



Published in final edited form as:

J Safety Res. 2024 February ; 88: 56–67. doi:10.1016/j.jsr.2023.10.008.

The impact of injury control research centers: Advancing the field of injury and violence prevention

Will Baker^{a,*}, Megan Skillman^b, Luciana Rocha^b, Alycia Bayne^b, Sarah Whitehouse^b, Elizabeth Murphy^b, Malina Papanikolaou^b, Marvin Caples^a, Ekta Choudhary^a

^aProgram Implementation and Evaluation Branch, Division of Injury Prevention, National Center for Injury Control and Prevention, Centers for Disease Control and Prevention, Atlanta, GA, United States

^bNORC at the University of Chicago, United States

Abstract

Introduction: The Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control (NCIPC) funds Injury Control Research Centers (ICRCs). These centers study injury and violence prevention through three core areas: (1) Research conducts cutting-edge, multidisciplinary research in the injury and violence prevention field; (2) Outreach translates injury and violence prevention research into action; and (3) Training educates and trains the next generation of injury and violence prevention professionals. We examined ICRC work from 2012 to 2019 to determine whether they fulfilled their goal of furthering injury and violence prevention research and practice.

Methods: We created a database of core area accomplishments reported through annual and interim progress reports. These reports track core area accomplishments by injury and violence prevention topic area, publications, partnerships, and trainings.

Results: From 2012 to 2019, ten ICRCs from two funding cycles received approximately \$49 million. ICRCs reported 703 research, 1,432 outreach, and 660 training accomplishments. There were also 342 accomplishments contributing to a special tool or resource. These accomplishments focused on preventing traumatic brain injury, suicide, adverse childhood experiences, and transportation safety. ICRCs produced over 3,500 peer-reviewed publications. ICRCs reported over 3,600 accomplishments partnered with academic institutions, public health agencies, healthcare, and non-profit organizations. ICRCs created resources for audiences such as students, law enforcement, and policy makers. ICRCs trained 3,131 students and faculty.

Practical Applications: ICRCs are the hubs of modern research and practice in the injury and violence prevention field. They successfully bring together stakeholders from disparate disciplines, perspectives, and agencies to join forces and tackle critical public health problems.

Conclusion: ICRCs are an integral component of NCIPC's, CDC's and the Department of Health and Human Service's missions to protect and enhance the health of Americans. Research covered NCIPC research priorities over the funding period, furthering injury and violence

*Corresponding author at: 4770 Buford Hwy, Atlanta, GA 30341, United States. qoo3@cdc.gov (W. Baker).

prevention research and working as a foundation to practice and policy. Outreach and partnerships with an array of organizations put research into action. Trainings educated the new generation of injury and violence prevention professionals.

Keywords

Adverse Childhood Experiences; Cross-Cutting Injury; Suicide; Transportation Safety; Traumatic Brain Injury

1. Introduction

Injury is the leading cause of death for children and adults between ages 1 and 44 in the United States (WISQARS Leading Causes of Death Visualization Tool, 2020). In 2020, more than 270,000 people died because of violence and unintentional injuries (WISQARS™ — Web-based Injury Statistics Query and Reporting System, 2021). In 2019, the total cost of fatal and nonfatal injuries in the United States was \$4.2 trillion (Peterson et al., 2021). Many injuries are predictable and preventable. The Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control (NCIPC) funds Injury Control Research Centers (ICRCs) to study ways to prevent injuries and violence and to work with community partners to put research findings into action.

The ICRC program began in 1987 when Congress appropriated \$10 million (Greenspan & Noonan, 2012; Injury Prevention Act of 1986, 1986; Runyan et al., 2022; Sleet et al., 2012) to CDC to establish the first five academically based centers of excellence. After 32 years (program completed 35 years in 2022) of funding research centers across the nation, the program began a new cycle, funding nine centers in 2019, with each awarded approximately \$833,000 annually. ICRCs are typically funded for five years through a competitive review process. There are three core functions of ICRCs—research, outreach, and training.

ICRCs conduct cutting-edge, multidisciplinary research on the causes, outcomes, and prevention of injuries and violence. Their research focuses on local and national level injury issues. Research is broken into core and exploratory research projects. A core research project typically lasts 2–3 years and is large in scale and scope. Exploratory research projects are one-year pilot studies with limited scope but can receive further funding from CDC or other outside sponsors if the pilot study findings are promising.

Through outreach ICRCs provide regional leadership and collaborate with their communities to translate research to practice preventing injury and violence. This includes state and local health agencies and non-profit, community, and non-governmental organizations. ICRCs provide expertise and technical assistance to support implementation of evidence-based injury prevention strategies, which leads to increased awareness and influences action. This is accomplished through several avenues: conferences, media communication, newsletters, social media, stakeholder meetings, podcasts and videos, symposiums, trainings to external audiences, webinars, and workshops.

ICRCs play a critical role training and developing the current and next generation of researchers and public health professionals. The training core provides continuing education

for researchers and practitioners, education to the injury prevention community, and formal training for students. Student groups include undergraduates, master's students, doctoral students, post-doctoral fellows, and junior faculty.

ICRCs also produce special tools and resources, such as websites, toolkits, online courses, mobile phone applications, and more as part of their core area activities. Underlying their three core functions is their ability to bring together multiple stakeholders from different disciplines, perspectives, and agencies to tackle critical public health problems. They serve as a hub for coordinating networks and facilitating strong partnerships because they have a strong administrative core of staff and resources. Fig. 1 shows all the funded ICRCs throughout the history of the program, including the currently funded ICRCs.

ICRCs are already recognized for their ability to uniquely benefit the injury and violence prevention field through state and local partnerships, and implementation of tested interventions (Childress, 2010), but past work has suggested the need for both quantitative and qualitative reporting of ICRC work (Runyan et al., 2014). NCIPC has published two impact reports showing the work of individual ICRCs that show some of the contributions made (The Impact of Injury Control Research Centers: Advancing the Field of Injury and Violence Prevention, 2016; The Impact of Injury Control Research Centers: Advancing the Field of Injury and Violence Prevention — An Update, 2022), but the purpose of this assessment is to examine the results of NCIPC's ICRC Program during its 2012 and 2014 funding cycles (2012–2019) during which a total of ten ICRCs were funded (Table 1). Our intent was to examine the program as a whole rather than to conduct any direct comparisons across ICRCs.

2. Methods

2.1. Data source

The ICRC program at CDC provides 5-years of funding to academic institutes in each grant cycle. ICRC funding requires ICRCs to submit two progress reports during each budget year. The data used in this study comes from 104 interim progress reports and annual progress reports received from ICRCs between August 1, 2012, and October 30, 2020. Funding for these two cycles ended in 2019, but all ICRCs were given a one year no-cost extension, so final progress reports were received in 2020.

Interim progress reports also served as a non-competing continuation application to receive funds for the next grant year. These include:

- Progress on research, outreach, and training core during the annual budget period,
- A translation of research (where it is explained how the significant findings can be used to translate research into practice or inform public health policy),
- Public health relevance and impact,
- Detailed funding utilization information, and
- Any publications or presentations during the budget period.

Annual progress reports include a description of the completion status of each core area activities in that budget period. They also include a complete list of publications released by the center, and a description of any changes made in funded projects or activities. There is also a final progress report submitted at the end of the five-year grant.

2.2. Database

We developed a database of all ICRC accomplishments reported in the progress reports. An accomplishment is a single activity, such as hosting a topic roundtable with community partners in the outreach core, a single change in an established project such as performing data collection for a core research project, or a yearly reporting of data such as the number of undergraduate students in the training core each year. Accomplishments are not always the final results of a project or the complete outcome of an outreach or training activity, but rather individual yearly updates from each ICRC for all their projects and activities. Some accomplishments will not directly influence the public or the ICRC overall, but the accumulation of these accomplishments leads to the completion of core activities and projects. Publications that are received through progress reports are not included in this database. Together, these data sources inventoried all ICRC's accomplishments.

Initially, progress report reviewers underwent six rounds of training as a group by reviewing progress reports, then met to discuss and come to consensus on how to identify, classify, and parse out accomplishments from descriptions of aggregate accomplishments to allow a consistent coding style among reviewers. After training, the team independently reviewed and captured data from progress reports. As a quality assurance measure, a coding lead was responsible for fielding reviewer questions, checking accomplishments for consistency, delivering feedback to reviewers during independent coding, and worked to keep consistency among coders.

We reviewed and manually entered the information from progress reports (i.e., ICRC accomplishments) into an Excel database, with each accomplishment being one row of the database. For each accomplishment, we captured text from the report as well as sub-fields including ICRC name, report year, core area (i.e., research, outreach, training, and special tool or resource), injury prevention topic areas (e.g., transportation safety, suicide, traumatic brain injury), outside partners (e.g., hospitals, federal agencies, state departments), and audience (e.g., students, law enforcement, healthcare professionals, policy makers).

In the first wave of review, we captured data from annual progress reports, the most comprehensive sources on ICRC accomplishments. In the second wave, we reviewed interim progress reports and added accomplishments to the database that were not already captured from the annual progress reports. Lastly, we conducted an extensive quality check by reviewing all data source documents against the database to ensure that all accomplishments were appropriately captured and parsed out. We also conducted a targeted quality control test by having each coder check a sample of accomplishments in the database for each section of each report reviewed ($n = 97$), any questions or discrepancies were resolved by the coding lead. The coding lead also performed a final comprehensive review of the database to ensure adequate level of detail was captured and performed logic checks (e.g., ensured that each accomplishment had an injury topic area classification).

ICRC publications were provided in progress reports, and we combined the different publication sources into a single database. Publications are separate from accomplishments because accomplishments are based on proposed core area activities. The database contains citation data. We created variables to track the topic area(s) and the level of funding the publication received from the ICRC grant program. Publications were excluded from the database if the authors did not include any key personnel (as identified by the ICRC in their annual progress reports), did not focus on some aspect of injury or violence prevention, focused on international populations, or were a publication type other than a book, book section, or journal article. Publications categorized as conference papers, conference proceedings, conference presentations, and technical packages were excluded from analysis.

Publications were assigned a level of funding based on the following criteria:

1. Fully funded: the ICRC grant program was the only funding source.
2. Partially funded: some of the funding came from the ICRC grant program.
3. Funding leveraged: the article did not list the ICRC grant program as a source of funding, but one of the authors was key personnel at the ICRC.
4. Previously funded: a previous ICRC grant funding cycle was listed as a source of funding.

2.3. Variable recoding

Each accomplishment was given a primary topic area. Primary topic areas tracked accomplishment's main topic area, or the topic area that seemed to be the focus of the accomplishment. Cross-Cutting Injury Prevention was created to account for any accomplishment that covered more than two specific injury topic areas, and any accomplishment that focused on methodology or policy. For example, if an ICRC hosted a seminar series, it would be labeled as Cross-Cutting Injury Prevention as each seminar may focus on one or more injury topic areas.

We merged several injury topic areas into broader categories to better reflect NCIPC's research topic areas. We also relabeled several topic areas to reflect current topic area labels. Emergency Department Care was merged with Acute Care/Trauma (non-Traumatic Brain Injury). Bullying, Child Abuse and Neglect, Teen Dating Violence, and Youth Violence were merged with Adverse Childhood Experiences. Alcohol/Substance Use, Opioid Overdose, Prescription Drug Overdose, and Illicit Drug Overdose were merged into Drug Overdose. Domestic Violence was merged with Intimate Partner Violence. Agricultural Injury and Workplace Safety were merged with Occupational Injury Prevention. A category of Other was created to cover topics that are not typically focused on, such as Spinal Cord Injury and Musculoskeletal Disorders. Child Home Safety, Pediatric Falls, and Suffocation/Unexplained Infant Death were merged with Pediatric Injury. Any accomplishment that focused on vehicular or pedestrian injury was merged into Transportation Safety. Concussion was merged with Traumatic Brain Injury. Finally, Intentional Injury, Community Violence, and Homicide were merged with Violence.

Publication topic areas were also relabeled according to the same rules used to relabel ICRC accomplishments' topic areas.

2.4. Data analyses

We report on the amount of funding ICRCs received every year over the funding period and the total amount of funding ICRCs received from 2012 to 2019.

Using the created database, we report the total number of accomplishments from each ICRC, the number of accomplishments in each core area, and the number of accomplishments done in each core area by topic area. We created figures to show the breakdown of core areas by primary topic area. The topic areas reported in our figures represent the ten most common primary topic areas and is not an exhaustive list. There is also a figure that combines all the core area accomplishments by topic area and presents them alphabetically. We also report the number of publications that fall under each level of funding. We also created figures showing some of the most common partners and audiences that ICRCs work with. This is also not an exhaustive or quantitative finding, but rather a snapshot of just some of the different partners and audiences. We also produced a figure of the total number of students trained by ICRCs at the undergraduate, masters, and doctorate levels. These are the number of students enrolled in ICRC provided courses. At higher levels, the number of post-doctorate fellows is reported, and the number of junior faculty being mentored within the ICRC is reported. Frequencies, percentages, and figures were created in Excel, and variable recoding was done in R 4.0.3 (R-Core-Team, 2020).

3. Results

A total of 10 ICRCs received approximately \$49 million in funding (Fig. 2) during these two funding cycles. Each ICRC received approximately \$833,000 in funding per year.

The 10 ICRCs reported a total of 3,238 accomplishments from 2012 to 2019. These include 703 core and exploratory research accomplishments, 1,432 outreach core accomplishments, 660 training accomplishments, and 342 accomplishments contributing to a special tool or resource. These accomplishments covered 26 primary topic areas.

3.1. Research

Fig. 3 shows the research core accomplishments by injury topic area. The three most prevalent topic areas were traumatic brain injury, transportation safety, and adverse childhood experiences.

ICRCs produced 3,505 peer-reviewed publications in the field of injury and violence prevention over the course of seven years with CDC funding. These publications cover numerous topic areas and reflect dozens of projects aimed at improving the injury and violence prevention field of research and practice. Fig. 4 shows ICRCs publications across injury topic areas. The three most frequent topic areas ICRCs produced publications in are drug overdose, suicide, and acute care/trauma (non-TBI).

The funding type of ICRC publications was analyzed. Funding leveraged was the most prevalent funding type at 87 % (3,041) of publications, followed by partially funded at 10 % (333). Fully and previously funded were the lowest reported funding types at 2 % (60, 71, respectively).

3.2. Outreach

Fig. 5 shows outreach core accomplishments by NCIPC research priorities. The three topic areas with the most accomplishments were cross-cutting injury prevention, suicide, and transportation safety.

ICRCs from both funding cycles participated in over 3,600 partnerships with various stakeholder groups such as academic institutions, federal, state, and local public health agencies, and healthcare and non-profit organizations (Fig. 6).

Ninety-four percent (1,358) of outreach accomplishments were focused on a specific audience. Some notable groups were researchers, policy makers, segments of the public, students, community groups, healthcare professionals, and law enforcement (Fig. 7).

3.3. Training

Fig. 8 shows the number of accomplishments in the training core by NCIPC research topic area. The three most prevalent topic areas were cross-cutting injury prevention, transportation safety, and traumatic brain injury.

Ninety-nine percent (659) of training accomplishments were focused on a specific audience. The most prominent audiences were students (undergraduate and graduate) and researchers (including post-doctorates, junior faculty, and full-time faculty).

Fig. 9 shows the number of students, post-Doctorates, and junior faculty trained at ICRCs in the 2012 and 2014 funding cycles. Over the course of the 2012 and 2014 funding cycles, ICRCs trained a total of 3,131 students, post-doctorates, and junior faculty staff.

3.4. Special tools and resources

Fig. 10 shows the number of special tools and resources by NCIPC research topic area. The three topic areas with the most accomplishments were cross-cutting injury prevention, drug overdose, and transportation safety.

Fig. 11 shows a combination of all the core areas to show the overall accomplishments within each topic area.

4. Discussion

The purpose of the ICRC program is to support research centers that can conduct high quality research and translate scientific discoveries into practice for the prevention of injuries and violence.

In 2012, NCIPC identified three research priorities: preventing child maltreatment, preventing motor vehicle injuries, and preventing falls among older adults. In 2014,

NCIPC's research priorities were motor vehicle-related injuries, violence against children and youth, prescription drug overdose, and traumatic brain injury (Grants for Injury Control Research Centers, 2011; Grants for Injury Control Research Centers, 2013). Applicants were expected to focus on these areas in their funded projects, and our analyses indicate that ICRCs successfully completed all three core area requirements.

4.1. Research

Through this core, ICRCs produce cutting-edge, multidisciplinary research on injury and violence causes and outcomes (ICRC Success Stories – Research Impact, 2022). While there are fewer research accomplishments than the outreach and training core, research work is labor-intensive, and requires more time and effort than many other accomplishments. As per the notice of funding opportunity (Grants for Injury Control Research Centers, 2011; Grants for Injury Control Research Centers, 2013) each ICRC was only allowed four funded research projects, and each project was meant to be completed over the course of two to five years. Due to this, the number of accomplishments in this core should not be compared to the other cores. Through this research, ICRCs produced over 500 publications every year, with most of them supported in some way by CDC funding. Most ICRC publications also did not receive direct funding. Rather, ICRCs leveraged their funding through faculty pay supplements, supporting the work that many ICRC researchers perform outside of directly funded CDC projects. Findings from research core projects have also supported and informed government policy around the nation. For example, research by the Columbia Center for Injury Science and Prevention and its partners at the New York State Department of Health demonstrated increased moderate to severe injuries, deaths, and medical costs among those unbuckled during a motor vehicle crash and provided evidence supporting the effectiveness of rear-seat seatbelt laws. A new law requiring all people in a vehicle to wear a seat belt in New York went into effect in 2020 (Carlucci, 2019).

4.2. Outreach

ICRC outreach partners with states, local communities, hospitals, and other injury and violence prevention professionals to put research into action. They provide technical assistance, spreading and translating research findings, increasing awareness, and influencing action in injury and violence prevention work. These outreach activities have focused on many different types of audiences, helping to advance the goal of translating research to practice. The Outreach core has impacted partnerships and policies with state, local, and federal stakeholders. For example, due to an increase in child poisoning associated with colorful laundry detergent packets, the Research Institute at Nationwide Children's Hospital's Center for Injury Research and Policy conducted a study to quantify the risks of these packets and found that there were more than 17,000 calls relating to laundry detergent pod poisoning among children younger than six years (Valdez et al., 2014). These results were shared with legislative and policy audiences, and in 2015, the Detergent PACS Act was introduced in Congress, which would have required the Consumer Product Safety Commission to set safety standards for liquid laundry detergent packets (Speier, 2015). The bill ultimately did not pass in Congress, as the American Society for Testing and Materials (ASTM) released guidance on laundry-detergent packets in September of 2015, later updated in 2022 (American Society for Testing and Materials, 2022; Standard

Safety Specification for Liquid Laundry Packets, 2022; American Society for Testing and Materials, 2015; Standard Safety Specification for Liquid Laundry Packets, 2015; American Society for Testing and Materials. New ASTM International Standard Will Help Improve Safety of Liquid Detergent Laundry Packets, 2015).

4.3. Training

ICRC training and education activities develop the next generation of public health researchers and professionals. Recently, it has been observed that there is an inadequate amount of violence and injury curricula in public health education (Runyan et al., 2022). ICRCs help fill this gap through training courses and curriculum focused heavily on keeping current students and working faculty up to date. Over the course of the funding cycles, the number of reported students trained increases dramatically, this is partly due to reporting requirements changing, but these increases are mostly due to ICRC's growth and ability to provide more injury prevention courses over time. Even members of the public have access to some ICRC educational resources, such as through the massive open online course provided by the University of Michigan Injury Prevention Center (Massive Open Online Course: Impacting the Opioid Crisis: Prevention, Education, And Practice For Non-Prescribing Providers, 2021). By providing cutting-edge training, ICRCs help to ensure the field of injury and violence prevention has a pipeline of young professionals using the most recent advancements in the field. For example, Johns Hopkin's Center for Injury Research and Policy provides training and professional development through its Summer Institute where nearly 800 participants have trained. Summer Institute alumni form a qualified public health network, and hold positions in federal agencies, state health departments, and local agencies (ICRC Success Stories – Training Impact, 2022).

4.4. Special tools and resources

ICRCs have produced over 350 special tools and resources that were informed by accomplishments from the three core areas. These tools and resources are used to translate research to practice directly through mediums such as, mobile apps, websites, toolkits, databases, and questionnaires. These tools allow research findings to be directly translated to relevant audiences through the outreach and training core. For example, the Research Institute at Nationwide Children's Hospital: Center for Injury Research and Policy developed the Make Safe Happen App for parents and caregivers to address difficulties surrounding home safety for children. The app aims to "make your home safer with room-to-room safety checklists and recommended products" (Make Safe Happen, 2019).

5. Limitations

The data reported in this manuscript only covered the 2012 and 2014 funding cycles and were self-reported by the ICRCs. This may include under-reporting, over-reporting, or limited details. Much of the data collection was done manually, and therefore the data may also contain inconsistencies or errors. The reporting requirements for ICRCs changed over the course of the funding cycles as well, leading to the possibility of missing, unreported data. Fortunately, as of 2019, ICRCs can report data into an online tool, and data are pulled through the tool for analysis, reducing the amount of manual labor required to parse and

analyze the data. There were also no connections made between specific accomplishments and funding received from 2012 to 2019, and therefore we are missing the ability to evaluate return on investment during these funding cycles. The ICRC landscape is regularly changing, and due to both the nature of the academic environment and of CDC funding cycles, we see changes throughout the funding cycles at ICRCs, e.g., amount of funding received, changes in NCIPC priority areas, and ICRC focus areas. Every five years an entirely new funding cycle with new grantees and new projects begins. We also excluded any international work done by ICRCs, as the program only allows the direct use of funds for work done within the United States, ICRCs perform injury and violence prevention work abroad, but that work is not funded by the CDC. We limited our scope to the 2012 and 2014 funding cycles to get consistent and reliable information, but these findings do not reflect the entirety of the ICRC programs history, or current work.

6. Practical applications

ICRCs have been vital to the work of injury and violence prevention in the United States. Our analyses have shown that over the course of seven years, the ten ICRCs, in our assessment, advanced the field of injury and violence prevention with assistance from CDC funding.

6.1. Research core

6.1.1. University of Iowa Injury Prevention and Research Center experts identify suicide burden in Iowa—The University of Iowa Injury Prevention Research Center (UI IPRC) found that farmers and agricultural workers have a significantly higher rate of suicide than all other occupations combined in the United States (Ringgenberg et al., 2018). UI IPRC found that 76 % of all the violent deaths in Iowa were suicides (Iowa Violent Death Reporting System Special Report on Suicide in Iowa, 2017, 2019). With this knowledge, UI IPRC has begun producing an annual *Suicide in Iowa* report, summarizing the state's suicide data in comparison to national data (Iowa Violent Death Reporting System Special Report on Suicide in Iowa, 2017, 2019). This report has been used to educate legislators and stakeholders on suicide and this data informed new federal legislation focused on curbing farmer suicide rates in America (Brindisi, 2019).

6.1.2. Preventing violence through blight remediation.—The Penn Injury Science Center (PISC) conducted a groundbreaking experiment in Philadelphia, using inexpensive interventions on abandoned homes and lots around the city. Researchers found that these blight remediation practices significantly impact residents perceived and actual safety (Kondo et al., 2018). For every dollar invested into this program, there was a \$5–\$333 return in violence related costs (ICRC Success Stories – Research Impact, 2022). This program has also begun to spread nationwide, with PISC linking with partners in several other states.

6.1.3. Challenges of enforcing cell phone use while driving laws among police.—The West Virginia University Injury Control Research Center (WVU ICRC) conducted a qualitative study in response to findings that the enforcement of cell phone use while driving bans have been lacking (ICRC Topic Brief: Motor Vehicle Injury, 2020).

Five focus groups were conducted with 19 police officers and four themes emerged: current driving culture, the legal system, the nature of police work, and prevention issues. WVU ICRC also ascertained barriers to enforcement: lack of perceived support from courts, unclear legislation, and the habits of officers. WVU ICRC suggests amended legislation and prevention measures that could affect drivers' perception of enforcement (Rudisill et al., 2019).

6.2. Outreach core

6.2.1. Combatting the Opioid Crisis in Michigan—The University of Michigan Injury Prevention Center (U-M IPC) has worked hard to help produce products to combat the opioid overdose problem in Michigan, with over 2,000 opioid overdose deaths in 2018 (ICRC Success Stories – Outreach Impact, 2022). Three notable products include the System for Opioid Overdose Surveillance (SOS), the Michigan Safer Opioid Prescribing Toolkit, and the Opioid Massive Open Online Course (MOOC). SOS is a system, made in collaboration with the Michigan High Intensity Drug Trafficking Areas, that tracks opioid overdoses in near real-time, providing data within one day of an opioid overdose incident (The System For Opioid Overdose Surveillance (SOS), 2021). The Michigan Safer Opioid Prescribing Toolkit is an evidence-based resource created for primary care providers and patients. It aims to make pain management safer, prevent opioid-related harm, and link to substance use treatment (Michigan Safer Opioid Prescribing Toolkit, 2021). U-M IPC has also developed, and provides the MOOC, a free open learning course designed for non-prescribing healthcare, behavioral health, dental, and social service professionals (Massive Open Online Course: Impacting the Opioid Crisis: Prevention, Education, And Practice For Non-Prescribing Providers, 2021).

6.2.2. Injury free coalition hosts inaugural injury prevention day.—The Injury Free Coalition for Kids, operated through Columbia Center for Injury Science and Prevention, coordinated the National Injury Prevention Day on November 18th, 2020, for awareness of important public health issues. Over 80 city landmarks and children's hospitals around the United States displayed a green light, as green represents "safety, positivity, peace, and growth" (ICRC Success Stories – Outreach Impact, 2022). More than 40 level I trauma centers came together, and proclamations from 18 mayors, governors, and senators were obtained declaring November 18th as National Injury Prevention Day. A post-event evaluation showed that relationships between healthcare providers and child advocate professionals were strengthened by activities on Injury Prevention Day (ICRC Success Stories – Outreach Impact, 2022). National Injury Prevention Day has also occurred every year since the inaugural event in 2020, with the next event planned for November 18th, 2023 (National Injury Prevention Day, 2023).

6.3. Training core

6.3.1. Short-Term Executive Plus (STEP) program—The Mount Sinai Injury Control Research Center (MS-ICRC) developed the STEP program to help integrate theoretically and empirically supported treatments for post-Traumatic Brain Injury executive dysfunction. STEP aims to teach meta-cognitive skills that can be applied in real life activities (Cantor et al., 2014). However, MS-ICRC was finding that the program was not

working as well as expected, except for three sites. MS-ICRC studied those three sites and investigated why the program was working there and worked to share those findings to improve the implementation of the STEP program nationwide (ICRC Topic Brief: Traumatic Brain Injury, 2019).

6.3.2. Advancing public health approaches to suicide prevention.—University of Rochester Medical Center’s Injury Control Research Center for Suicide Prevention held a bi-annual training promoting the study of suicide prevention. This Research Training Institute (RTI) was held for injury and violence prevention professionals to educate and collaborate on suicide prevention science and research methodology. RTI collaboration has helped to create a community-based suicide prevention program, an investigation into emergency room services, and an exploration of state agencies and researchers more effectively collaborating to prevent suicide (ICRC Success Stories – Training Impact, 2022).

6.4. Special tools and resources

6.4.1. Interactive pedestrian injury mapper—Columbia’s Center for Injury Science and Prevention developed an interactive mapping tool to serve three purposes, (1) document the location of a pedestrian being hit by an automobile, (2) trace the route the pedestrian walked prior to the hit, and (3) collect basic demographic and collision data (Launching the Interactive-Pedestrian Injury Mapper (I-PIM), 2018).

7. Conclusion

ICRCs advances to the field of injury prevention support the mission of NCIPC, the CDC, “to protect America from health, safety, and security threats” (Mission, Role and Pledge, 2022), and the Department of Health and Human Services, “to enhance the health and well-being of all Americans, by providing for effective health and human services and by fostering sound, sustained advances in the sciences underlying medicine, public health, and social services” (About HHS, 2023). Due to their locality, ICRCs have strong ties to local, state, and tribal partners. Through these partnerships, ICRCs have advanced research affecting these communities, and through outreach, disseminate the findings made through research. ICRCs can leverage resources provided by CDC, attain further funding, and use that funding to perform additional and wider-scope work. ICRCs are fundamental to maintaining the research-to-practice pipeline that is required to advance the public’s health. ICRCs are fundamental to providing the field of injury prevention with practitioners, advocates, and experts. Using CDC funding, ICRCs trained the next generation of the injury and violence prevention workforce. The work done by CDC-funded ICRCs has benefitted the field of injury and violence prevention, and continues to this day with new research, outreach, and training activities every year.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: ‘This project was supported in part by an appointment to the Research Participation Program at the Centers for Disease Control and Prevention administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and the Centers for Disease Control and Prevention. Findings reported in this publication were partially supported by the Centers for Disease Control and Prevention (CDC) contract (HHSD2002013M53955B) with NORC at the University of Chicago’.

Biographies

Will Baker, MSc, is originally from Atlanta, Georgia and has a Masters in Psychological Research from the University of Edinburgh. He is currently an Oak Ridge Institute for Science and Education (ORISE) Fellow at CDC's National Center for Injury Prevention and Control, in the Program Implementation and Evaluation Branch. Will has been at the CDC for three years, and works with Injury Control Research Centers, compiling and analyzing data provided by the ICRCs to evaluate the accomplishments of the program.

Megan Skillman, MPA, is a Senior Research Scientist at NORC. She has over a decade of experience in health services research. Skillman has expertise in qualitative and mixed-methods and has led analyses for federal and foundation funded projects. Her work largely focuses on value-based payment models and care transformation as well as patient-centered outcomes research. She holds a Master of Public Administration degree with a concentration in public policy analysis from the Robert F. Wagner School of Public Service at New York University.

Luciana Rocha, MPH, is a Senior Research Scientist at NORC with over a decade of experience in qualitative research, with a focus on health equity, the social determinants of health, and rural health care access and delivery. She holds a Master of Public Health degree with a concentration in health and social behavior from the University of California, Berkeley School of Public Health.

Alycia Bayne, MPA, is Associate Director for Public Health Research at NORC. She is a public health researcher with 17 years of experience conducting program evaluations for the federal government and foundations. Bayne directs research studies on injury prevention, transportation, healthy aging, rural health, and the social determinants of health. She has expertise in qualitative research and mixed methods. She holds a Master of Public Affairs degree from the Princeton School of Public and International Affairs.

Sarah Whitehouse, MPH, is a Senior Research Associate II at NORC. She is a researcher with more than five years of experience working on program evaluations and research projects for federal and state governments. Whitehouse primarily works as a qualitative researcher, with a focus on access to care and Medicaid policy. She holds a Master of Public Health degree with a concentration in health policy from University at Albany, SUNY.

Elizabeth Murphy, BA, is a Senior Research Associate I at NORC with over six years of experience in policy research, specifically health policy. Elizabeth is well versed in qualitative methods and serves as research support for multiple NORC projects focused on health care delivery, social determinants of health, and behavioral health. She holds a Bachelor of Arts degree in political science and French from Marquette University in Milwaukee, WI.

Malina Papanikolaou, BS, is a Research Associate II at NORC. Her work focuses on applying qualitative research and evaluation skills to a range of public health topics including health equity, injury prevention, sexual harassment and sexual assault, and the

opioid epidemic. She holds a Bachelor of Science degree in public health from the Ohio State University.

Marvin Caples joined CDC in 2011 as a Management Program Analyst, he served as the subject matter expert for personnel matters and represented NCIPC on agency wide HRO Advisory Boards and workgroups. Marvin led a team of his peers to develop new systems that improved upon several processes that streamlined workflow and made them more user friendly. In 2019 Marvin began working with the ICRC unit as a Public Health Analyst and Project Officer where he support's his team members and provides technical assistance to funded Injury Control Research Centers across the nation.

Ekta Choudhary, PhD, MPH, leads the Injury Control Research Centers (ICRCs) Program at the Program Implementation and Evaluation Branch, in the Division of Injury Prevention (DIP) in CDC's National Center for Injury Prevention and Control. The ICRC Program forms a national network of 9 comprehensive academic research centers that focus on three core functions — research, training, and outreach. Dr. Choudhary provides programmatic and scientific leadership in initiating, implementing, and evaluating primary prevention strategies, programs, and policies through independent and collaborative research. She received her master's and Doctorate degrees in Public Health Sciences from West Virginia University.

References

- About HHS (2023). Department of Health and Human Services. Retrieved 4/11/2023 from <https://www.hhs.gov/about/index.html>.
- American Society for Testing and Materials F3159 (2015). Standard Safety Specification for Liquid Laundry Packets. [Standard]. www.astm.org.
- American Society for Testing and Materials F3159–15e1 (2022). Standard Safety Specification for Liquid Laundry Packets [Standard]. www.astm.org.
- American Society for Testing and Materials (2015). New ASTM International Standard Will Help Improve Safety of Liquid Detergent Laundry Packets. [Press Release]. <https://newsroom.astm.org/new-astm-international-standard-will-help-improve-safety-liquid-detergent-laundry-packets#:~:text=Today%20ASTM%20International%20announced%20that%20a%20new%20safety,at%20reducing%20risks%20of%20ingestion%2C%20particularly%20by%20children>.
- Brindisi A (2019). H.R.4820 - Seeding Rural Resilience Act.
- Cantor J, Ashman T, Dams-O'Connor K, Dijkers MP, Gordon W, Spielman L, ... Oswald J (2014). Evaluation of the short-term executive plus intervention for executive dysfunction after traumatic brain injury: a randomized controlled trial with minimization. *Archives of Physical Medicine and Rehabilitation*, 95(1), 1–9.e3. 10.1016/j.apmr.2013.08.005 [PubMed: 23988395]
- Carlucci D (2019). New York State Senate Bill S4336; AN ACT to amend the vehicle and traffic law, in relation to mandatory seat belt use.
- Childress AM (2010). The role of the injury prevention research centers in promoting the national center for injury prevention and control research agenda. *The Western Journal of Emergency Medicine*, 11(3), 231–232. [PubMed: 20882140]
- Grants for Injury Control Research Centers (2011). Retrieved from <https://www.grants.gov/web/grants/view-opportunity.html?oppId=90173>.
- Grants for Injury Control Research Centers (2013). Retrieved from <https://www.grants.gov/web/grants/view-opportunity.html?oppId=233534>.

- Greenspan AI, & Noonan RK (2012). Twenty years of scientific progress in injury and violence research and the next public health frontier. *Journal of Safety Research*, 43(4), 249–255. 10.1016/j.jsr.2012.08.005 [PubMed: 23127673]
- ICRC Success Stories – Outreach Impact (2022). National Center for Injury Prevention and Control. Retrieved 5/10/2022 from https://www.cdc.gov/injury/erpo/icrc/stories_outreach_impact.html.
- ICRC Success Stories – Research Impact (2022). National Center for Injury Prevention and Control. Retrieved 5/10/2022 from https://www.cdc.gov/injury/erpo/icrc/stories_research_impact.html.
- ICRC Topic Brief: Motor Vehicle Injury (2020). https://www.cdc.gov/injury/erpo/icrc/topic_briefs.html.
- ICRC Topic Brief: Traumatic Brain Injury (2019). https://www.cdc.gov/injury/erpo/icrc/topic_briefs.html.
- Injury Prevention Act of 1986, 99 USC § 2648 (1986). <https://www.congress.gov/bill/99th-congress/senate-bill/2648>.
- Iowa Violent Death Reporting System Special Report on Suicide in Iowa, 2017 (2019). Injury Prevention Research Center.
- Kondo MC, Andreyeva E, South EC, MacDonald JM, & Branas CC (2018). Neighborhood interventions to reduce violence. *Annual Review of Public Health*, 39, 253–271. 10.1146/annurev-publhealth-040617-014600
- Launching the Interactive-Pedestrian Injury Mapper (I-PIM) (2018). Retrieved 10/18/2022 from <https://beh.columbia.edu/2018/06/04/launching-the-interactive-pedestrian-injury-mapper-i-pim/>.
- Make Safe Happen (2019). Nationwide Children’s Hospital. Retrieved 10/18/2022 from <https://makesafehappen.com/get-the-app>.
- Massive Open Online Course: Impacting the Opioid Crisis: Prevention, Education, And Practice For Non-Prescribing Providers (2021). Injury Prevention Center. Retrieved 5/17/2022 from <https://injurycenter.umich.edu/mooc-opioid/>.
- Michigan Safer Opioid Prescribing Toolkit (2021). Injury Prevention Center and Michigan Department of Health & Human Services. Retrieved 5/17/2022 from <https://injurycenter.umich.edu/opioid-overdose/michigan-safer-opioid-prescribing-toolkit/>.
- Mission, Role and Pledge (2022). Centers for Disease Control and Prevention. Retrieved 4/11/2023 from <https://www.cdc.gov/about/organization/mission.htm#print>.
- National Injury Prevention Day (2023). Injury Free Coalition for Kids. Retrieved 4/4/2023 from <https://www.injuryfree.org/nationalinjurypreventionday/2023/index.cfm?CFID=2135092&CFTOKEN=375443297d217e0f-992B11A0-A0B3-84BA-4E6B412815F064BE>.
- Peterson C, Miller GF, Barnett SBL, & Florence C (2021). Economic Cost of Injury – United States, 2019. *MMWR. Morbidity and Mortality Weekly Report*, 70(48), 1655–1659. 10.15585/mmwr.mm7048a1 [PubMed: 34855726]
- R-Core-Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Ringgenberg W, Peek-Asa C, Donham K, & Ramirez M (2018). Trends and characteristics of occupational suicide and homicide in farmers and agriculture workers, 1992–2010. *The Journal of Rural Health*, 34(3), 246–253. 10.1111/jrh.12245 [PubMed: 28464402]
- Rudisill TM, Baus AD, & Jarrett T (2019). Challenges of enforcing cell phone use while driving laws among police: a qualitative study. *Injury Prevention*, 25(6), 494–500. 10.1136/injuryprev-2018-042931 [PubMed: 30291154]
- Runyan CW, Carlson KF, DeFrancesco S, & Johnson RM (2022). Violence and injury curricula still inadequate in public health schools and programs-a call to action. *American Journal of Public Health*, 112(10), 1385–1388. 10.2105/ajph.2022.307045 [PubMed: 35981273]
- Runyan C, Garrettson M, & Yee SL (2014). Development of a set of indicators to evaluate injury control research centers. *Evaluation Review*, 38(2), 133–159. 10.1177/0193841x14529287 [PubMed: 24743645]
- Sleet DA, Baldwin G, Marr A, Spivak H, Patterson S, Morrison C, ... Degutis LC (2012). History of injury and violence as public health problems and emergence of the National Center for Injury Prevention and Control at CDC. *Journal of Safety Research*, 43(4), 233–247. 10.1016/j.jsr.2012.09.002 [PubMed: 23127672]

- Speier J (2015). H.R.1139 - Detergent PACS Act of 2015. Retrieved from <https://www.congress.gov/bill/114th-congress/house-bill/1139/text>.
- ICRC Success Stories – Training Impact (2022). National Center for Injury Prevention and Control. Retrieved 5/10/2022 from https://www.cdc.gov/injury/erpo/icrc/stories_training_impact.html.
- The Impact of Injury Control Research Centers: Advancing the Field of Injury and Violence Prevention — An Update (2022). https://www.cdc.gov/injury/pdfs/icrc/The-Impact-of-Injury-Control-Research-Centers_FINAL_508.pdf.
- The Impact of Injury Control Research Centers: Advancing the Field of Injury and Violence Prevention (2016). https://www.cdc.gov/injury/pdfs/ICRC_Impact_Report-508.pdf.
- The System For Opioid Overdose Surveillance (SOS) (2021). University of Michigan: Injury Prevention Center. Retrieved 5/17/2022 from <https://injurycenter.umich.edu/opioid-overdose/opioid-surveillance/>.
- Valdez AL, Casavant MJ, Spiller HA, Chounthirath T, Xiang H, & Smith GA (2014). Pediatric exposure to laundry detergent pods. *Pediatrics*, 134(6), 1127–1135. 10.1542/peds.2014-0057 [PubMed: 25384489]
- WISQARS Leading Causes of Death Visualization Tool (2020). Centers for Disease Control and Prevention. Retrieved 7/28/2022 from <https://wisqars.cdc.gov/data/lcd/home>.
- WISQARS™ — Web-based Injury Statistics Query and Reporting System. (2021). National Centers for Injury Prevention and Control. Retrieved 5/31/2022 from <https://www.cdc.gov/injury/wisqars/index.html>.

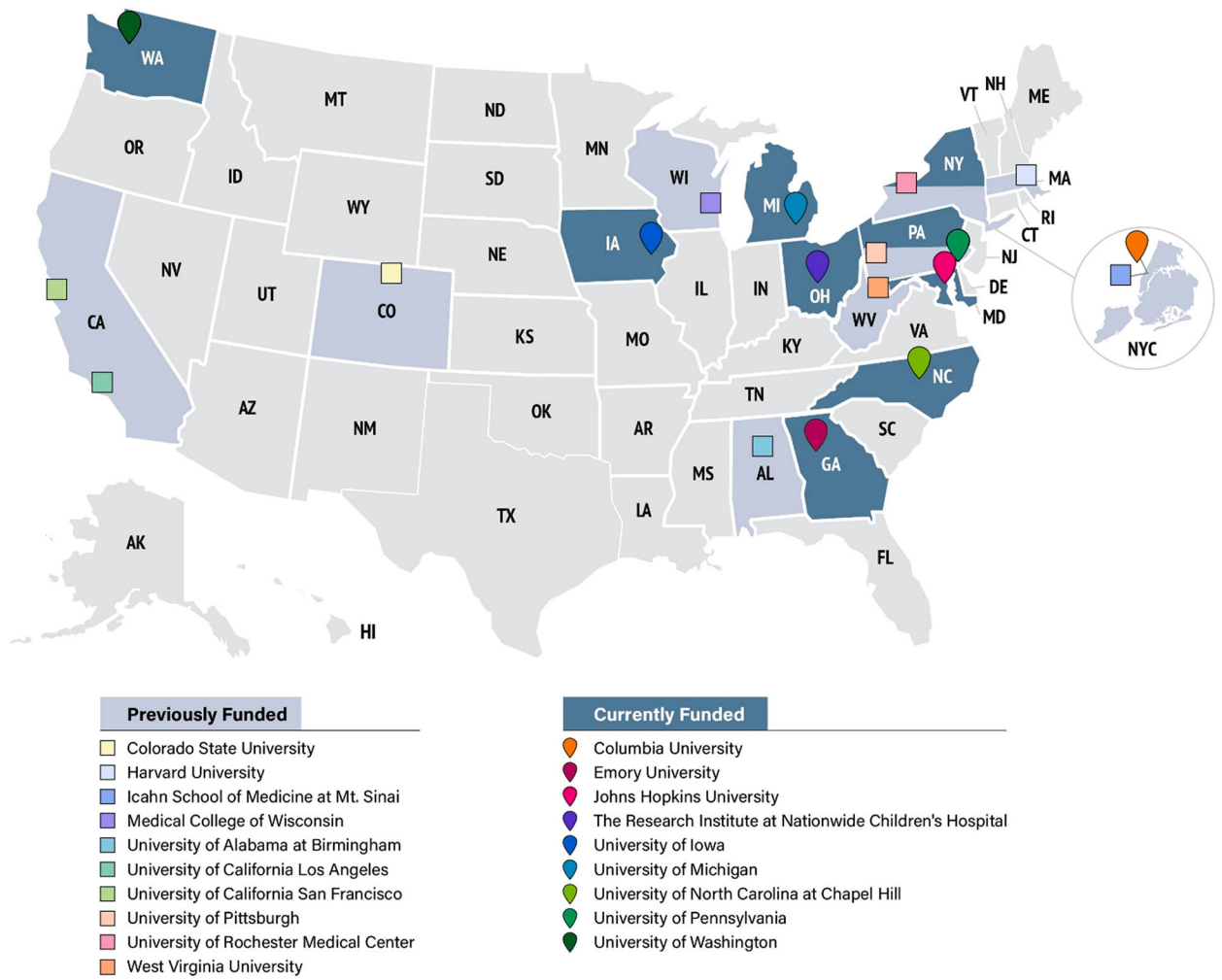


Fig. 1.
CDC-funded Injury Control Research Centers, 1987–2024.

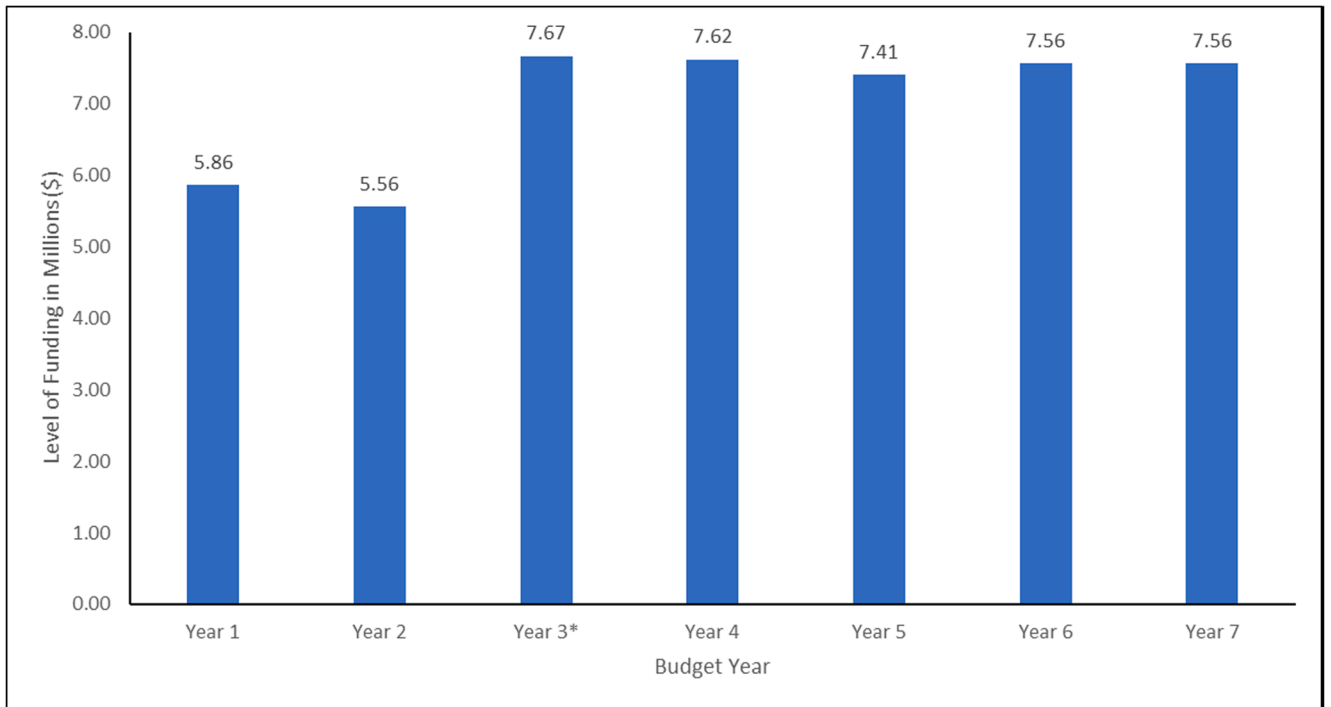


Fig. 2. Injury Control Research Center funding by budget year, 2012–2018. *The 2014 funding cycle begins, adding three ICRCs to the total number of funded ICRCs. The 2012 funding cycle ICRCs receive a two-year extension.

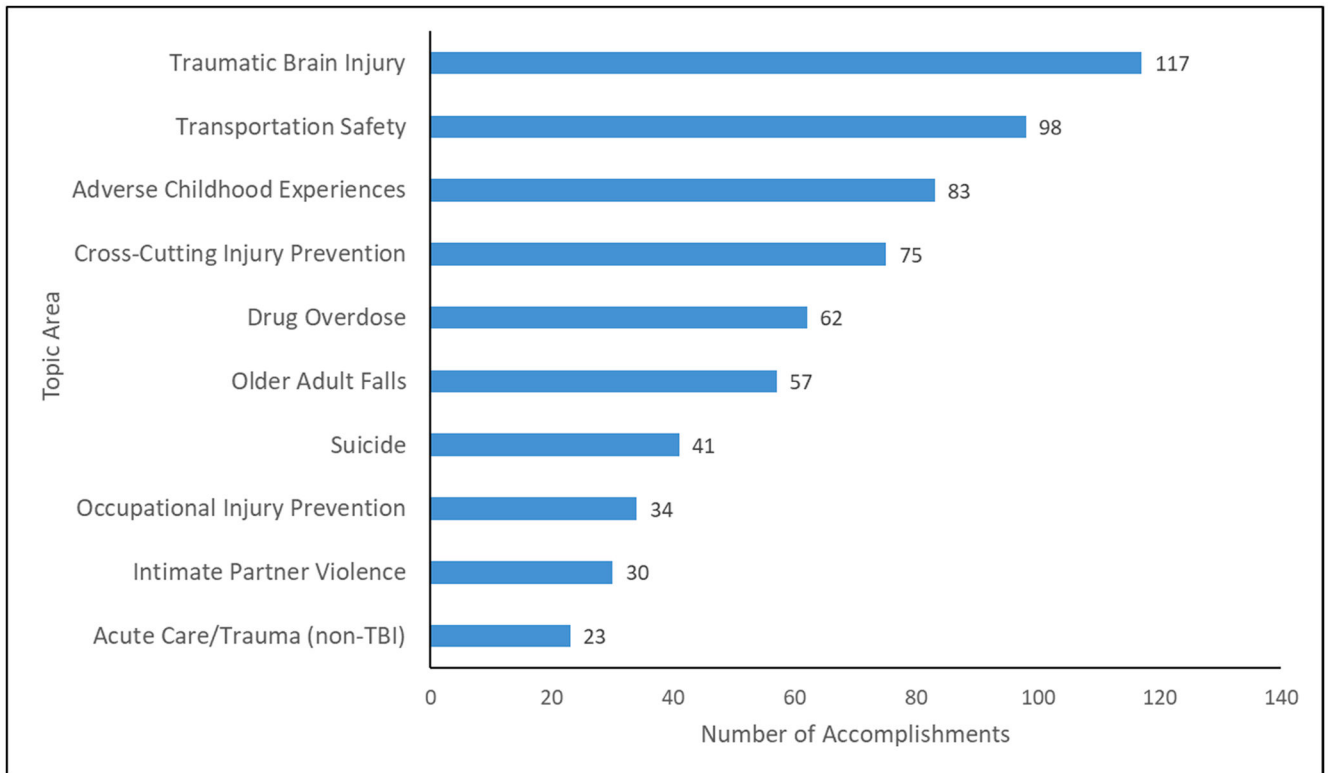


Fig. 3. Injury Control Research Center research core accomplishments by primary topic area, 2012–2019.

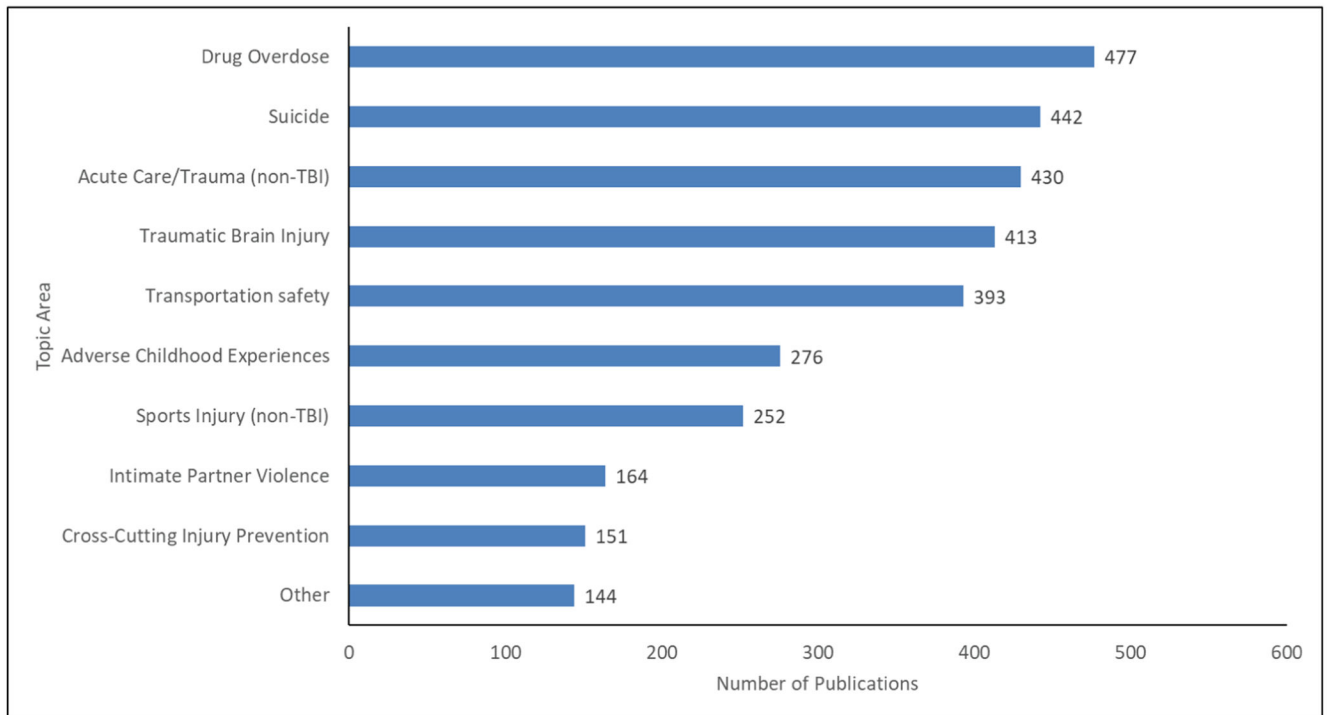


Fig. 4. Injury Control Research Center publications by primary topic area, 2012–2019.

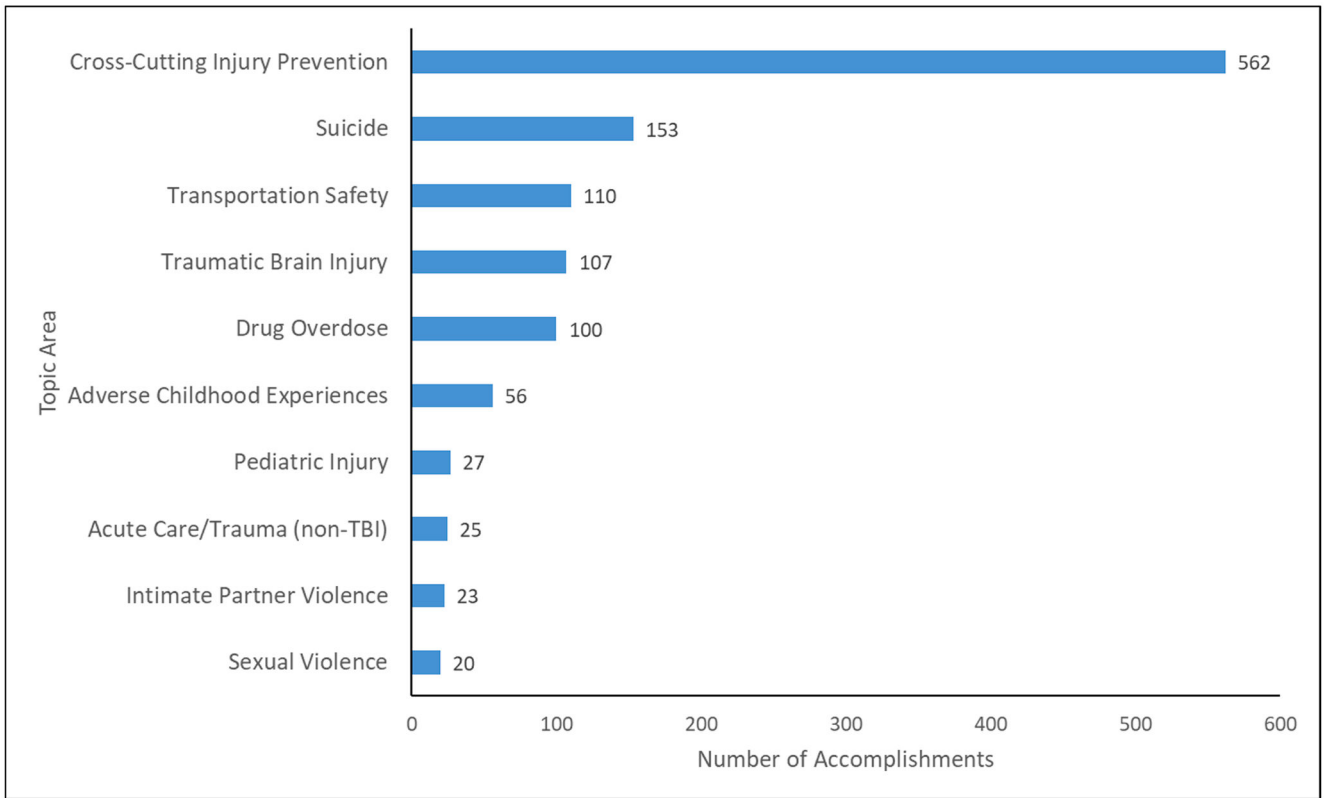


Fig. 5. Injury Control Research Center outreach core accomplishments by primary topic area, 2012–2019.

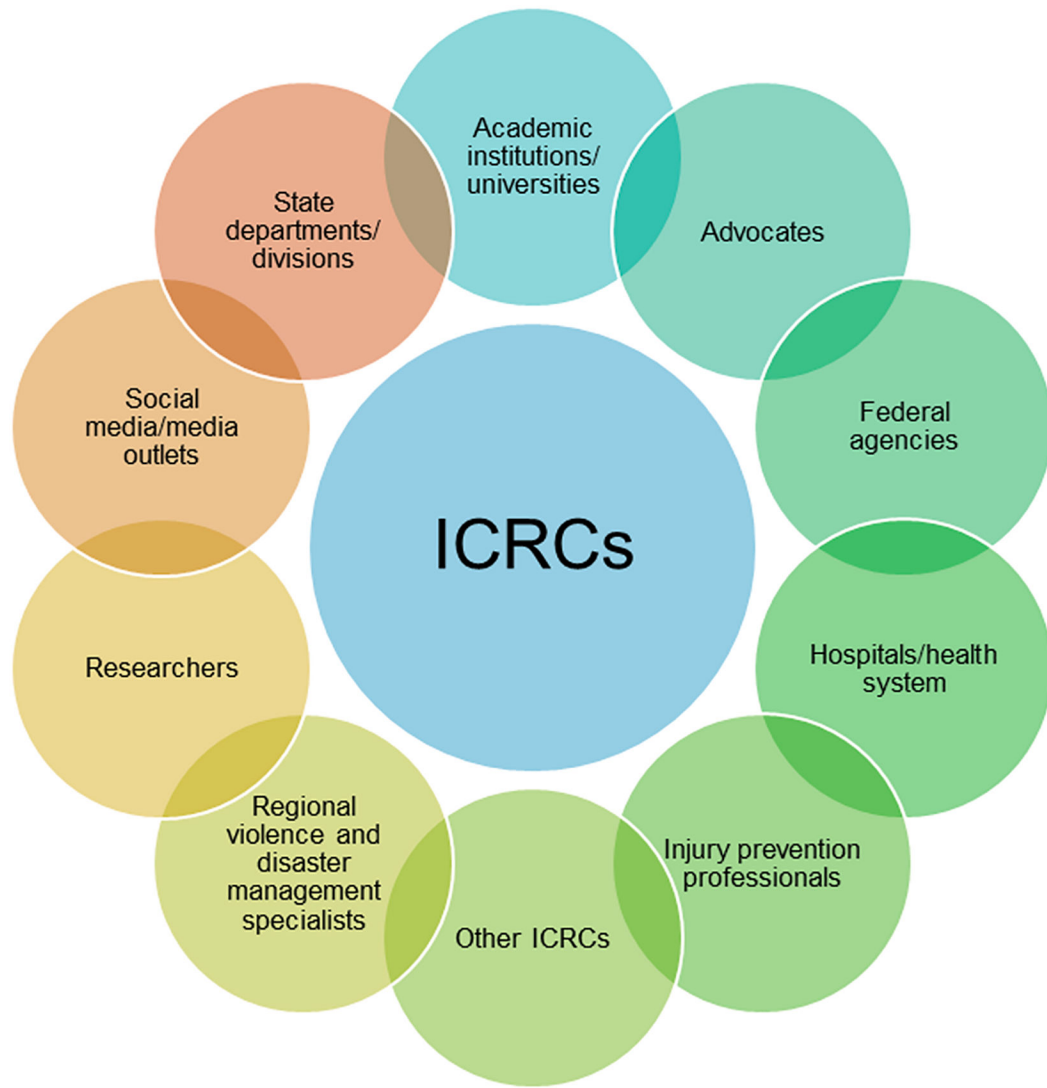


Fig. 6. Injury Control Research Center partnerships, 2012–2019.

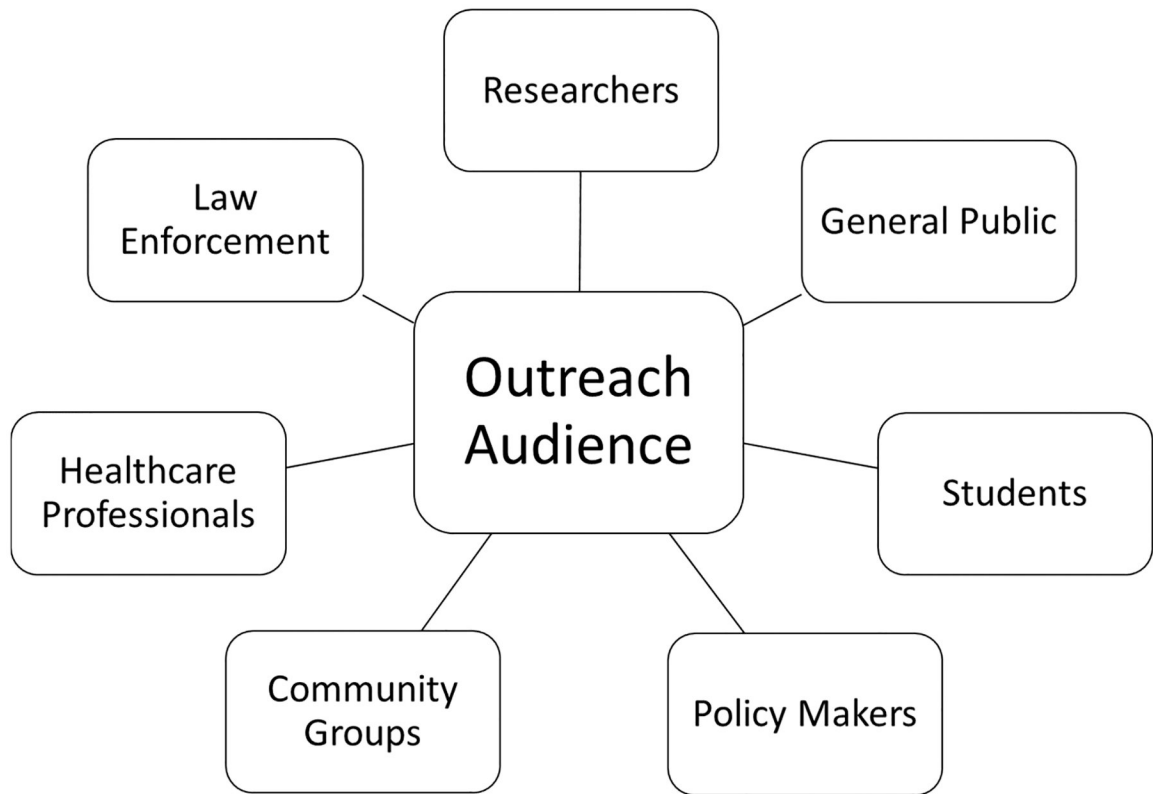


Fig. 7.
Injury Control Research Center outreach core audiences, 2012–2019.

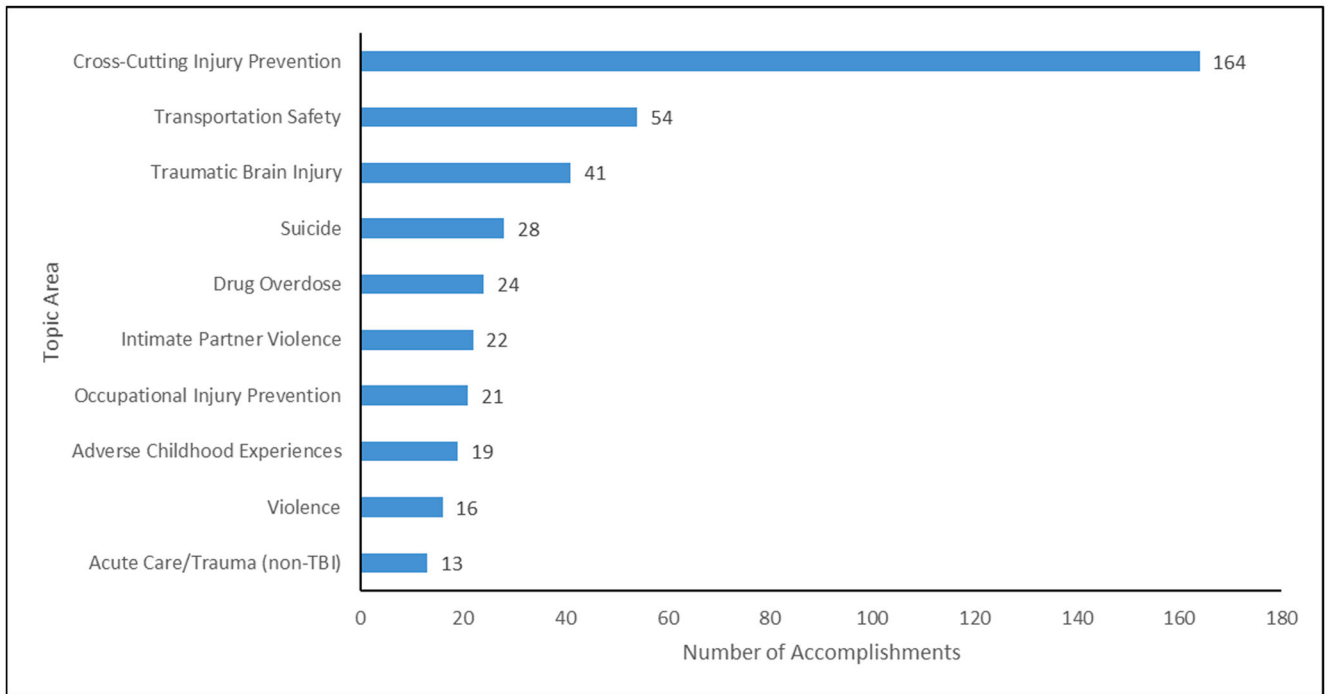


Fig. 8. Injury Control Research Center training core accomplishments by primary topic area, 2012–2019.

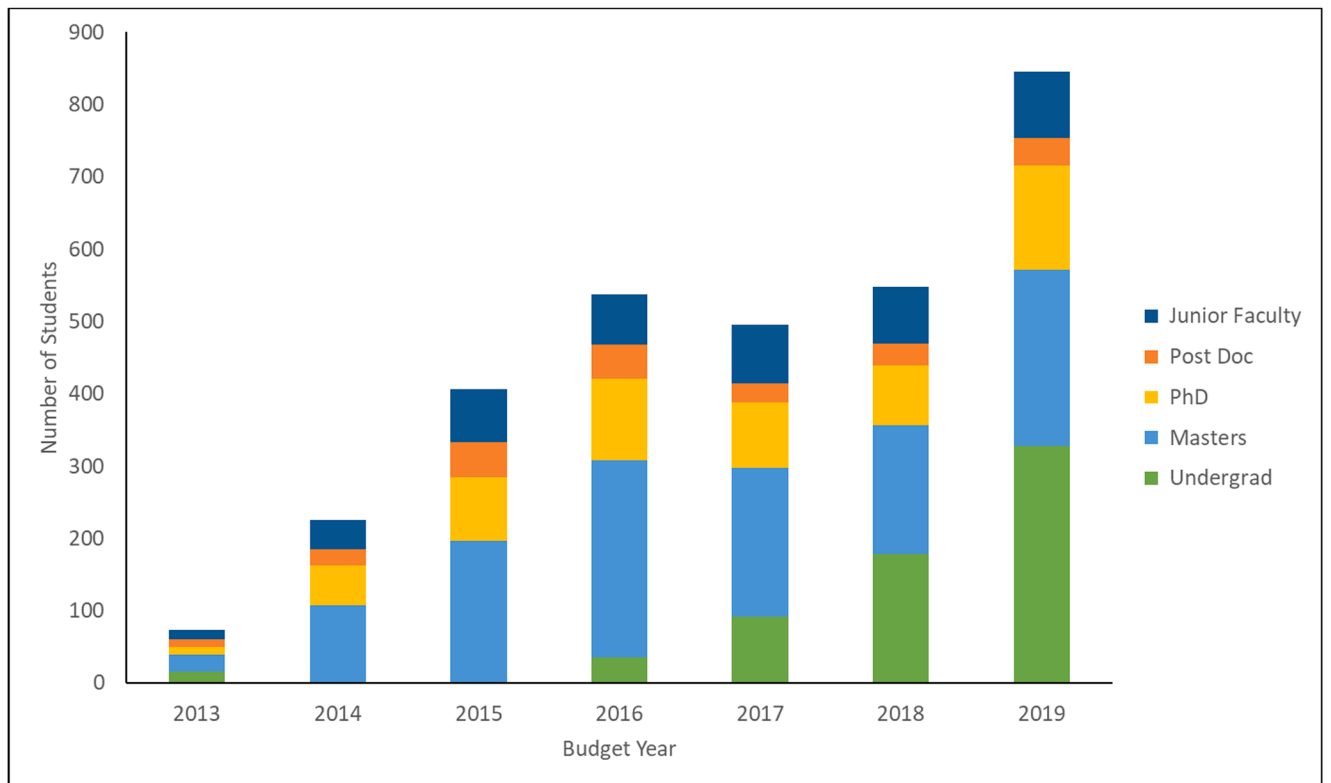


Fig. 9. Number of students, post-Doctoral students, and junior faculty trained by Injury Control Research Centers, 2012–2019.

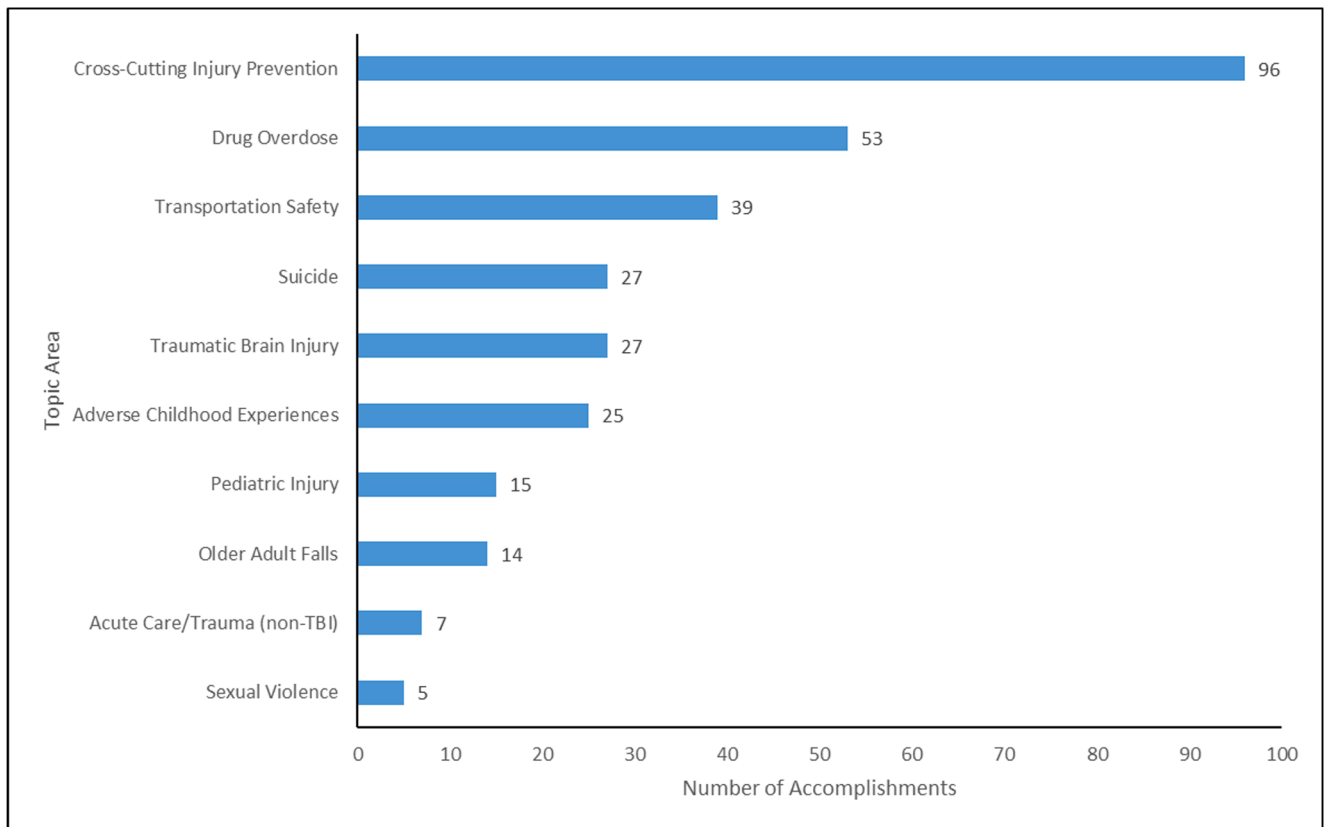


Fig. 10. Injury Control Research Center special tools and resources by primary topic area, 2012–2019.

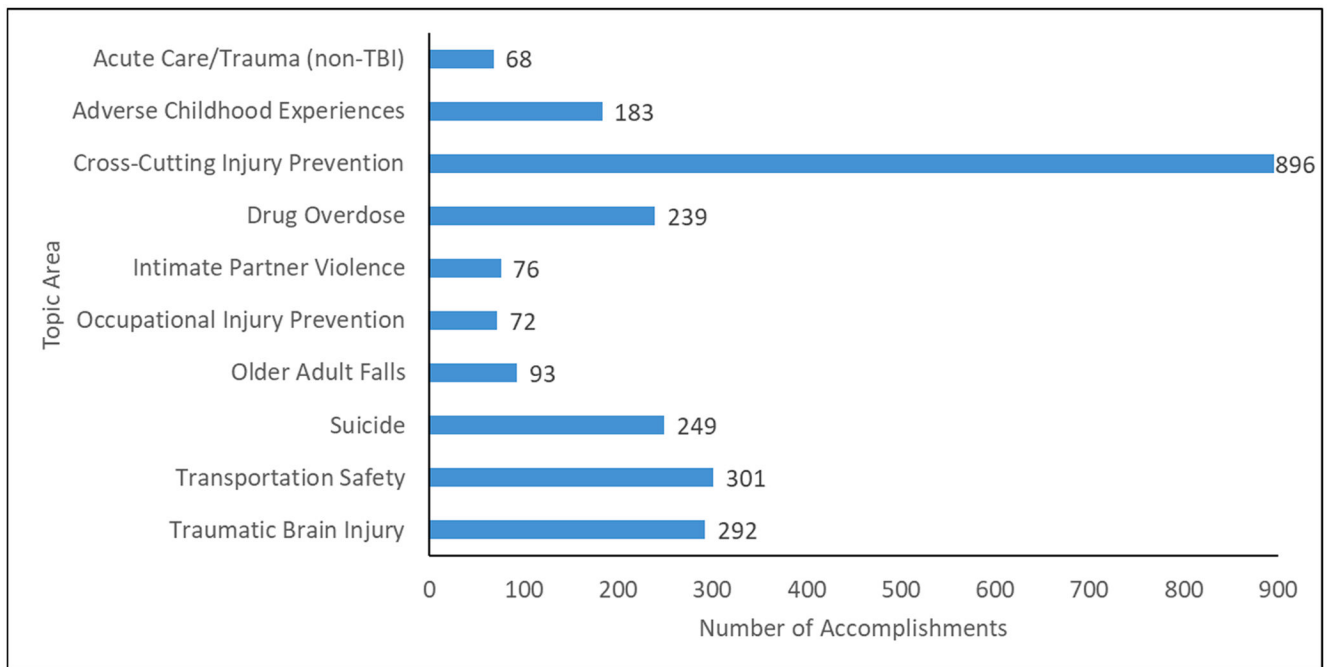


Fig. 11.

Injury control research centers all core areas and special tools and resources by primary topic area, alphabetized, 2012–2019. Fig. 11 only shows the ten most prevalent topic areas. Topic areas not included in this figure are alcohol-related injury, amputee falls, burn injuries, cross-cutting violence prevention, disasters, drowning, firearm safety, other, pediatric injury, poisoning, rehabilitation, rural injury prevention, sexual violence, sports injury (non-TBI), violence, and work-place violence.

Table 1

Injury Control Research Centers funded in the 2012 and 2014 Funding Cycles.

2012 ICRC Funding Cycle	2014 ICRC Funding Cycle
Columbia University: Columbia Center for Injury Science and Prevention	Johns Hopkins University: Center for Injury Research and Policy
Icahn School of Medicine at Mount Sinai: Mount Sinai Injury Control Research Center	University of North Carolina: Injury Prevention Research Center
Research Institute at Nationwide Children's Hospital: Center for Injury Research and Policy	University of Pennsylvania: Penn Injury Science Center
University of Iowa: Injury Prevention Research Center	
University of Michigan: Injury Prevention Center	
University of Rochester Medical Center: Injury Control Research Center for Suicide Prevention	
West Virginia University: Injury Control Research Center	

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript