population Health, School of Public Health, University of Michigan, Ann Arbor, MI |

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**F. PUBLIC HEALTH & COMMUNITY SERVICE EXPERIENCE**

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- 2025 – Present**    **Membership Committee Member**  
Public Health Academy  
National Academies of Practice  
Lexington, KY
- 2025 – Present**    **Project Volunteer**  
Canadian Red Cross Society  
Ottawa, Ontario
- 2024 – 2026**        **Co-Chair**  
Climate Change and Health Working Group  
International Health Section  
American Public Health Association  
Washington (D.C.)
- 2023 – 2025**        **Section Councilor**  
International Health Section  
American Public Health Association  
Washington (D.C.)
- 2021**                **Deputy Co-Chair**  
Events and Networking Committee  
International Health Section  
American Public Health Association  
Washington (D.C.)
- 2020**                **Volunteer**  
Community Service During COVID-19  
Pandemic at Caring Ministries  
Pima County Volunteer Services  
Tucson, Arizona

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**G. UNIVERSITY COMMITTEES**

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- 2025 – Present**    **Special Interest Group Faculty Advisor**  
Student-led Special Interest Group on Global Health, Covenant HealthCare  
College of Medicine at Central Michigan University

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**H. PROFESSIONAL SERVICE**

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- 2026 – Present**    BMC Public Health  
• *Editorial Board Member*
- 2024 – Present**    American Journal of Preventive Medicine (AJPM) Focus

- Associate Editor

**2023 – Present** PLOS Global Public Health  
 • Manuscript Reviewer

**2023 – Present** BMC Public Health  
 • Manuscript Reviewer

**2023 – Present** BMC Geriatrics  
 • Manuscript Reviewer

**2023 – Present** BMC Health Services Research  
 • Manuscript Reviewer

**2023 – Present** Lancet Public Health  
 • Manuscript Reviewer

**2023 – Present** Global Health Economics and Sustainability  
 • Manuscript Reviewer

**2022 – Present** Journal of Racial and Ethnic Health Disparities  
 • Manuscript Reviewer

**2022 – Present** Healthcare  
 • Manuscript Reviewer

## I. PUBLICATIONS

### a. JOURNAL ARTICLES

1. **Ambade P.N.**, Zimmerman, C., Haddad, C., Miller, M., MacKinnon N. (2026). Telehealth Use and Satisfaction in Primary and Mental Health Care Across Nine High-Income Countries. *Pharmacists Mayo Clinic Proceedings: Digital Health*
2. Naylor, H., Choi, W., LeBlanc, M., Andrews, S., **Ambade, P. N.**, & MacKinnon, N. J. (2026). Perspectives on Leadership Development and Learning Needs of Pharmacy Leaders in Canadian Health Care Systems: A Qualitative Study. *Canadian Journal of Hospital Pharmacy*, 79(3), e3837.
3. Naylor, H., Choi, W., LeBlanc, M., Andrews, S., **Ambade, P. N.**, MacKinnon, B. H., & MacKinnon, N. J. (2026). Leadership and managerial development needs of pharmacy leaders in Canadian health care systems: results from a national questionnaire. *Can J Hosp Pharm*, 79(3), e3836.
4. **Ambade, P.**, Zimmerman, C., Haddad, C., Koperski, C., Rashid, G., Kafri, A., ... & MacKinnon, N. (2026). Updating knowledge on existing approaches on advanced care planning interventions: An umbrella review (vol 148, 106255, 2026). *ARCHIVES OF GERONTOLOGY AND GERIATRICS*, 150.
5. Chow, R., Pham, M., Cope, M.,..., **Preshit Ambade**,..., *et al.* (2026). Sexually dimorphic response to tobacco exposure in COPD: a systematic review and meta-analysis. *BMC Pulm Med* 26, 45. <https://doi.org/10.1186/s12890-025-04079-w>

6. Neil J. MacKinnon and **Preshit N. Ambade** (2025). National academies of practice's member survey on workplace mental health and well-being. *Journal of Interprofessional Education & Practice*; <https://doi.org/10.1016/j.xjep.2025.100784>
7. Joseph, J., Alhabeeb, F., **Ambade, P.**, Falavinha, B., Jama, S., Yang, S., ... & Pakhale, S. (2025). A global overview of sickle cell disease: populations, policy limitations and urgent need for comprehensive SCD clinical care, a systematic review. *Journal of Sickle Cell Disease*, Volume 2, Issue 1, 2025, yoaf026, <https://doi.org/10.1093/jscdis/yoaf026>
8. **Ambade P.N.**, Hoffman Z, Mehra K, et al. (2025). Hospital discharge communication problems in 10 high-income nations: a secondary analysis of an international health policy survey. *BMJ Open*;15:e094724. doi: 10.1136/bmjopen-2024-094724
9. **Ambade P.N.**, Hoffman Z, Minseo Y, et al. (2025). A National Survey of Health Preceptors' Workplace Mental Health and Well-Being. *Electron J Gen Med*. 2025;22(5):em682. <https://doi.org/10.29333/ejgm/16746>
10. Escobar, S., MacKinnon, N. J., **Ambade, P.**, Hoffman, Z., & Cuadros, D. F. (2025). Spatiotemporal analysis of substance use disorder mortality in the United States: an observational study of emerging hotspots and vulnerable populations (2005–2020). *The Lancet Regional Health–Americas*, 45
11. **Ambade P.N.**, Hoffman Z, Vest T, et al. (2025). Factors influencing communication issues during hospital discharge for older adults in 11 high-income countries: a secondary analysis of the 2021 International Health Policy Survey. *BMJ Open*;15:e089430. doi:10.1136/bmjopen-2024-089430
12. **Ambade P.N.**, Hoffman Z., Mehra K., Gunja M., Moore J. X. (2025). The link between perceived racism and health services utilization among older adults: an analysis of Commonwealth Fund's 2021 International Health Policy Survey. *Medical Care*.
13. Wang, J. Z., Chow, R., Shin, S., Yang, S., **Ambade, P.**, Jama, S., ... & Pakhale, S. (2024). Race-Based Pulmonary Function Testing Correction in COPD Inhaler Therapy Trials: A Systematic Review. *International Journal of Chronic Obstructive Pulmonary Disease*, 2285-2297.
14. MacKinnon, N. J., **Ambade, P. N.**, Hoffman, Z. T., Mehra, K., Ange, B., Ruffa, A., ... & Odo, N. (2024). Development of a New Instrument to Measure Workplace Mental Health and Well-Being. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes*, 8(6), 507-516.
15. **Ambade, P.N.**, Hoffman, Z. T., Mehra, K., MacKinnon, N. J., (2024) Predictors of Advance Care Planning in Eleven High-Income Nations. *Journal of American Geriatrics Society*.
16. **Ambade, P.N.**, Hajjar, J., Adjei, N., Yaya, S. (2024, August) Using the Family Planning Estimation Tool (FPET) to estimate national-level family planning trends and future projections for contraceptive prevalence and associated demand for HIV-infected women in sub-Saharan Africa. *PLOS Global Public Health*.
17. MacKinnon, N. J., Powell-Williams, M., **Ambade, P.**, Emery, V., Punukollu, P., Chen, M., (2024, August) Evaluation of an International Collaborative to Address Wicked Rural Health Issues: All The Things She Said. *Scientific Reports*.

18. **Ambade, P. N.**, Thavorn, K., & Pakhale, S. (2023, July). COVID-19 Pandemic: Did Strict Mobility Restrictions Save Lives and Healthcare Costs in Maharashtra, India?. In *Healthcare* (Vol. 11, No. 14, p. 2112). MDPI.
19. MacKinnon, N. J., Emery, V., Waller, J., Ange, B., **Ambade, P.**, Gunja, M., & Watson, E. (2023). Mapping Health Disparities in 11 High-Income Nations. *JAMA network open*, 6(7), e2322310-e2322310.
20. **Ambade, P. N.**, Gerald, J., & Rahman, T. (2023, May). Wealth Status and Health Insurance Enrollment in India: An Empirical Analysis. In *Healthcare* (Vol. 11, No. 9, p. 1343). MDPI.
21. **Ambade P.**, Rahman T. (2022). Working Paper: Do National Health Insurance Programs for the Poor Improve the Relative Health Outcomes of the Poor? Evidence from India. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4228939](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4228939)
22. **Ambade P.**, Pakhale S., Rahman T. (2022). Explaining caste-based disparities in enrollment for national health insurance program in India: A decomposition analysis. *Journal of Racial and Ethnic Health Disparities*. <https://doi.org/10.1007/s40615-022-01374-8>.
23. Imran, M., Uddin, A., **Ambade, P. N.**, et al. (2022). "SARS CoV-2 RT PCR positivity in relation to the demographic characteristics and symptoms in COVID-19 patients, Khyber Pakhtunkhwa, Pakistan: A prospective cohort study. *Tropical Medicine & International Health*, 116(8):750-757. doi: 10.1093/trstmh/trac057.
24. Huynh N., Saania Tariq S.,....., **Ambade P.**, ....., and Smita Pakhalé S. (2022). Personalized Multi-component Interventions for Tobacco Dependence Management in Low Socio-Economic Populations: A Systematic Review and Meta-analysis. *Journal of Epidemiology and Community Health*, 76:716-729.
25. Imran, M., Uddin, A., Khan, S., Khan, S., Uddin, A., Khan, M., Salman, **Ambade, P. N.** (2021). COVID-19 Situation in Pakistan: A Broad Overview. *Respirology*, 2021;1–2. <https://doi.org/10.1111/resp.14093>.
26. **Ambade, P. N.**, Katragadda, C., Sun, D., Bootman, J. L., & Abraham, I. (2019). Why health policies should be transnational: A case for East Asia Pacific countries. *International Journal of Risk & Safety in Medicine*, (Preprint), 1-25.

#### b. MANUSCRIPTS UNDER REVIEW

1. Hodgkins K, **Ambade P.N.**, Hoffman Z, Weid P, MacKinnon N. (XXXX). Workplace Mental Health and Well-Being, Loneliness, and Fulfillment in the National Academies of Practice. *Journal of Interprofessional Education and Practice*

#### c. BOOK CHAPTER

1. **Ambade, P. N.** (2020). Chapter 24- Gurukul of Skill in Dongargaon, Chhattisgarh, In: Making Development Happen: Transformational Change in Rural India, K. Seeta Prabhu and S. Parasuraman ed., Orient BlackSwan Pvt. Ltd.

#### d. BOOK REVIEW

1. **Ambade, P. N.** (2022) Corporatizing American health care: How we lost our health care system Robert Derlet Baltimore, MD, John Hopkins University Press, 2021c. \$29.95. Paperback pp. 216. ISBN: 9781421439587.

#### e. REPORTS

1. MacKinnon NJ, **Ambade PN**, Zimmerman CN, Haddad CN, Weid PS. Analysis of Spokane Regional Health District Workplace Mental Health and Well-Being: A Report. December 2025; 1-39.
2. **Ambade PN**, Hoffman Z, Hodgkins K, Weed P, MacKinnon NJ. National Academies of Practice (NAP) Membership Workplace Mental Health and Well-Being Survey 2024: A Brief Report. May 2025; 1-31.
3. MacKinnon NJ, **Ambade PN**, Hoffman Z, Yi M. National Area Health Education Centers Organization (NAO) Preceptors' Survey 2024: A Brief Report. June 2024; 1-31.

#### J. POSTER PRESENTATIONS

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1. **Author**, oral presentation titled "Association between primary care relationship quality and unmet mental health need: Evidence from eight high-income countries" at the American Public Health Association (APHA)'s Annual Meeting & Expo 2026, held between 1<sup>st</sup> and 4<sup>th</sup> November 2026 at San Antonio, Texas, USA.
2. **Author**, oral presentation titled "Reducing Loneliness in Older Adults through a Structured Intergenerational Telephone Intervention: a Pilot Study" at the American Public Health Association (APHA)'s Annual Meeting & Expo 2026, held between 1<sup>st</sup> and 4<sup>th</sup> November 2026 at San Antonio, Texas, USA.
3. **Presenter**, poster presentation titled "Measuring workplace mental health & well-being in a pediatric hospital using the Augusta+ Scale" at the American Public Health Association (APHA)'s Annual Meeting & Expo 2026, held between 1<sup>st</sup> and 4<sup>th</sup> November 2026 at San Antonio, Texas, USA.
4. **Presenter**, poster presentation titled "Spokane regional health district workplace mental health and well-being assessment" at the American Public Health Association (APHA)'s Annual Meeting & Expo 2026, held between 1<sup>st</sup> and 4<sup>th</sup> November 2026 at San Antonio, Texas, USA.
5. **Author**, poster presentation titled "The Global Telehealth Divide: Adoption, Satisfaction, and Policy Lessons from Nine High-Income Countries" at the Canadian Society of Healthcare-Systems Pharmacy (CSHP)'s Professional Practice Conference 2026, held between 30<sup>th</sup> April and 2<sup>nd</sup> May 2026 at Halifax, Nova Scotia, Canada.
6. **Author**, poster presentation titled "Understanding Workplace Well-Being Among Health Professions Faculty, Staff, and Students in Academic Institutions: Implications for Organizational Policy and Practice" at the 21st Annual Michigan Epidemiology Conference, held on 17<sup>th</sup> April 2026 at Grand Rapids, MI.
7. **Author**, poster presentation titled "Analysis of the OTAGO Exercise Program Core Assessments" at the 21st Annual Michigan Epidemiology Conference, held on 17<sup>th</sup> April

2026 at Grand Rapids, MI.

8. **Presenter**, poster presentation titled "Spokane Regional Health District Workplace Mental Health and Well-Being Assessment" at the 21st Annual Michigan Epidemiology Conference, held on 17<sup>th</sup> April 2026 at Grand Rapids, MI.
9. **Presenter**, poster presentation titled "Updating Knowledge on Existing Approaches on Advanced Care Planning Interventions: A Review of Systematic Reviews" at the 21st Annual Michigan Epidemiology Conference, held on 17<sup>th</sup> April 2026 at Grand Rapids, MI.
10. **Author**, oral presentation titled "Reducing Loneliness in Older Adults Through a Structured Intergenerational Telephone Intervention" at the 21st Annual Michigan Epidemiology Conference, held on 17<sup>th</sup> April 2026 at Grand Rapids, MI.
11. **Presenter**, poster presentation titled "Global Patterns of Telehealth Use and Satisfaction in Health Services" at the National Academies of Practice's Annual Meeting and Forum 2026, held between 12-14 March 2026 at Indianapolis, IN.
12. **Presenter**, poster presentation titled "Canadian Hospital Pharmacy Leadership Training and Learning Needs: Results from A Country-Wide Leadership Survey 2024" at the American Public Health Association's Annual Meeting and Expo 2025, held between 2-5 November 2025 at Washington, D.C.
13. **Presenter**, oral presentation titled "The Evolving Landscape of Substance Use Disorder Mortality in the United States: A Spatiotemporal Analysis of Emerging Hotspots and Vulnerable Populations (2005-2020)" at the American Public Health Association's Annual Meeting and Expo 2025, held between 2-5 November 2025 at Washington, D.C.
14. **Author**, poster presentation titled "*Global Patterns of Telehealth Use and Satisfaction in Primary Care and Mental Health Services*" at the Michigan Chapter of the American College of Physicians' 8<sup>th</sup> Annual Scientific Meeting, held on 26th September 2025 at Acme, MI.
15. **Author**, poster presentation titled "*Incidence & Short-Term Outcomes of Pulmonary Embolism in Patients with End-Stage Renal Disease*" at the Pulmonary Embolism Response Teams (PERT) Research Consortium's 11<sup>th</sup> Annual Pulmonary Embolism Scientific Symposium, held between 17-20 September 2025 at San Diego, CA.
16. **Presenter**, poster presentation titled "Assessment of Workplace Mental Health and Well-Being Using the Augusta Scale Among Healthcare Professionals: Report from a 2024 Survey of the National Academies of Practice Membership" at the 20th Annual Michigan Epidemiology Conference, held on 11 April 2025 at Mount Pleasant, MI.
17. **Presenter**, poster presentation titled "The Evolving Landscape of Substance Use Disorder Mortality in the United States: A Spatiotemporal Analysis of Emerging Hotspots and Vulnerable Populations (2005-2020)" at the 20th Annual Michigan Epidemiology Conference, held on 11 April 2025 at Mount Pleasant, MI.
18. **Author**, poster presentation titled "Assessment of Workplace Mental Health and Well-Being Using the Augusta Scale Among Healthcare Professionals: Report from a 2024 Survey of the National Academies of Practice Membership" at the Central Michigan University College of Health Profession's 8<sup>th</sup> Annual Research Symposium, held on 9th

April 2025 at Mount Pleasant, MI.

19. **Author**, poster presentation titled "Qualitative Analysis of Workplace Interventions: Report from a 2024 Survey of the National Academies of Practice Membership" at the Central Michigan University Student Creative & Research Endeavors Exhibition (SCREE), held on 2<sup>nd</sup> April 2025 at Mount Pleasant, MI.
20. **Author**, poster presentation titled "Communication let me down: Hospital discharge communication problems in 10 high-income nations" at American Public Health Association (APHA) Annual Meeting held between 27-30 October 2024 at Minneapolis, MN.
21. **Author**, poster presentation titled "Death at one's elbow: Factors influencing advance care planning activities in 11 high-income nations" at American Public Health Association (APHA) Annual Meeting held between 27-30 October 2024 at Minneapolis, MN.
22. **Author**, poster presentation titled "Medicaid coverage continuity matters: Evaluating the impact of the families first coronavirus act 2020 using medical expenditure panel survey 2019-21" at American Public Health Association (APHA) Annual Meeting held between 27-30 October 2024 at Minneapolis, MN.
23. **Presenter**, poster presentation titled "Development and validation of an Index of Social Attributes Predictive of Frailty Among Older Adults" at Georgia Public Health Association's Annual Meeting and Conference 2024, held between 1-33 May 2024 at Jekyll Island, GA.
24. **Presenter**, poster presentation titled "Leave in Silence: Hospital Discharge Communication Problems in Older Adults in 11 Countries" at Georgia Public Health Association's Annual Meeting and Conference 2024, held between 1-3 May 2024 at Jekyll Island, GA.
25. **Presenter**, poster presentation titled "The link between perceived racism and healthcare utilization among older adults: a health equity analysis" at Georgia Public Health Association's Annual Meeting and Conference 2024, held between 1-3 May 2024 at Jekyll Island, GA.
26. **Author**, poster presentation titled "Development of the Augusta Scale: A Workplace Mental Health and Well-Being Survey" at AcademyHealth's 2024 Annual Research Meeting, June 29 - July 2, in Baltimore, MD.
27. **Presenter**, poster presentation titled "Psychometric Testing of a New Instrument to Measure Workplace Mental Health and Well-Being" at National Academies of Practice (NAP) 2024 NAP Annual Meeting & Forum scheduled on 15-16 March 2023 at Jacksonville, FL.
28. **Presenter**, poster session titled "Mapping health disparities in 11 high-income nations: When geography matters" at American Public Health Association (APHA) Annual Meeting held between 12-15 November 2023 at Atlanta, GA.
29. **Presenter**, poster session titled "Uncovering Geographic Health Disparities: A Secondary Analysis of the Commonwealth Fund International Health Policy Survey" at Georgia Public Health Association's Annual Meeting and Conference 2023 held between 3-5 May 2023.
30. **Presenter**, poster session titled "Explaining caste-based disparities in enrollment for

national health insurance program in India: A decomposition analysis? at Evidence for Development What Works Global Summit (WWGS 2021) online conference between 18-26 October 2021.

31. **Presenter**, poster session titled "COVID-19 pandemic: Did complete lockdown saved lives and cost in Maharashtra, India?" presented at the Canadian Public Health Association (CPHA) COVID-19 and Public Health Forum 2021, Canada held virtually between 21-22 April 2021.
32. **Presenter**, poster session titled "COVID-19 pandemic: Did complete lockdown saved lives and cost in Maharashtra, India?" presented at the American Public Health Association (APHA) 2020 VIRTUAL Annual Meeting and Expo, USA, held between 24-28 October 2020.
33. **Presenter**, poster session titled "Explaining caste-based disparities in enrollment for national health insurance program (RSBY) in India: A decomposition analysis." presented at the 2019 Public Health Poster Forum, Tucson, Arizona, USA, held on 29 March 2019.
34. **Presenter**, poster session titled "Transnational Health Economic Policy Development: Study of East Asian and Pacific Countries." presented at the 12<sup>th</sup> International Conference on Health Policy Statistics, Charleston, South Carolina, USA, held between 10-12 January 2018.
35. **Author**, poster session titled "Transnational Health Economic Policy Development: Study of East Asian and Pacific Countries." presented at the 76th International Pharmaceutical Federation (FIP) World Congress of Pharmacy and Pharmaceutical Sciences 2016 Buenos Aires, Argentina, held in Aug-Sept 2016.

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#### K. INVITED LECTURES / PRESENTATIONS

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1. **Ambade PN**. Workshop titled "NAP Survey on Workplace Mental Health and Well-Being" at the National Academies of Practice's Annual Meeting and Forum 2026, held between 12-14 March 2026 at Indianapolis, IN.
2. **Ambade PN**. Bench to Bedside to Bench Seminar, Lecture: Workplace Mental Health & Well-Being in Health Professionals: The Development and Testing of a New Instrument. Central Michigan University, College of Medicine, Mount Pleasant, MI; *May 13, 2025*.
3. **Ambade PN**. Department Seminar, Lecture: Neglected Topics in Social Determinants of Health: Refocusing on Workplace Wellbeing and Healthcare Financing in the Post-Pandemic World. Augusta University, School of Public Health, Department of Biostatistics; *September 25, 2024*.
4. **Ambade PN & Hajjar J**. Canadian Red Cross Society section presentation, Topic: Using the Family Planning Estimation Tool (FPET) to estimate national-level family planning trends and future projections for contraceptive prevalence and associated demand for HIV-infected women in sub-Saharan Africa; *October 8, 2024*.
5. **Ambade PN & Hoffman Z**. Roundtable discussion, Topic: Psychometric Testing of a New Instrument to Measure Workplace Mental Health and Well-Being. Georgia Public Health Association's Annual Meeting and Conference 2024, Jekyll Island, GA; *May 1-3, 2024*.

6. **Ambade PN & Hoffman Z.** Roundtable discussion, Topic: Development of The Augusta Scale, a Workplace Mental Health and Well-being Survey. Georgia Public Health Association's Annual Meeting and Conference 2024 at Jekyll Island, GA; *May 1-3, 2024.*
7. **Ambade PN.** Roundtable discussion, Topic: How severe mobility restrictions during the COVID-19 pandemic impacted institutional delivery-related out-of-pocket expenditure? Empirical evidence from India. Southern Economic Association (SEA) 93<sup>rd</sup> Annual Meeting at New Orleans, LA; *November 18-20, 2023.*
8. **Ambade PN.** Oral session, Topic: Evaluation of an international collaborative to address wicked rural health issues: All the things she said. American Public Health Association (APHA) Annual Meeting at Atlanta, GA; *November 12-15, 2023.*
9. **Ambade PN.** Roundtable discussion, Topic: The link between perceived racism and health services utilization among older adults: A health equity analysis of commonwealth fund's 2021 international health policy survey. American Public Health Association (APHA) Annual Meeting at Atlanta, GA; *November 12-15, 2023.*
10. **Ambade PN.** Roundtable discussion, Topic: Addressing Rural Health Challenges in Georgia and Scotland: A Framework for International Collaboration. Georgia Public Health Association's Annual Meeting and Conference 2023 at Jekyll Island, GA; *May 3-5, 2023.*
11. **Ambade PN.** Back to Basics lecture series for M4 medical graduates, Topic: Population Health: Social Determinants of Health and Health Promotion. University of Ottawa, College of Medicine; *December 2022.*
12. **Ambade PN.** Co-moderator of a panel discussion at Evidence for Development What Works Global Summit (WWGS 2021), Topic: COVID-19 pandemic response: India and Pakistan; *October 18-26, 2021.*
13. **Ambade PN.** Co-moderator of a plenary session at Canadian Public Health Association's (CPHA) COVID-19 and Public Health Forum 2021, Topic: COVID-19 impact on marginalized communities in Canada; *April 21-22, 2021.*

## L. GRANTS AND FELLOWSHIPS

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1. **PI**, 2025, Otago Exercise Program, funded by Region VII Area Agency on Aging, Total Funding: \$181,266 over four years, Competitive Funding.
2. **Co-Applicant**, 2024 Harkness Senior Fellow Small Grant Program by The Commonwealth Fund, Total Funding: \$16,850, Competitive Funding.
3. **Co-Applicant**, 2023 Summer Scholars Program Organized by the Center for Undergraduate Research and Scholarship (CURS), Augusta University, Total Funding: \$2700, Competitive Funding.
4. **Co-Applicant**, Canadian Institutes of Health Research, Operating Grant: Emerging COVID-19 Research Gaps & Priorities (July 2021), Granted in December 2021, Project Title: Redefining eligibility of Social Assistance (SA) programs for vulnerable populations of Canada: A Data-driven Approach! Total Funding: \$497,129, Competitive Funding.

5. **Co-Applicant**, Canadian Institutes of Health Research, Catalyst Grant: Cannabis and Mental Health 2020-11-19, Granted in March 202, Project Title: Ottawa Cannabis and Mental Health Project in Marginalized Populations (OCM): Examining the experiences of youth using Photovoice, Total Funding: \$100,000, Competitive Funding.
6. **Co-Applicant**, Canadian Institutes of Health Research, Operating Grant: COVID-19 Vaccine Confidence 2021-08-10, Granted in September 2021, Project Title: Canada's COVID-19 Vaccine Confidence in Indigenous Populations: A Mixed Method Study, Total Funding: \$132,150, Competitive Funding.

## M. TEACHING EXPERIENCES

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|                     |                                                                                                                                                                                                                                                        |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2026, Fall</b>   | <b>Instructor</b><br>MPH 648: Health Policy and Management<br>Master of Public Health Program<br>Herbert H. and Grace A. Dow College of Health Professions, Central Michigan University                                                                |
| <b>2025, Fall</b>   | <b>Problem-Based Learning (PBL) Facilitator</b><br>Cellular and Molecular Principles of Medicine<br>Hematopoietic, Lymphatic and Immune systems<br>Medical Education Program<br>Covenant HealthCare College of Medicine at Central Michigan University |
| <b>2025, Fall</b>   | <b>Instructor</b><br>MPH 648: Health Policy and Management<br>Master of Public Health Program<br>Herbert H. and Grace A. Dow College of Health Professions, Central Michigan University                                                                |
| <b>2025, Spring</b> | <b>Instructor</b><br>MPH 640: Biostatistics<br>Master of Public Health Program<br>Herbert H. and Grace A. Dow College of Health Professions, Central Michigan University                                                                               |
| <b>2024, Summer</b> | <b>Co-Instructor</b><br>Independent Study: International and United States Health Policy Research<br>Center for Undergraduate Research and Scholarship,<br>Augusta University                                                                          |
| <b>2023, Summer</b> | <b>Co-Instructor</b><br>Independent Study: International and United States Health Policy Research<br>Center for Undergraduate Research and Scholarship,<br>Augusta University                                                                          |

|                     |                                                                                                                                                                                                                                                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2021, Fall</b>   | <b>Co-Instructor</b><br>Independent Study: Health Inequities - Theory and Current<br>Methods of Measurement<br>School of Epidemiology and Public Health, University of<br>Ottawa                                                                 |
| <b>2016, Spring</b> |                                                                                                                                                                                                                                                  |
| <b>– 2019, Fall</b> | <b>Teaching Assistant</b><br>PHPM 574: Public Health Policy and Management<br>PHPM515: Strategic Planning<br>CPH 310: US Healthcare System<br>Department of Community, Environment and Policy, School of Public<br>Health, University of Arizona |

#### N. MENTORSHIP EXPERIENCE

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|                     |                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2025, Fall</b>   | <b>Doctor of Health Administration (DHA) Dissertation Project Committee Chair</b><br>Student Name: Elizabeth Studley<br>Project Name: A Retrospective Case Study on Non-profit<br>Organizational Resilience During Crisis: COVID-19 and<br>Kenya Relief, 2020-2022<br>Herbert H. and Grace A. Dow College of Health<br>Professions, Central Michigan University   |
| <b>2025, Fall</b>   | <b>Master of Public Health (MPH) Plan B Final Project Committee Chair</b><br>Student Name: McKenna Wietecha<br>Project Name: The Impact of Community Health Workers<br>on Medication Adherence<br>Herbert H. and Grace A. Dow College of Health<br>Professions, Central Michigan University                                                                       |
| <b>2025, Fall</b>   | <b>Master of Public Health (MPH) Plan B Final Project Committee Chair</b><br>Student Name: Lujain Saeed Alobaid<br>Project Name: Impact of Underinsurance and Uninsurance<br>on Healthcare Access for Low-Income Racial Minorities in<br>the USA: A Narrative Review<br>Herbert H. and Grace A. Dow College of Health<br>Professions, Central Michigan University |
| <b>2024, Summer</b> | <b>2024 Summer Scholars Program</b><br>Independent Study<br>Center for Undergraduate Research and Scholarship<br>(CURS), Augusta University                                                                                                                                                                                                                       |
| <b>2023, Summer</b> | <b>2023 Summer Scholars Program</b>                                                                                                                                                                                                                                                                                                                               |

Independent Study  
Center for Undergraduate Research and Scholarship  
(CURS), Augusta University

## O. PROFESSIONAL AFFILIATIONS

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**2025 – Present**    **Member**, Association of University Programs in Health Administration (AUPHA)  
**2024 – Present**    **Member**, National Academies of Practice (NAP)  
**2018 – Present**    **Member**, American Public Health Association (APHA)

## P. PUBLISHED ARTICLES/BLOGS

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**2022**    [Scroll.in](#): “On Ambedkar Jayanti, a reminder why healthcare for Bahujans must get special attention.”  
**2021**    [Medium.com](#): “What India needs is an army of well-trained field epidemiologists and public health professionals.”  
**2020**    [Esakal.com](#): “Commentary: The need to eradicate health inequality as COVID-19 pandemic spreads.”  
**2018**    [Esakal.com](#): “Commentary: Implementation challenges in front of Ayushman Bharat Program.”  
**2018**    [Roundtableindia.com](#): “India Needs to Change its Health Policy Discourse to Understand Dalit Agitation.”

## Q. ACHIEVEMENTS

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**2026**    Inducted as Professional Member in Public Health Academy of National Academies of Practice (NAP)  
**2023**    2023 Nobuo Maeda Global Health Award from the Aging in Public Health Section of the American Public Health Association (APHA)  
**2023**    2023 Travel Scholarship award for best abstract in the International Health Section of the American Public Health Association (APHA)  
**2019**    Second Place Scholarship Award for poster presentation in 2019 Public Health Poster Forum at the College of Public Health, University of Arizona  
**2014**    “*Letter of Appreciation*” for achievements in skill development scheme from District Collector- Rajnandgaon  
**2013**    “*Letter of Appreciation*” for work and participation in voter awareness activities under PRATIGYA (SVEEP) program from District Collector –Rajnandgaon

## R. Workshop/Seminars Attended

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**2025**    CMU New Faculty Community of Practice (Academic Year 2025-26)  
**2025**    Columbia University Causal Mediation Analysis Training July 9-11, 2025  
**2025**    RUSH University Early Career Faculty Bootcamp 13-15 May 2025  
**2025**    Title: Supporting and Empowering Diverse Learners: A Workshop for Designing Accessible and Equitable Courses by Applying Inclusive Practices Organized by CMU’s Curriculum and Instructional Support (CIS) on May 14, 2025  
**2025**    Title: AI in Action: A Day of Discovery and Practice Organized by CMU’s Curriculum and Instructional Support (CIS) on May 15, 2025

## S. Media Coverage

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**2025** Mapping a crisis: The shifting landscape of opioid deaths 6 May 2025  
<https://www.cmich.edu/news/details/mapping-a-crisis>

# Development of a New Instrument to Measure Workplace Mental Health and Well-Being

Neil J. MacKinnon, PhD; Preshit N. Ambade, DrPH; Zach T. Hoffman, MS;  
Kaamya Mehra, BS, MD(c); Brittany Ange, EdD; Alyssa Ruffa, MPH;  
Denise Kornegay, MSW; and Nadine Odo, MPH

## Abstract

**Objective:** To develop and pilot test a new instrument measuring workplace mental health and well-being among health professionals.

**Participants and Methods:** A new survey instrument (hereafter referred to as the *Augusta Scale*) was developed using Qualtrics on the basis of the 5 essentials in the Office of the Surgeon General's (OSG) framework for workplace mental health and well-being (protection from harm, connection and community, work-life harmony, mattering at work, and opportunity for growth). The *Augusta Scale* contains 22 core questions (on a 1-5 Likert scale) and several demographic characteristic questions. We piloted the *Augusta Scale* from May 9, 2023, to June 5, 2023, with health professionals serving as preceptors for the Georgia Area Health Education Centers and assessed the instrument's psychometric properties under the classical test theory paradigm.

**Results:** The survey's response rate was 97.8% (583 responses out of 596 surveyed). Physicians comprised the largest health professional group surveyed (307, 52.7%), followed by advanced practice nurses (207, 35.5%), and physician assistants (69, 11.8%). The domain-specific Cronbach's  $\alpha$  ranged from 0.71 (0.67-0.75) to 0.90 (0.87-0.92), whereas the overall scale  $\alpha$  was 0.94 (0.93-0.95), suggesting strong reliability. The  $\Omega$  (high-order) score was 0.91, confirming that all items measured the latent construct. The convergent validity analysis confirmed the inverse relationship between total scale score and perception of burnout.

**Conclusion:** To our knowledge, the *Augusta Scale* is the first instrument to assess workplace mental health and well-being using the OSG's framework. Findings from this pilot test of Georgia health professionals offer evidence to support its validity in certain domains.

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In May 2022, the US Office of the Surgeon General (OSG) released an advisory report highlighting increasing rates of burnout, turnover, lack of resiliency, and poor workplace conditions in health care.<sup>1</sup> The report identifies health workers who are at an increased risk for burnout, burnout-associated factors, and specific action items to reduce burnout and turnover. Surgeon General Vivek Murthy argued elsewhere that the burnout is primarily driven by the disconnect between health professionals' desire to serve others and their need for self-care, rather than just long shifts and work hours.<sup>2</sup>

In October 2022, the OSG released The US Surgeon General's Framework for Workplace Mental Health & Well-Being, which built on the previous report. This framework incorporates five essentials (aligned with two basic human needs in each of them) that center around worker voice and equity: protection from harm (safety and security), connection and community (social support and belonging), work-life harmony (autonomy and flexibility), mattering at work (dignity and meaning), and opportunity for growth (learning and accomplishment).<sup>3</sup> Aligning the essentials with basic human needs serves to



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Affiliations continued at the end of this article.

enhance workplace mental health and well-being and connect the health of an organization to the health of its workforce. The essential, work-life harmony, also recognizes factors that influence the mental health and fulfillment of health professionals outside of their careers.

Although not specific to health care workers, the framework builds on the 2022 OSG report, which does address health care workers. In addition, the essentials in the framework align with elements that have been found to be critical for addressing health care workers well-being and reducing burnout. West et al<sup>4</sup> discuss several factors that contribute to physician burnout, such as spending substantial time on unmeaningful administrative tasks, high workloads, low social support, and minimal chances to collaborate, and limited chances to advance professionally. These factors correspond to the elements: mattering at work, work-life harmony, connection and community, and opportunity for growth, respectively. A National Academy of Medicine report points out similar factors affecting burnout rates among physicians, nurses, and other providers.<sup>5</sup> Specifically noted were workloads and schedules, which are overly burdensome, unmeaningful administrative tasks, difficulty finding meaning in work more generally, overlap of work and personal time, and limited or strained relationships, among others. Again, these align with the OSG's framework, suggesting that it can be a useful way to assess health care providers.

Taken together, the two OSG reports call health care organizations, payers, educators, and health professionals to take holistic action to address workplace mental health and well-being. Others have made similar calls. The previously mentioned National Academy of Medicine report recommended several actionable items to improve provider health, which address improving working and learning environments, limiting the number of administrative tasks placed on physicians, improving health information systems, providing support for those experiencing burnout and minimizing the associated barriers and stigma, and increasing research programs.<sup>4</sup> Shanafelt<sup>6</sup> discussed the importance of transitioning from physician well-being 1.0 to physician

well-being 2.0.<sup>6</sup> In 1.0, which describes the current state of provider well-being, the importance of addressing burnout and the consequences of not doing so, has been acknowledged; however, the onus of change falls to providers themselves, and solutions focus on the individual level. In 2.0, the focus would shift to addressing provider well-being at an organizational level and stress the importance of taking action. Workplace culture would shift to burnout prevention at the foundational level, understanding the limits of health care providers as human beings and allowing for vulnerability and self-compassion.

The OSG's framework provides a broad, holistic perspective that incorporates the whole person, both inside and outside the work environment. As such, it is a useful foundation from which to address the expanded focus of workplace well-being among health care providers. The purpose of this instrument development study was to develop and pilot test a new instrument measuring workplace mental health and well-being among health care professionals on the basis of the OSG's holistic framework, which would highlight specific areas to be improved by health care organizations.

## METHODS

The study methodology, including instrument development and design, was on the basis of recommendations by Salant and Dillman in *How to Conduct Your Own Survey*.<sup>7</sup>

Augusta University's institutional review board approved the study (IRB No. 1990141-3) and informed consent was obtained from all participants. No patient or public was involved in any stage of survey development, data analysis and interpretation, and manuscript writing.

## Development of the Augusta Scale

Two of the authors (NM and PA) developed a conceptual high-order model for the *Augusta Scale* with five domains on the basis of the four essentials in the OSG's framework: protection from harm (PH), connection and community (CC), work-life harmony (WH), mattering at work (WW), and opportunity for growth (OG). After incorporating feedback from the entire research team, the final instrument consisted of 22 questions on the basis of

the framework. Responses to each question were measured on a 5-point Likert scale from 1 strongly disagree to 5 strongly agree. Minimum and maximum scores varied by domain (PH 6-30; CC 4-20; WH 5-25; MW 4-20; and OG 3-15). The total possible score for the 22 core questions ranged from 22-110. In addition to the core questions, several demographic characteristic questions were added. As will be reviewed in detail below, we also included a one-item emotional burnout question and one-item quality of life (QoL) question to assess the convergent validity of the *Augusta Scale*. Because the items are modeled from bullet points in the OSG report, the 22 questions are spread across 5 domains, meaning domains have an unequal number of questions. Although no domain is conceptually weighted more heavily than another, the domains with more questions will contribute more to the overall score. The scale is intended to be simple to administer and score; thus, different weights were not given to individual subscales. During this pilot phase, our focus was to confirm that each of the included questions belonged to its respective domain. With additional data, we intend to establish standardized scores and thresholds for the domains.

### Survey Procedures and Sample

The *Augusta Scale* was sent to health professionals who precept for the Georgia Statewide Area Health Education Centers Network (GA AHEC). The GA AHEC is housed at Augusta University, Georgia's only public academic health center. The GA AHEC's goal is to increase access to primary care services in rural and urban underserved areas through the recruitment, training, and retention of primary care health professionals. To accomplish this goal, GA AHEC uses health professionals from across Georgia to serve as preceptors. The GA AHEC periodically surveys its preceptors on program satisfaction using Qualtrics. The *Augusta Scale* was included as part of the spring 2023 statewide survey of preceptors that was circulated from May 9, 2023, to June 5, 2023. A survey reminder was sent on May 23, 2023.

The GA AHEC preceptors were chosen as a convenience sample but reflect a mix of health professionals (physicians, nurses,

physician assistants, etc.) who work in geographically diverse parts of the state of Georgia. Thus, these preceptors are a reasonable sample to pilot test the reliability and validity of the *Augusta Scale*.

### Statistical analyses

All analyses were performed using the R statistical software version 4.2.3.<sup>8</sup> and SAS 9.4.<sup>9</sup> In R, the package Lavaan and its dependencies were used to perform the analyses.<sup>10</sup>

The *Augusta Scale*'s reliability was measured by checking internal consistency using Cronbach's  $\alpha$ <sup>11</sup> and  $\Omega$ .<sup>12</sup> The acceptable Cronbach's  $\alpha$  score for the questionnaire containing 14 items or more is  $>0.70$ .<sup>13</sup> A similar threshold is recommended for the  $\Omega$  score.<sup>14</sup> Internal consistencies were assessed for the overall scale (all 22 core questions) and for each of the five domains using these measures.

The *Augusta Scale* was tested for face, content, construct, and convergent-divergent validity.<sup>15</sup> A content expert (NM) checked the face and content validity and the construct and convergent validity were assessed empirically. We performed a confirmatory factor analysis (CFA) to check the scale's construct validity and to assess if the items mapped on the predefined domains by using correlated five-factor CFA with variance standardization. Given the nature of the scale's structure, we hypothesized that each item is nested in its respective domain, and these domains are ultimately nested with the broader concept of workplace well-being. To test this, we determined a high-order model considering each domain as the first order and workplace well-being as a second-order factor. To complement this structure, we also estimated a bifactor model, assuming the well-being factor explains most of the variance structure. An alternate third model was also estimated, ignoring the high-order structure but considering a correlational structure between the domains. The analysis was performed using all complete cases without implementing any imputations on the incomplete responses.

Various fit indices (Kaiser-Meyer-Olkin measure of sampling adequacy/Bartlett's test of sphericity, Tucker-Lewis Index  $>0.95$ ,  $\chi^2$  goodness of fit test, Root Mean Square Error of Approximation  $<0.08$ , Comparative Fit Index  $>0.95$ , and the Standardized Root Mean

Square Residual < 0.08) were estimated to check the plausibility of the five-factor solution.<sup>16,17</sup> Factor loading >0.40 was considered as a criterion for assessing the appropriateness of each item within the domain.<sup>18</sup> The variance for each domain/factor was checked to note the total variance explained by the model.

Convergent validity was assessed by measuring the association between a one-item burnout question and the total score on the *Augusta Scale*. Given the positive wording of the *Augusta Scale*, we expected to observe an inverse association between the two scales (ie, a higher scale score related to lower chances of emotional burnout). For this purpose, we defined burnout by dichotomizing the responses after Rohland et al.<sup>19</sup> We ran a logistic regression to predict the probability of emotional burnout given the total survey score after controlling for sociodemographic factors. Furthermore, an interaction model was also implemented to check the joint effect of the well-being score on the *Augusta Scale* and QoL measure. The statistical significance of the regression results was measured at the *P*-value <.05. For analytical purposes, the responses to the QoL measure were dichotomized to define high and low QoL.<sup>20</sup> Please review the online supplement for more details on the included burnout and QoL measures.

## RESULTS

### Respondents and Descriptive Statistics

As mentioned, since this is a pilot study, preceptors were selected as a population of convenience and may not be wholly representative of the larger community of health care workers. Although respondent representativeness was not a primary aim for this pilot, the sample does include a mix of ages, males and females, ethnicities, and professions (see Table 1). The *Augusta Scale* will be further analyzed and developed with additional data collection. Online Supplemental Figure S1 (available online at <http://www.mcpiqjournal.org>) depicts the mean of the total scale score, whereas Table S1 (available online at <http://www.mcpiqjournal.org>) shows its distribution across the socioeconomic variables. The total score ranged between 32 and 110, with a mean score of

TABLE 1. Descriptive Statistics for Survey Respondents of the *Augusta Scale*

| Characteristic          | N=583 <sup>a</sup> |
|-------------------------|--------------------|
| Age group (y)           |                    |
| 30-39                   | 161 (27.6%)        |
| 40-49                   | 136 (23.3%)        |
| 50-59                   | 173 (29.7%)        |
| 60+                     | 113 (19.4%)        |
| Gender                  |                    |
| Female                  | 323 (55.4%)        |
| Male                    | 260 (44.6%)        |
| Ethnicity               |                    |
| White                   | 437 (75.0%)        |
| Black                   | 67 (11.5%)         |
| Asian                   | 46 (7.9%)          |
| Others                  | 33 (5.7%)          |
| Profession              |                    |
| Physician               | 307 (52.7%)        |
| Physician Assistant     | 69 (11.8%)         |
| Advanced Practice Nurse | 207 (35.5%)        |

<sup>a</sup>Total observations and corresponding percentages for each variable are shown.

85.9 (standard deviation [SD]:17.4). This score varied considerably across sociodemographic variables (Table S1). For example, the total score increases gradually with the increasing age of the participants. Males, Whites, and physicians scored higher than their respective counterparts. The domain-specific mean scores and their sociodemographic distribution are presented in the Online Supplemental Figure 2 and Table S2 (available online at <http://www.mcpiqjournal.org>). The domain-specific mean total scores for domains 1, 2, 3, 4, and 5 were 24.07 (SD:5.19), 17.4 (SD:3.54), 18.55 (SD:4.49), 15.67 (SD:4.07), and 10.19 (SD:3.71), respectively. The sociodemographic distribution of these mean scores closely followed the distribution pattern for the total score (Figure 1).

### Scale Reliability

The reliability statistics are presented in Table 2. The five subscales reported acceptable reliability with Cronbach's  $\alpha$  ranging from 0.71 (0.67-0.75) to 0.90 (0.87-0.92). The overall scale reliability was 0.94 (0.93-0.95), suggesting strong reliability. The  $\Omega$  (high-order) =0.91, suggesting a high proportion

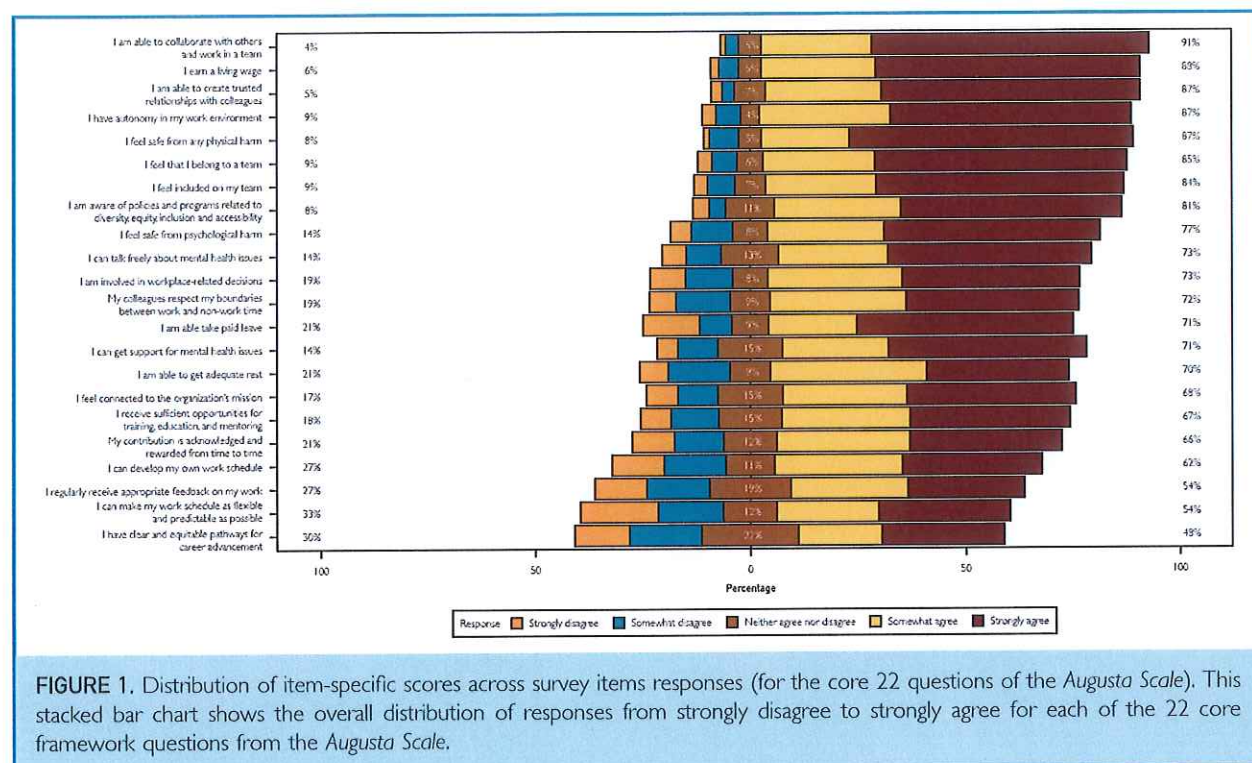


FIGURE 1. Distribution of item-specific scores across survey items responses (for the core 22 questions of the Augusta Scale). This stacked bar chart shows the overall distribution of responses from strongly disagree to strongly agree for each of the 22 core framework questions from the Augusta Scale.

of the questionnaire's total score variance is attributable to the overarching well-being construct. For domain-specific subscales, the score ranged between 0.88 and 0.99, suggesting a high reliability of the items in measuring the latent construct. A high value for the well-being factor and relatively smaller residual domain-specific values from the bifactor model (denoted as  $\Omega$  [hierarchical]) confirmed the theoretical high-order model and suggested that all items reliably measure the intended higher construct although loosely corresponding to their respective domains.

### Model Fit Statistics

The fit statistics are presented in Online Supplemental Table S3 (available online at <http://www.mcpiqjournal.org>). The Kaiser-Meyer-Olkin = 0.93 and Bartlett's Test with  $P < .001$  suggested the data is appropriate and sufficient correlations in the data were present to conduct the CFA. The results from the five-factor CFA model reported statistically significant  $\chi^2$  statistics ( $c^2$  difference [204] = 982.45;  $P < .001$ ), suggesting that there is a difference between implied and

actual polychoric correlation matrices. However, the model  $\chi^2$  statistic is sensitive to a larger sample size, and model fit should be checked with other parameters as well.<sup>21-23</sup> The other model fit statistics reveal a good fit for the model: comparative fit index = 0.97, root mean square error of approximation = 0.09 (95% CI, 0.08-0.10), standardized root mean square residual = 0.07, and Tucker-Lewis index = 0.97. These results indicated that the 5-factor solution for the CFA was validated. The fit statistics for other specifications also reported satisfactory model fit on the above-mentioned indicators.

### Factor Loadings

Figure 2 is the path diagram for the CFA model that depicts factor loading, coefficients, and variance structure. Table 3 presents the standardized factor loadings of each item. There was a positive correlation between the domains and second-order factor well-being, with the estimates ranging between 1.55 and 4.30 at  $P < 0.001$ . For the domain PH, three items were flagged for low factor loading (PH1, PH3, and PH6). All items display

TABLE 2. Reliability Estimates for the *Augusta Scale*<sup>a,b,c</sup>

| Domains                  | Cronbach's $\alpha$ (95% CI) | $\Omega$ | $\Omega$ (Hierarchical) |
|--------------------------|------------------------------|----------|-------------------------|
| Protection from harm     | 0.81 (0.78-0.84)             | 0.92     | 0.21                    |
| Connection and community | 0.90 (0.87-0.92)             | 0.95     | 0.19                    |
| Work-life harmony        | 0.71 (0.67-0.75)             | 0.99     | 0.13                    |
| Mattering at work        | 0.84 (0.82-0.86)             | 0.90     | 0.03                    |
| Opportunity for growth   | 0.87 (0.85-0.89)             | 0.88     | 0.13                    |
| Total scale              | 0.94 (0.93-0.95)             | 0.91     | 0.92                    |

<sup>a</sup>Abbreviations: CC, connection and community; CI, confidence interval; MW, mattering at work; OG, opportunity for growth; PH, protection from harm; WH, work-life harmony.

<sup>b</sup>The total scale row presents Cronbach's  $\alpha$  and total reliability variance ( $\Omega$ ) values for entire scale whereas the  $\Omega$  (hierarchical) represents proportion of total scale variance because of total score that is over and above individual domains.

<sup>c</sup>The domain-specific rows represent Cronbach's  $\alpha$  and total reliability variance ( $\Omega$ ) values for each domain, considering them as independent subscales, whereas the  $\Omega$  (hierarchical) values are residual variances that remained above and beyond the general well-being factor.

satisfactory factor loadings in the CC domain, whereas only one item (WH4) was flagged from the WH domain. All the items in domains MW and OG had loadings lower than the threshold, of which the former had the lowest values ranging between 0.13 and 0.21. All items in the high-order model, however, had results that were statistically significant at  $P < .001$  (Figure 2).

In the bifactor model, all items reported high factor loading on the latent factor well-being. In contrast, their residual loadings on the domains were relatively smaller (even negative in some instances). This alternate specification confirms items' ability to capture the overall workplace well-being. The factor loadings were excellent for all items in the correlational model where no additional latent variable structure is imposed on the domains (Supplemental Tables S4 and S5, available online at <http://www.mcpiqjournal.org>).

### Convergent Validity

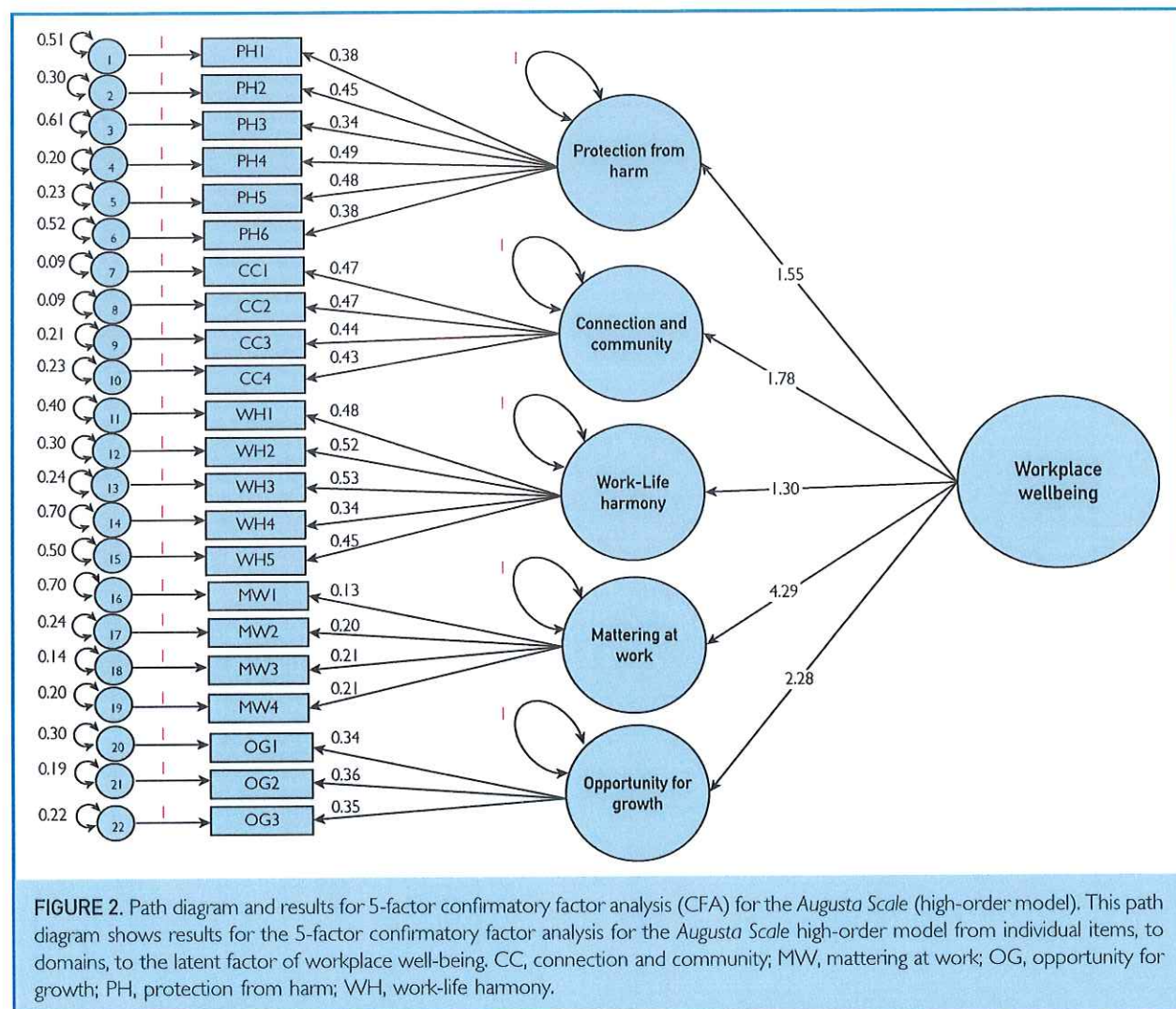
The convergent validity analysis confirmed the inverse relationship between the total scale score and the perception of burnout. More specifically, a one-unit high well-being score was associated with six times reduced odds of feeling burnout (OR: 0.94; 95% CI, 0.93-0.95). The interaction effect of total well-being score and low QoL was also in the same direction; however, the result was not statistically significant (Supplemental Table S6, available online at <http://www.mcpiqjournal.org>).

### DISCUSSION

To our knowledge, this is the first study to use the OSG's framework to create an instrument and measure its psychometric properties. Using latent factor modeling, we found that the developed items have high-reliability scores and measure the construct of workplace well-being through the specified domains. The fit indices and factor loadings confirm the high-order structure of the scale. Our findings suggest that the current version of the *Augusta Scale* is a solid foundation on which future iterations can be developed.

Higher well-being scores on the *Augusta Scale* were inversely related to perceptions of burnout. Overall well-being scores and low QoL had a similar, but not statistically significant relationship. Burnout has been widely used to assess health care workers' well-being.<sup>24,25</sup> However, the *Augusta Scale* offers the opportunity to examine a broader picture of worker well-being across its domains.<sup>26-28</sup>

We found statistically significant associations between demographic characteristic variables and *Augusta Scale* scores. Responses reported that men scored higher than women overall and across each domain. This pattern is seen across existing literature<sup>27</sup> and is more pronounced in the United States vis-à-vis other high-income countries.<sup>29</sup> A special report from 2023 indicated that, when compared with men, female clinicians reported spending more time working in electronic health records and working at home, being less able to control their own schedule,



getting lower pay, having fewer promotions, worse work-life balance and opportunities, and lower self-compassion.<sup>30</sup> Such conditions are likely to lead to higher levels of burnout.<sup>31,32</sup>

Respondent's race was also related to the well-being score. We found that White and Asian respondents had the highest overall well-being scores and highest scores across 4 of the 5 domains, including PH, CC, MW, and OG. However, those categorized as other had the highest scores on the WH domain, followed by Asian, Black, and then White respondents. Findings from previous studies regarding race and ethnicity are varied, with some indicating racial and ethnic minorities reported higher burnout when compared

with nonminorities, some indicating lower burnout, and still others indicating no difference.<sup>32,33</sup>

Age was also associated with well-being scores, with those 60 years and above scoring higher overall and across domains. A systematic review found mixed results, with studies indicating positive, negative, or no association with age<sup>31</sup>; however, a number of studies align with our findings. One study of physicians surveyed between 2011 and 2020 similarly found that physicians 35 and younger were more likely to experience burnout and be less satisfied with their work-life integration than physicians over the age of 35.<sup>34</sup> Younger age was also associated with increased burnout and stress among physician trainees.<sup>23</sup> Perhaps

**TABLE 3. Descriptive Statistics for Scale Items and Standardized Factor Loadings (with standard error and 95% Confidence Intervals for confirmatory factor analysis of the 5-factor *Augusta Scale* with a high-order model structure) (N=471)<sup>a,b</sup>**

| Item                                                                                            | Code | Mean ± SD | Skewness/<br>Kurtosis | Loading | SE   | 95% CI      |
|-------------------------------------------------------------------------------------------------|------|-----------|-----------------------|---------|------|-------------|
| Domain: protection from harm                                                                    |      |           |                       |         |      |             |
| I feel safe from any physical harm.                                                             | PH1  | 4.44±0.96 | -1.79/2.42            | 0.38    | 0.02 | (0.33-0.43) |
| I feel safe from psychological harm.                                                            | PH2  | 4.09±1.18 | -1.21/0.41            | 0.45    | 0.02 | (0.40-0.50) |
| I am able to get adequate rest.                                                                 | PH3  | 3.75±1.24 | -0.81/-0.48           | 0.34    | 0.03 | (0.29-0.39) |
| I can talk freely about mental health issues.                                                   | PH4  | 4.01±1.2  | -1.08/0.14            | 0.49    | 0.02 | (0.44-0.53) |
| I can get support for mental health issues.                                                     | PH5  | 3.98±1.2  | -0.98/-0.08           | 0.48    | 0.02 | (0.43-0.52) |
| I am aware of policies and programs related to diversity, equity, inclusion, and accessibility. | PH6  | 4.21±1.05 | -1.45/1.63            | 0.38    | 0.03 | (0.33-0.43) |
| Domain: connection and community                                                                |      |           |                       |         |      |             |
| I feel included on my team.                                                                     | CC1  | 4.29±1.05 | -1.57/1.73            | 0.47    | 0.03 | (0.41-0.53) |
| I feel that I belong to a team.                                                                 | CC2  | 4.31±1.04 | -1.67/2.1             | 0.47    | 0.03 | (0.41-0.53) |
| I am able to create trusted relationships with colleagues.                                      | CC3  | 4.40±0.93 | -1.85/3.38            | 0.44    | 0.03 | (0.38-0.49) |
| I am able to collaborate with others and work in a team.                                        | CC4  | 4.50±0.82 | -1.98/4.13            | 0.43    | 0.03 | (0.38-0.49) |
| Domain: work-life harmony                                                                       |      |           |                       |         |      |             |
| I have autonomy in my work environment.                                                         | WH1  | 4.31±1.02 | -1.71/2.41            | 0.48    | 0.03 | (0.42-0.54) |
| I can develop my own work schedule.                                                             | WH2  | 3.56±1.39 | -0.61/-0.96           | 0.52    | 0.02 | (0.48-0.57) |
| I can make my work schedule as flexible and predictable as possible.                            | WH3  | 3.34±1.49 | -0.36/-1.34           | 0.53    | 0.02 | (0.49-0.58) |
| I am able take paid leave.                                                                      | WH4  | 3.88±1.43 | -1.00/-0.46           | 0.34    | 0.03 | (0.28-0.40) |
| My colleagues respect my boundaries between work and non-work time.                             | WH5  | 3.87±1.24 | -0.93/-0.29           | 0.45    | 0.03 | (0.39-0.51) |
| Domain: mattering at work                                                                       |      |           |                       |         |      |             |
| I earn a living wage.                                                                           | MW1  | 4.42±0.92 | -1.85/3.14            | 0.13    | 0.02 | (0.09-0.18) |
| I am involved in workplace-related decisions.                                                   | MW2  | 3.87±1.29 | -0.99/-0.23           | 0.20    | 0.03 | (0.14-0.26) |
| My contribution is acknowledged and rewarded from time to time.                                 | MW3  | 3.71±1.32 | -0.78/-0.59           | 0.21    | 0.03 | (0.15-0.27) |
| I feel connected to the organization's mission.                                                 | MW4  | 3.84±1.25 | -0.89/-0.26           | 0.21    | 0.03 | (0.14-0.27) |
| Domain: opportunity for growth                                                                  |      |           |                       |         |      |             |
| I receive sufficient opportunities for training, education, and mentoring.                      | OG1  | 3.79±1.25 | -0.82/-0.41           | 0.34    | 0.03 | (0.29-0.39) |
| I have clear and equitable pathways for career advancement.                                     | OG2  | 3.34±1.38 | -0.26/-1.18           | 0.36    | 0.03 | (0.31-0.41) |
| I regularly receive appropriate feedback on my work.                                            | OG3  | 3.43±1.35 | -0.44/-1.02           | 0.35    | 0.03 | (0.30-0.41) |

<sup>a</sup>Abbreviations: CC, connection and community; MW, mattering at work; OG, opportunity for growth; PH, protection from harm; WH, work-life harmony.<sup>b</sup>All factor loadings are significant at  $P<.001$ .

older age is associated with lower burnout and better well-being because older individuals being in a later, more stable place in their career.

In addition, profession also affected scores. Our results indicated that physicians scored higher than other professions overall, but PAs scored higher on the CC and WH domains. These findings align with the existing literature. A 2023 study examining the well-being of physicians and nurses found that both experience high levels of burnout, but nurses typically rated their burnout as worse. Physicians reported worse work-life balance.<sup>33</sup> Research regarding PAs found that over two-

in-five had burnout symptoms; despite this, PAs largely reported being satisfied with aspects of their work, and around nine-in-ten were satisfied with their ability to work autonomously and with the physicians with whom they worked.<sup>35</sup> This may be due, at least in part, to some of the features of the PA position, such as the ability to change specialties mid-career and the focus on team-based care.<sup>36</sup>

Burnout is prominent among health care workers across a variety of demographic characteristics and professions.<sup>29,36</sup> If left unchecked, the health care workforce could

see continued turnover, leading to substantial problems in the health care system.<sup>37</sup> Key to addressing these issues is understanding who is affected and in what ways. Recent systematic reviews were unable to yield conclusive results, possibly due to inconsistent measuring and defining of workplace burnout and worker health.<sup>24,31</sup> Implementation of the *Augusta Scale* would provide a consistent, well-defined, and up-to-date method of assessing the mental health and well-being of health care professionals, allowing programs and policymakers to target areas most in need.

### Limitations

Cronbach's  $\alpha$  is affected by the test length, giving higher estimates for longer tests. Some authors suggest an  $\alpha$  value  $>0.90$  might imply redundancy.<sup>11</sup> Other researchers suggest the score should be  $>0.90$  if the scale has more than 11 items and over 300 respondents.<sup>38</sup> In the next iterations of the *Augusta Scale*, we would reduce or modify some of the items that have weak factor loading to reduce redundancy. Nearly 5% of our survey respondents ( $n=33$ ) scored the highest possible score (120) on our survey, potentially skewing results. To check extreme response bias, we removed them and repeated the CFA and IRT analyses. The robustness checks are available on request. The results from robustness check models with excluded high-scoring responses show similar results as discussed previously. In the future, the survey needs to be tested with a more diverse health care workforce, including pharmacists, dentists, allied health professionals, and others to explore its full potential. The *Augusta Scale* was designed to be simple to administer and score. As such, different weighting was not given to individual subscales because our focus was on confirming that the included questions belong to their respective domains. We intend to determine standardized survey scores and thresholds in future iterations of the scale, with a larger sample of diverse health care and other professionals.

### CONCLUSION

This study assessing the *Augusta Scale* offers evidence in support of validity in certain domains. This instrument can be used to assess

the workplace mental health and well-being of health care professionals. Implementation of the scale can provide programmers and policymakers information on the greatest problem areas for providers. The authors will continue to develop and revise the *Augusta Scale*.

### POTENTIAL COMPETING INTERESTS

The authors report no competing interests.

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### SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at <http://www.mcpiqjournal.org>. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

**Abbreviations and Acronyms:** CFA, confirmatory factor analysis; GA AHEC, Georgia Area Health Education Centers; OSG, office of the surgeon general; QoL, quality of life

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