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Equity Gaps in Injury and Violence Data Across Seattle, King County, Washington State, and Pacific Northwest Region

Health Assessment (2019-2021)

Presented by:

Harborview Injury Prevention & Research Center (www.hiprc.org)
A joint program of the University of Washington School of Medicine
and Harborview Medical Center

Contents

About the Harborview Injury Prevention & Research Center

Why HIPRC Exists

Together we have the power to prevent harm and suffering from injury and violence.

Who We Are

The Harborview Injury Prevention & Research Center (HIPRC; www.hiprc.org) is a joint initiative of the University of Washington and Harborview Medical Center, and is one of nine Injury Research and Control Centers (ICRC; https://www.cdc.gov/injury/erpo/icrc/index.html) funded by the Centers for Disease Control and Prevention (CDC). The ICRC network is tasked to find ways to prevent injury and violence. HIPRC is the only ICRC in the western half of the United States. Scientists and staff at the HIPRC work with diverse communities to identify injury and violence prevention concerns and collaborate with community and policy partners to prevent injury and violence.

Our Mission

Our interdisciplinary faculty and staff conduct research, train scientists, educate public health practitioners, and implement prevention programs to achieve injury-related health equity across the lifespan, because all people belong in the circle of human concern.

Who We Serve

HIPRC directs its research and programs toward those groups at greatest risk of injury: children, older adults. Families living in poverty, people of color, residents of rural areas, and others who are disproportionately affected by preventable injury, mindful of the intersectionality between these population groups. We aim to reduce the rates of injury, violence, and death among these groups from unintentional events such as car crashes and drownings and from purposeful acts such as suicide and murder. Efforts span the continuum of primary and secondary prevention, from epidemiological research to determine injury causes, to acute care of trauma patients, to rehabilitation in the hospital, community, and home.

What We Do

- Track the type, causes, treatment and consequences of injuries
- Use epidemiological tools to identify risk factors for injury
- Develop and evaluate new injury-prevention programs, using behavior change, community education, government action, and product environment modification
- Develop more effective ways to resuscitate and treat injury victims
- Improve rehabilitation strategies by identifying short- and long-term injury-related sequelae and their associated disabilities
- Train new investigators in injury research
- Educate health professionals, policy makers, and the public about the magnitude, costs, and prevention of trauma and violence.

Foreword

December 13, 2021

Dear Friends and Colleagues,

The Harborview Injury Prevention & Research Center (HIPRC; www.hiprc.org) welcomes you to read Assessment of Equity Gaps in Injury and Violence Data in the City of Seattle, King County, Washington State, and the Pacific Northwest Region.

At HIPRC, our work is grounded in health equity, aiming to dismantle biases based on age, disability, ethnicity, indigeneity, gender identity, linguistic differences, national origin, race, religion, sexual orientation, and social class. Our research, training, and outreach efforts are informed by the Injury and Health Equity Across the Lifespan initiative (iHeal; Supplemental Table A).

HIPRC Model for Achieving Health Equity Across the Lifespan for Injury and Violence Prevention

Together, the HIPRC and our 12-member Community Advisory Board are a dedicated group of researchers, medical professionals, educators, community health workers and advocates who unite to prevent the harm and suffering caused by injury and violence in our urban and rural communities. We are united in the conviction that strategic shared action, through meaningful partnerships, informed and guided by those communities most impacted by injury and violence, and informed by research, will be needed to achieve health equity, and prevent injury and violence. Using best practices from health education, behavioral science, social

marketing, and communication, we aim for our science to be responsive to community injury and violence prevention needs. We jointly work so that our research is translated to public policy and effective programs.

Following guidance from our Community Advisory Board to not further burden communities already experiencing the stresses, economic and disparate, of the impacts of the COVID-19 pandemic, we paused our plan for a conventional community needs assessment.[1] Instead, we examined the most recent existing injury and violence data to understand the realities facing our local, state, and regional communities more fully.

We also asked that the Community Advisory Board to prioritize the four ICRC research topics areas (suicide, traumatic brain injury, falls and opioids) for outreach and communication. The HIPRC Community Advisory Board ranked suicide prevention as the number one priority along with violence prevention, falls in older adults and opioids ranked equally as the number two priority, and concussion/TBI ranked third.

In response to this feedback and as shown in the figure above, where we developed a model for achieving health equity across the lifespan to prevent injury and violence, only through equitable data collection can we develop tailored and culturally resonant interventions to prevent injury and violence across our communities. As a result, we examined equity gaps in standard injury and violence data collection in Seattle, King County, Washington State and the Pacific Northwest region for the four ICRC project areas. We created a suicide prevention resource guide (https://hiprc.org/suicide-prevention-resource-guide/) and conducted a suicide prevention campaign during 2020-2021, reaching thousands of social media users and stakeholders. In 2021, the HIPRC released a Firearms digital toolkit featuring three interventions to address firearm injury and death: firearm safe storage, voluntary waiver of firearm rights, and extreme-risk protection order (www.https://hiprc.org/3interventionstoolkit/).

This report to our partners and community, "Assessment of Equity Gaps in Injury and Violence Data Across Seattle, King County, Washington State, and the Pacific Northwest Region," begins with an **Executive Summary** and is then divided into the main report with three analytical sections, followed by report conclusions and our path forward. We acknowledge that communities whose data are represented in existing data sources did not have an opportunity to self-identify and that our use of traditionally used data collection language is a limitation of this report. Wherever possible, we have used community preferred language.

With guidance from community, this report will guide our path forward to improve injury and violence data collection so that pro-equity community health assessments can be performed, with the long-term goal of developing precision driven health equity interventions that accurately identify and benefit our communities. We look forward to working together - with you - to reduce the burden from injury and violence in our communities most harmed.

We welcome you to read our **Executive Summary**, as well as the report in its entirety, which we have shared with our Community Advisory Board who gave feedback which has been incorporated into our path forward.

Sincerely,

On Behalf of The Harborview Injury Prevention and Research Center

In alphabetical order:

Beth E. Ebel, MD, MSc, MPH, Kenneth M. Jaffe, MD, MS, Megan Moore, PhD, MSW, Lynn G. Stansbury, MD, MPH, MFA, Julian Takagi-Stewart, BA, and Monica S. Vavilala, MD

Executive Summary

The burden of injury falls heaviest on people who face other inequities on account of poverty, racism, language barriers, and inequal access to resources and care. HIPRC's injury and violence prevention work is grounded in an enduring commitment to equity and anti-racism (https://hiprc.org/about/iheal/). This commitment requires that we be guided by the lived experience of those communities most harmed by structural racism, who know best what needs to change, and yet who are often furthest from power to effectuate the necessary changes to the status quo.

In partnership with the HIPRC Community Advisory Board, the HIPRC conducted an equity assessment of standard injury and violence data collection in Seattle, King County, Washington State, and the Pacific Northwest Region. In this report, we present information on areas where a deeper understanding of injury and violence burden will inform evidence-based interventions which meet local needs.

In Section A, we report on the burden of injury and violence using existing sources and databases, and using currently used data collection language. We identify the equity gaps in local (King County and Seattle), Washington (WA) State and national injury and violence data collection that preclude accurate and equitable local community health assessments, and prevent the development of tailored, more precise, and culturally resonant interventions to reduce the burden of injury and violence. Analysis of available data suggest important differences in local risk when compared to national and or state level data, and that local injury and violence risk varies inequitably by community for the four high priority research project areas ranked by the Community Advisory Board.

In Section B, we examine the hidden burden of injury, violence, and inequality. We show how equity gaps in data collection hide and/or obscure risk of injury and violence, especially at intersections with race, socioeconomic status, and gender. We share our findings on how hardscape factors contribute to inequitable risk of injury and violence in our local communities. Here, we use both currently used and community preferred language.

In Section C, we discuss implications and next steps for strengthening consideration of health equity in injury and violence prevention research, training and outreach. Here, we use community preferred language.

Our findings are highlighted in the Table below, followed by our conclusion and path forward.

Executive Summary Table	
Priority by Research Topic Area	**Main Findings**
Section A: Burden of injury and violence and findings of equity gaps in standard injury and violence data.	
Priority #1	
Suicide **Violence**	• Overall suicide risk has been exacerbated by the COVID-19 pandemic. • Males have higher rates of suicide; largest gender gap among the 15 leading causes of death. • Highest rates of suicide death were for American Indian/Alaska Native and White people, followed by Hispanic, Asian/Pacific Islander, and Black/African American people. • Substantial proportions of Lesbian, Gay, Bisexual, Transgender, Queer + youth report both suicidal ideation (42.1%) and suicide plan (35.0%). • Rates of attempted suicide were higher in Seattle than King County average among those in the poverty group. • Rates of attempted suicide were significantly higher than county-wide average in city of Seattle (highest in the South Region). • Data are lacking to accurately determine suicide rates and risk factors among socioeconomic subgroups to sufficiently examine intersectionality. • Overall, violence risk has been exacerbated by the COVID-19 pandemic. • Males are at greatest risk for firearm deaths: older males have the highest suicide rate; younger males have the highest homicide rate. • Eastern WA has higher firearm homicide and suicide rates than Western WA. • High firearm suicide-rate regions and clusters have high unemployment, low life satisfaction, little emotional support, poor quality of life, low educational attainment, and high firearm availability. • Proportions of homicide vs. suicide deaths vary among index socio-demographic groups: firearms deaths among White and American Indian/Alaska Native people are more likely to be suicide (84% and 73%, respectively) and more likely homicide (70% and 64%) among Black and Hispanic people, respectively. Both types of firearms deaths are more common in rural than urban areas. • Local data on root causes and mitigating factors of violence are lacking, especially for people of color.

Priority #2	
Falls in older adults **Opioid abuse**	• Falls in older adults are a significant public health problem in our local, state, and regional communities, exacerbated in historically marginalized (low-income, non-white racial/ethnic, and/or rural) communities. • Data on falls characteristics and outcomes are lacking for sub-groups. • Survival bias precludes understanding falls burden in people of color. • Non-fatal and fatal opioid overdose is a major burden on the community and on public health systems, significantly accelerated by the COVID-19 pandemic. • Valid quantitative assessment continues to be difficult at the local, state and regional levels. • Focus on opioids underestimates other forms of substance that may differentially impact marginalized communities.
Priority #3	
Traumatic brain injury	• There are significant disparities among historically marginalized groups. • WA state recently adopted a law requiring reporting of school concussions, but data collection systems are lacking. • There are no data systems to capture, monitor and report on traumatic brain injury incidence or outcomes overall and by race, ethnicity or geography.

Section B: Examples of how gaps and weaknesses in state and local data collection and hardscape factors contribute to inequality, and the hidden burden of injury and violence risk.	
Failure to collect relevant social variables **Trauma registries**	• There is a lack of trauma registry data collection on sexual orientation and gender identity. • Barriers to equity related data collection are staff investment, lack of national standardization, trust gap between staff and patients. • Facilitators to equity related data collection are cultural resonance training, self-report by patients, and script development for data collection, and addition of discrete fields in trauma registries. • There is lack of long-term follow up of patients to examine how local practices and system factors affect the health of injured patients over time and lead to outcome disparities. • There is a lack of inclusion of valid health equity-related measures in trauma registries.
Missing data on injury and violence in the Pacific Northwest **Regional data collection**	• Washington, Alaska, Idaho do not contribute to National Emergency Data System. • Idaho does not collect hospital discharge data. • There is a lack of high-quality epidemiologic data from tribal partners for pedestrian and bicyclist fatality rates, and likely higher for other injury and violence conditions. • Target Zero partners suspect that this number is underreported due to gaps in data sharing between Washington State and tribes. • There are limitations in availability of firearm data which severely curtail the ability to conduct research and evaluate efforts to reduce gun violence. • Violence data can be suppressed includes the impact of racism and fear on the willingness to seek health care, which delays needed treatment and significantly undercounts all cause statistics. • Some of the highest risk areas for injury are those in Central, South and West Seattle; areas which historically housed families of color. • Some areas of violence and injury such as firearms, remain significantly understudied due to national policies blocking access to data and funding.
Bias introduced by methods to collect and present data **Language access** **Taxonomy**	• There are limits of collecting patient histories only in English. • Many WA State hospital websites are not translated or lack easily accessible information about language assistance services and consequently may not be a useful resource to families with LEP, resulting in challenges with accessing appointments, follow up, discharge teaching. • Existing data sources and databases do not use community preferred language to characterize communities and conditions. • Use of existing language to describe communities perpetuates biases and contributes to inequality.

Failure to consider racist policies and relevant metrics **Street features and neighborhoods**	• Pedestrian injuries are increasing in King County and WA state. • Street features are associated with pedestrian risk. • Lower income and rural communities suffer disproportionately from this risk. • The lack of adoption of equity measures such as pedestrian hybrid beacons, signalized crosswalks and raised crosswalks do not protect pedestrians. • In King County and Seattle, pedestrian and bicyclists are over half of the fatal traffic injuries. • Some of the highest risk areas for injury are those in Central, South and West Seattle; areas which historically housed families of color, reflecting racist policies and practices such as redlining. • In addition to hardscape barriers, social and environmental factors have not historically examined. • Significant concerns precluding active transportation and asking public safety for help are police harassment and lack of resources. • Mobility justice and community engagement are not sufficiently used to advance active transportation in communities of color Community leaders reveal how. • Redlining and anti-restrictive covenants restrict access to neighborhoods, forcing marginalized communities to live in neighborhoods without sidewalks.
School resource officers	• Local and national landscape on school resource officers varies. • Funds flow, roles and responsibilities, and trainings of school resource officers is highly variable across WA state. • Accurate data on behavioral health needs, violence, firearm carry, equity measures, and arrest types are not easily available from schools or enforcement. • Community and student voices have not been sufficiently considered on how to achieve community well-being.
Section C: Implications and next steps for strengthening consideration of health equity in injury and violence prevention research, training, and outreach.	
	• Improvements to injury data collection and analysis are needed. Strategies include incorporation of validated self-reported measures of race, gender and ethnicity, addressing artificial barriers to inclusion of different language communities, and explicit inclusion and measurement of structural racism. • Community partnerships are at the heart of defining and informing the research agenda, ensuring that work addresses identified community needs. • The research agenda should be motivated to actions which prevent, treat, or rehabilitate injury, and must work towards the elimination of injury inequality. • Engage research to inform and shape policies which impact injury and health equity. • Targeted communication strategies are needed to reach communities most affected by injury and violence.

Report conclusion. HIPRC's injury and violence prevention work is grounded in an enduring commitment to equity and anti-racism (https://hiprc.org/about/iheal/). This commitment requires that we be guided by the lived experience of those communities most harmed by structural racism, who know best what needs to change, and yet who are often furthest from power to effectuate the necessary changes to the status quo.

The impact of injury and violence remains heavy and has been further exacerbated by the isolation and inequalities ushered in by the COVID-19 pandemic and response. To complement how the needs assessments inform this report, we incorporate the HIPRC charge, which has been encouraged by the HIPRC Community Advisory Board to direct the focus our analysis to marginalized people and communities to guide actions.

There is currently no coordinated, standardized, pro-equity approach to injury and violence-related data collection at local, statewide, regional or national levels. Misclassification of race, ethnicity and language proficiency is rampant. This lack of a standardized approach weakens our ability to hold ourselves and each other accountable for making progress in tackling the inequities in the status quo, and, if unaddressed, makes us complicit in allowing perpetuation of structural racism and other forms of structural bias and marginalization. Currently used language used to collect injury and violence data are not community preferred and perpetuate inequities in injury and violence risk, data collection and prevention.

Improvements to injury data collection and analysis are urgently needed. Strategies include incorporation of validated self-reported measures of race, gender, and ethnicity, addressing artificial barriers to inclusion of different language communities, and explicit inclusion and measurement of structural racism. Community partnerships are at the heart of defining and informing the research agenda, ensuring that work addresses identified community needs. The research agenda should be motivated to actions which prevent, treat, or rehabilitate injury, and must work towards the elimination of injury and violence inequality. Engagement with research to inform and shape policies which impact injury and health equity, and targeted communication strategies are needed to reach underserved communities.

Our path forward. The HIPRC commits to the adoption and implementation of mechanisms to ensure that approaches to changes in injury and violence-related data collection are community-led, and accountable to those communities most harmed by structural racism, and that those partnerships have significant representation as our partners. We also acknowledge that the harms of racism are often compounded by other forms of structural bias and marginalization. Taking responsibility for necessary transformative pro-equity changes in existing injury and violence data collection methods will require the setting of standardized, universal goals that intentionally and expressly target those communities that have historically been marginalized in the collection of injury and violence-related data. This approach has been termed "targeted universalism" by Professor John A. Powell at the UC Berkeley Law School's "Othering & Belonging Institute" (https://belonging.berkeley.edu/targeted-universalism).[2]

We commit to the following four high priority actions in injury and violence prevention, as we approach 2022:

1. Applying an express, embedded race equity template and analysis to the redesign and decision-making about changes to injury and violence-related data collection
2. Directly understanding the needs and priorities of our communities most affected by injury and violence.
3. Developing protocols that ensure that the lenses and analyses applied to the data are customized to recognize the unique historic and demographic attributes of each community in ways that are resonant and accountable to those communities most affected by inequity in the status quo.
4. Sharing this report and our commitment with partners who also strive to reduce injury and violence in our communities.

Section A. Burden of Injury and Violence and Equity Gaps in Injury and Violence Data.

Here, we use data language used in existing data sources and databases.

The CDC defines primary data collection and focus for a Community Needs Assessment as: "…assessing a community's strengths and weaknesses through mainly qualitative collection methods;" but notes that "…it is still important to support those findings with quantitative data collection methods (e.g., vital statistics, hospital records) to assess the health status of a community; for example, identifying prevalence and incidence of [non-communicable diseases]."[1] Here, we summarize current data on the four general areas of injury addressed by the four ICRC research projects grant cycle in the order of importance ranked by our CAB: suicide, falls in older adults, opiates, and non-lethal TBI. For each area, where possible, we also include an assessment of the effects of the COVID-19 pandemic, using March 2020, as the onset.[3] National and Pacific Northwest regional data are presented briefly in the text and in Supplemental material, followed by Washington State and Seattle/King County.

For each of the four areas of concern, we sought validated public health datasets on subgroups known to be vulnerable to health and injury disparities,[4] particularly groups reflected in the diverse composition of the Pacific Northwest region,[5] WA state, and Seattle/King County communities. The CDC data was by far the most accessible and useful but had very limited ability to examine intersectional subcategories such as age group and conventional racial identifications, expanded gender or language/ethnicity classifications,[6] and rapidly lost power owing to small numbers when narrowing from national to state groupings. The recently published Big Cities Health Coalition open access data platform from Drexel University provided data only for urban communities, omitting significant groups such as indigenous populations and important subsets of injury such as traumatic brain injury (TBI) and falls in older adults.[7] Likewise, the Social Determinants of Health Database maintained by the Agency for Healthcare Research and Quality provides fascinating data at a county-by-county level but fails to distinguish regions

within counties. Seattle/King County is an important example, in which relative poverty and risk of injury and violence are well known to be aggregated in South King County.[8]

Many sources of varying quality of summarized data exist regarding the public health burden in our four focus areas. We concentrated on sources with validated datasets and, where possible, variables such as income, race/ethnicity, preferred language spoken at home and health disparities. However, as detailed below, the ability to elucidate injury and health equity was often limited by data availability, missing variables, which are limitations from administrative databases.

Community Priority #1: Suicide and Violence

One of our four CDC ICRC research projects evaluates the efficacy of provider training in suicide prevention, with a particular focus on limiting access to means of self-harm.[9]
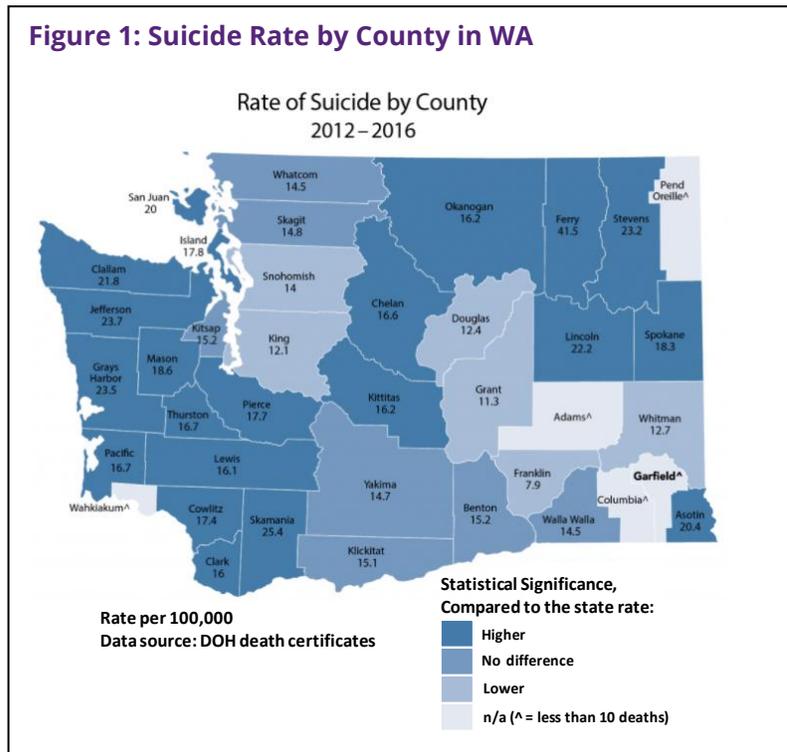
Suicide
National and regional. Suicide, and its association with firearms, is a major focus for the CDC and a community concern. Suicide is the 10th leading cause of death in the US, and the overall incidence of suicide increased by roughly one-third from 1999 to 2019. Suicide accounted for almost 2% of all reported deaths in the US in 2019, for an annualized crude death rate of $14.5/10^5$.[10] Provisional data from 2020, capturing the early months of the pandemic, indicated an alarming 17.7% increase from the prior year. The prevalence of suicidal ideation among American adults in 2019 is reported at 12 million, with 1.4 million reported suicide attempts.[11] Suicide in general and its association with firearms is a major focus of CDC and community concern.[12]

 Socio-demographic disparities in suicide attempts and deaths are well established. Crude death rates increase with age; males have higher age-adjusted rates of suicide deaths by an age-adjusted relative risk of 3.7, the largest gender gap among the 15 leading causes of death.[13] Conversely, attempted suicides are much more common among females, with the difference driven by the lower prevalence of firearm use.[14] American Indian/Alaska Native (AI/AN) persons have the highest

crude death rate, followed by non-Hispanic White persons (Supplemental Table 1).[12,13] When age and race are cross-examined, AI/AN persons face substantially higher crude death rates among those under 30 years of age, compared to other racial/ethnic groups (Supplemental Figure 1). In all other subgroups, crude mortality rates increase with increasing age and in rural vs. urban populations.

WA State. In 2019, WA state ranked 24th highest for suicide deaths among the U.S. 50 states, with a crude mortality rate of 16.6 per 100,000 persons, compared to the US average of 14.5 per 100,000 persons, nationally.[13] In-state demographic disparities reflect those at the national level (Supplemental Table 1); rates of suicide for males are almost 4 times that of females (26.2 vs 7.0 per 100,000 persons

Figure 1: Suicide Rate by County in WA

Rate of Suicide by County
2012 – 2016

Rate per 100,000
Data source: DOH death certificates

Statistical Significance,
Compared to the state rate:
Higher
No difference
Lower
n/a (^ = less than 10 deaths)

respectively). Rural, AI/AN, and White populations showed the highest rates, essentially double those of Black, Asian/Pacific Islander, and Hispanic persons (11.7, 8.7, and 7.8 per 100,000 persons, respectively; Supplemental Table 1, Figure 1). [13] Grouped by age, crude death rates by suicide gradually increase from 7.4 per 100,000 among those between 10 and 19 years, to 22.4 per 100,000 among those between 40 and 49 years, to 25.1 per 100,000 among those 80 years and older. [12][13]

Seattle/King County. The King County 2021-2022 Community Health Needs Assessment summarizes the impact of suicides on our local population as follows:[15]

- Although crude death rates in King County for suicide from 2014–2018, were lower than national rates, 12.1 per 100,000, suicide was the 8th leading cause of death in the county.
- Sex: Local data on binary heterosexual gender differences in suicide deaths and attempts mirror those of the country and WA state and are likely underreported. Data averaged from 2016 and 2018 reveal alarming proportions of LGBT+ youth reporting both suicidal ideation (42.1%) and suicide plan (35.0%), underscoring behavioral health needs that are largely unmet.
- Age: Rates of hospitalization for attempted suicide were highest among young adults aged 18–24 (77.0 per 100,000). Among older adults, the rate for adults age 75 years and older was 20.0 per 100,000, which is also significantly higher than the King County average.
- Race: The highest rates of suicide death by racial/ethnic groups were for AI/AN persons (20.2 per 100,000), followed by White persons (14.0 per 100,000), with rates for Hispanic, Asian/Pacific Islander, and Black persons all significantly lower (6.6, 7.3 and 6.4 per 100,000, respectively).
- Income: Rates of attempted suicide were significantly higher than the King County average among individuals living below the poverty line (78.0 per 100,000) and more than two times the rate among those below the poverty line (37.6 per 100,000).

- County Regions: Rates of attempted suicide were significantly higher than county-wide average in the city of Seattle (50.4 per 100,000) and significantly lower in the county's East Region (36.0 per 100,000) (Figure 2). Death rates from suicide were highest in the South Region (Figure 3).

Figure 2: Hospitalizations by Poverty Status and Region

Self-harm & attempted suicide hospitalizations
King County (average: 2016-2018)

	Rate
King County	42.6
Low poverty	37.6
Medium poverty	41.1
High poverty	78.0*
East	36.0*
North	46.0
Seattle	50.4*
South	41.4

Source: Comprehensive Hospital Abstract Reporting System (CHARS)
*Significantly different from King County Average.

Figure 3: Suicide Deaths by Race and Region

Suicide
King County (average: 2014-2018)

	Rate
King County	12.1
AIAN	20.2
Asian	7.3*
Black	6.4*
Hispanic	6.6*
NHPI	8.4!
White	14.0*
East	10.7
North	12.1
Seattle	11.3
South	13.4

Source: WA State Department of Health, Death Certificate data
*Significantly different from King County average

Lethal means. In 2017, approximately half of all fatal suicides in WA resulted from use of a firearm. Put another way, three of every four firearm deaths reported in WA between 2007 and 2017 were a person who died from suicide.[16] The association between suicides, homicides, and domestic violence injuries is well-described. [17] [18]

COVID-19 impact. In the US and abroad, the COVID-19 pandemic has been associated with an increased prevalence of suicidal ideation and incidence of suicide.[19][20] Coordinated national and local efforts are needed to tackle this tragedy of despair, including work to limit access to fatal means and improved behavioral health care.[21]

Summary. Suicide is a public health problem that impacts all populations at the national, state, and county levels. Demographic and socioeconomic variables, including sex, age, race, rurality of residence, income, and sexual orientation show disparities of suicide rates. However, aggregated national and state data quickly lose power to examine the experience of socio-demographic subgroups for individual states by disaggregated groups, which limits the ability of communities to understand the burden more locally.

Violence

National and regional. Tracking the public health effects of self-directed and interpersonal violence in the US is complex. Passage of the Dickey Amendment in 1996 stifled national funding for data collection and research on interpersonal violence for the past 25 years, most notably slashing research funding to examine approaches to reducing firearm injury.[22]

The CDC data from 2008-2014 suggest wide regional differences in age-adjusted firearms death by county (Supplemental Figure 2).[13] Data tabulated by the Kaiser Foundation from current CDC data suggest striking regional and racial/ethnic differences.[23] In 2019, except for California and Washington (respective crude mortality rates, 7.3 and 11.7 per 100,000), fatal firearm injury rates in all other western states are higher than the US national rate of 11.9 per 100,000. In the Pacific Northwest, the state with the highest firearm mortality rate is Alaska (24.4 per 100,000).In every state where numbers are sufficient to support stable calculation of rates, those for African American/Black persons are higher than those for White persons, most prominently in the Southeast. Only five states report rates for AI/AN persons. In those five western states, only in California and Alaska are firearm mortality rates for AI/AN persons higher than the median state rates (California AI/AN 9.9 per 100,000 persons vs mean rate of 7.2 per 100,000 persons; Alaska Native persons (47.4 per 100,00) compared with the state rate of 24.4 per 100,000 persons).[23]

WA State. Although based on older data, the 2013 WA State Health Services Research Brief on firearm deaths provides a comprehensive and uniquely granular view of the burden of firearms injuries at the state and local levels and among index socio-demographic groups, including the interweaving of the various forms of violent death forged by firearms availability.[24] Key findings include:

- Firearm deaths now exceed motor vehicle crash deaths in WA State.
- Suicides account for nearly four in every five firearm deaths.
- Males are at greatest risk for firearm death. Older males have the highest suicide rate; younger males are more likely to die from homicide.
- Eastern WA has higher firearm homicide and suicide rates than Western WA.
- High firearm suicide-rate regions and clusters have corresponding measures of high unemployment, low life satisfaction, little emotional support, poor quality of life, and high firearm availability.
- High firearm homicide-rate regions and clusters have corresponding measures of low income and low educational attainment.
- Washington's firearm suicide rate is higher than the U.S. rate; Washington's firearm homicide rate is lower.
- Proportions of homicide vs suicide deaths vary among index socio-demographic groups.
- Firearms deaths among White and AI/AN persons are more likely to be suicide (84% and 73% of all firearm deaths, respectively between 2007-2011). Black and Hispanic persons who were fatally injured by a firearm were more likely to have died from homicide (70% and 64% of all firearm deaths). Rates of firearm death from suicide or homicide are more common in rural areas.
- According to Washington Department of Licensing data, annual numbers of handgun sales in Washington State essentially tripled, from roughly 65,000 to roughly 170,000 from 2006 to 2012.

More recent CDC data allows some assessment of potential changes in some of these patterns, though estimates are often unstable rates due to small numbers (Figure 4).

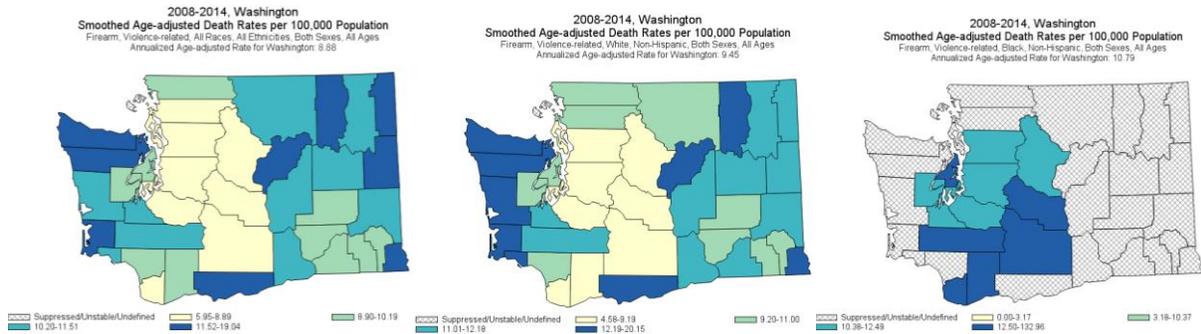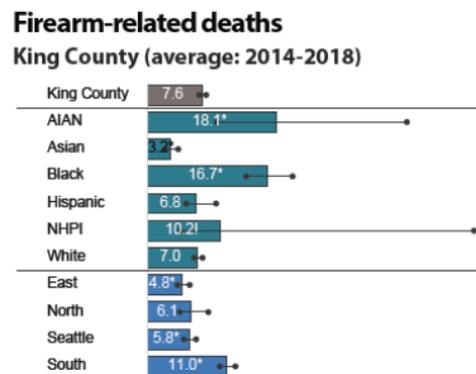**Figure 4: Loss of Data When Considering Firearms Deaths in Washington State by White/Black Race**

Figure shows stability of smoothed age-adjusted death rates across couties when examining all races, non-hispanic white race, and non-hispanic black race, respectively from left to right. Figure produced by: the Statistics, Programming & Economc Branch, Nationla Center for Injury Prevention & Control, CDC. Data Sources: NCHS Nationla Vital Statistics System for numbers of deaths; US Census Bureau for population estimates.

Seattle/King County. Based on data from 2014-2018, the 2021/2022 King County Community Needs Assessment reports crude mortality from firearms injury as 7.6 per 100,000, essentially the same as the mortality rate for Washington State. However, firearm mortalities rates have increased between 2013-2015 to 2016-2018 and there have been dramatic increases in firearm death rates for high-poverty neighborhoods, Native Hawaiian/Pacific Islanders, and the South Region of King County. [15] (Figure 5).

Figure 5: Violent Deaths by Race and Region

Firearm-related deaths
King County (average: 2014-2018)

King County	7.6
AIAN	18.1*
Asian	3.2*
Black	16.7*
Hispanic	6.8
NHPI	10.2‡
White	7.0
East	4.8*
North	6.1
Seattle	5.8*‡
South	11.0*

Source: WA State Department of Health, Death Certificate data
*Significantly different from King County average

COVID-19 impact. Nationally, the early months of the COVID-19 pandemic lockdown were associated with increases in gun purchases, and the expectation was that the combination of the isolation and tensions of lockdown coupled with the increase in prevalence of firearms in homes and personal possession would be an increase in firearms injuries and deaths.[25][26][27] However, as the pandemic has evolved, the national picture has become more complex. with early increases in the incidence of fatal firearm injury, followed by a temporary decrease.[28] However, since June 2020, with various re-opening mandates, a worrisome post-lockdown resurgence in firearm deaths has been documented.[29] Validated data are not yet available for Seattle/King County, but anecdotal reports from the Harborview trauma service suggests a post-lockdown firearms violence phenomenon. Studies supported by the HIPRC Research Core are underway to explore Harborview Trauma Registry and other clinical databases to document these trends more clearly.

Summary. In the US, data collection and research for understanding of the root causes and mitigating factors in interpersonal violence, particularly that associated with firearms, unfortunately is poor with much missing data for persons of color at all levels. Local data are lacking to understand root causes of violence and mitigating factors. However, evidence is also mounting that communities are not powerless to effect life-saving changes.[30] [31]

Community Priority #2a: Falls among older adults

One of the four HIPRC ICRC research projects is aimed at preventing falls among older adults living in communal housing or skilled nursing facilities in rural areas.[32]

National and Regional. Falls are the leading cause of reported injury in the US in all age groups and are the leading cause of injury-related death in individuals 65 years and older.[10] Strategies to prevent falls among older adults is a major focus of Centers for Disease Control and Prevention (CDC) research, outreach, and research funding.[33] The annualized crude death rate attributed to falls among US adults 65 years and older is estimated 55.2 per 100,000 population (Supplemental Figure 3), 12.5 per 100,000 among those 65-69 years.

- Falls death rates nearly double every five years, reaching 265 per 100,000 older adults among adults who are 85 years and older (Supplemental Table 2).
- Regionally, the Pacific Northwest includes a cluster of the highest fall rates.
- Across the racial (White, African American/Black, Asian/Pacific Islander, and AL/AN) and ethnic (Hispanic) group identified by the CDC, crude fall injury rates for White persons are essentially twice those of AI/AN or Asian/Pacific Islander persons and are three times higher than fall rates for Black persons (Supplemental Table 2, Supplemental Figure 4, Panel A).

Within age subgroups, fall rates are highest for White persons but small numbers preclude analysis of differences between racial groups.

WA State. In June 2021, based on CDC and state data, WA State Department of Health summarized the statewide status of falls among older adults as follows:[34]

- In 2019, there were 14,275 non-fatal unintentional fall-related hospitalizations among Washington residents age 65 years and older;
- The total number of unintentional fall-related deaths among WA State residents aged 65 and older has more than doubled from 393 in 2000 to 974 in 2019;
- In 2019, unintentional fall-related deaths account for more than half of all unintentional injury deaths of Washington residents over age 65. Most of these deaths (3 of 4) occurred among adults who were 85 years and older;
- In 2019, WA State had the 18th-highest rate of unintentional fall-related deaths in the nation for adults 65 years and older.

Seattle/King County. Roughly 30% of the population of WA State live in Seattle/King County. [34] Roughly 37% of Seattle/King County residents are 65 years and older and face higher risk of injury from a fall. The 2021/2022 update of the King County Health Needs Assessment [15] notes that falls are a significant burden in neighborhoods below the poverty line and an excessive burden for older adults (Figure 6) in those neighborhoods.

COVID-19 Impact. The first documented cases in the US of COVID-19 were in King County, WA, among older adult residents of a local rehabilitation center, and the logarithmic increase of mortality of COVID-19 infection as age increases has been a dominant feature of the pandemic and in

Figure 6: King County Hospitalizations by Falls and Unintentional Injury Deaths

Panel A **Fall hospitalizations**
King County (average: 2016-2018)

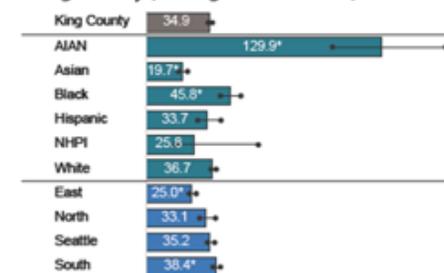|	
King County	337.2
Low poverty	338.1
Medium poverty	327.1*
High poverty	437.7*
East	328.2
North	343.6
Seattle	338.6
South	346.9

Source: Comprehensive Hospital Abstract Reporting System (CHARS)
* Significantly different from King County average

The hospitalization rate from falls for people in the high-poverty group was 437.7 per 100,000 — higher than the King County average.

Panel B **Unintentional injury deaths**
King County (average: 2014 - 2018)

King County	34.9
AIAN	129.9*
Asian	19.7*
Black	45.8*
Hispanic	33.7
NHPI	25.8
White	36.7
East	25.0*
North	33.1
Seattle	35.2
South	38.4*

Source: WA State Department of Health, Death Certificate data
* Significantly different from King County average

For adults age 75 and older, the rate of death from unintentional injury (209.9 per 100,000) was six times the county average. Most such injuries in this age group are due to falls (153.1 per 100,000).

social, medical, and public health responses. [35][36] Specific impacts of the pandemic on falls injuries and deaths have not been documented. However, the availability of caregivers, their access to frail individuals, and resources for preventive interventions are likely to have decreased. In addition, decreased population numbers among various cohorts of older people will distort and impede getting quantitative access to the specific needs of these subgroups, creating the same types of data and outreach response gaps described below.

Summary. Falls in older adults are a significant public health problem in our local, state, and regional communities. As with the national data, however, data-based access to known markers of health disparities like urban/rural residence or race/ethnicity at the state and county level—the main sources of public health intervention for most Americans—is limited by small numbers. Table 1 (below) provides crude death rates by age and race/ethnicity. The three panels of Figure 7 map these data by county—Panel A for all residents, Panel B for White people, and Panel C for Hispanic people. The overall picture and that for White people suggest that falls in older adults are a greater health burden in the rural eastern region of WA. However, because the mapping and statistical functions used to generate this summary information become "unstable" when subgroup numbers become smaller, the actual burden of injury in these subgroups is lost. (See also Supplemental Figure 4 Panel B).

Overall, as with the national data, these results raise the possibility of survival bias. That is, irrespective of socio-demographic subgroups, if individuals reach the age of 80 years, their risk of death from falls does escalate markedly, but the likelihood of surviving to 80 years is significantly less in some groups than others. These patterns are exacerbated in historically marginalized communities (low-income, non-white racial/ethnic, rural) by a range of factors that work against each other in conventional data-collection matrices, including factors which decrease numbers, and therefore visibility, of subgroups of older adults.

Figure 7: Loss of Data When Considering Falls Deaths in Washington State for persons age 65 years and older and are reported to have White Race or Hispanic Ethnicity
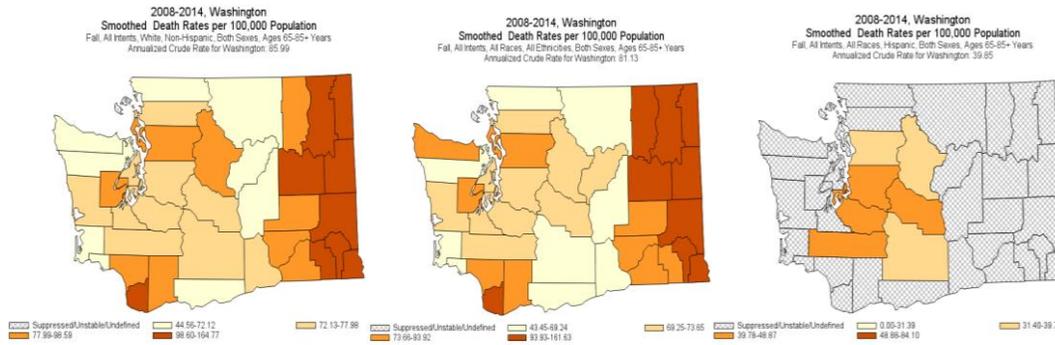

2008-2014, Washington
Smoothed Death Rates per 100,000 Population
Fall, All Intents, White, Non-Hispanic, Both Sexes, Ages 65-85+ Years
Annualized Crude Rate for Washington: 85.99

2008-2014, Washington
Smoothed Death Rates per 100,000 Population
Fall, All Intents, All Races, All Ethnicities, Both Sexes, Ages 65-85+ Years
Annualized Crude Rate for Washington: 81.13

2008-2014, Washington
Smoothed Death Rates per 100,000 Population
Fall, All Intents, All Races, Hispanic, Both Sexes, Ages 65-85+ Years
Annualized Crude Rate for Washington: 39.85

Figure shows stability of smoothed crude death rates across couties when examining all races, non-hispanic white race, and Hispanic ethnicity, respectively from left to right. Figure produced by: the Statistics, Programming & Economc Branch, Nationla Center for Injury Prevention & Control, CDC. Data Sources: NCHS Nationla Vital Statistics System for numbers of deaths; US Census Bureau for population estimates.

Table 1: Crude Falls Related Death Rate by Age, Race and Ethnicity

Race/ethnicity→ Age group↓	All	White	Black	Hispanic	Indigenous	Asian/ Pasifika
All ≥65	82.3	86.6	24.5	35.5	31.3	48.7
65-69 years	14.43	14.2	c	c	c	18.23
70-74 years	26.87	27.49	c	21.94	c	24.27
75-79 years	55.5	57.2	c	c	c	40.7
80-84 years	123.9	128.8	106.8	61.0	186.5	186.5
85+ years	404.6	425.0	164.0	186.7	241.1	200.5
c: cannot be calculated due to small sample size						

Community Priority #2b: Opioids

One of the four HIPRC research projects funded as part of the ICRC grant tests an innovative program for assisting rural practitioners in managing post-acute-care discharge trauma patients at risk for prescription opioid addiction.[37]

National and regional. As summarized by Bohnert and Ilgen in 2019, [38] addiction to opiates and their derivatives has flared episodically as a public health issue at times when large-scale access to novel and more addictive forms of the drugs has become available. The current epidemic in the US has its origins through the early-mid 1990's with the perception in the clinical community that non-cancer pain was under-treated, coupled with aggressive marketing of new synthetic opioids by pharmaceutical companies. Recognition of the causative role of prescription opioids, commercial pressures to increase prescriptions, and inadequate oversight of prescribing practices and diversion contributed to the devastating opioid overdose epidemic. More recently there have been significant professional and regulatory efforts to improve prescribing practices and accountability. However, a generation of individuals who were now chronically using opioid medications led to a shift which was rapidly filled by other sources, most importantly by fentanyl and its derivatives, which are far more potent, often unexpectedly so for inexperienced users, leading to a marked increase in lethal overdoses and some debate over the distinctions between overdose and suicide.

At the present time, the CDC data-gathering and support for research on drug-associated illness and deaths, as for injuries, provides separate data channels for non-fatal drug overdoses and drug overdose deaths. [39][40] non-fatal drug overdose data are clustered as: all drugs, opioids including heroin, (heroin alone, and stimulants. Fatal drug overdose data are clustered as: prescription opioids, heroin overdose, synthetic opioid overdose, fentanyl encounter data, other drugs, and poly-substances (mainly psychostimulants, mainly cocaine, methamphetamine, and poly-substances).

The most current CDC summary mapping of fatal drug overdose data by state suggests an overall stabilization of death rates from prescription opioids between 2018 and 2019 but notes that, overall: "Drug overdose deaths involving synthetic opioids ...have shifted geographically. No state experienced a significant decrease from 2018-2019."[40] Supplemental Table 3 shows age-adjusted

Figure 8: Data Showing Increasing Opioid Overdose Deaths in WA

death rates by state for 2019. Rates in the four states of our Pacific Northwest Region rank from 11th lowest to 22nd lowest, ranging from Montana (14.1 per 100,000) to Alaska (17.8 per 100,000). However, as shown in Figure 8 Panels A and B, the largest relative increases in synthetic opioid deaths from 2018 to 2019 was in the CDC Western region states.[40]
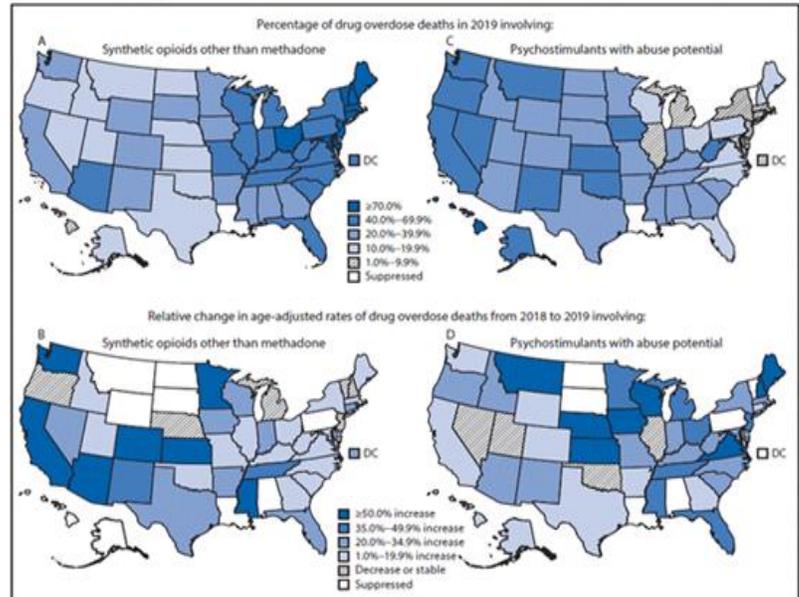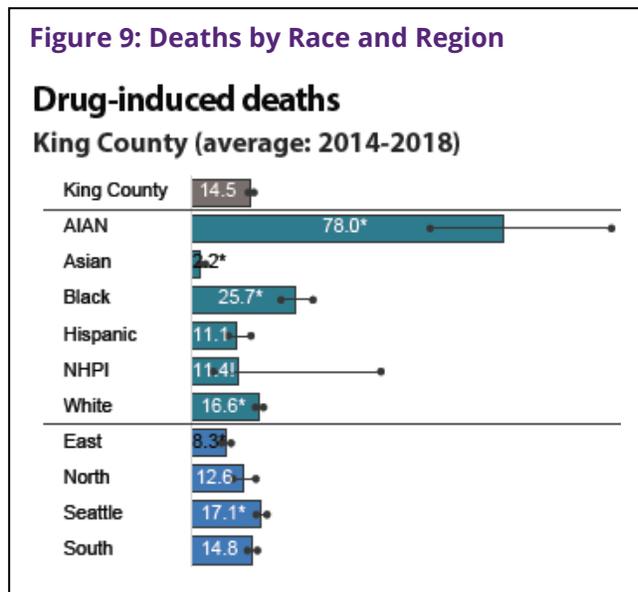
WA State/King County

- The crude rate of fatal drug-related death in WA state for 2019 was 15.1 per 100,000 (Supplemental Table 3). The equivalent rate for Seattle/King County, 2014-2018, averaged 14.5 per 100,000 (Figure 9).
- As with national data, rates in King County are significantly higher among AI/AN persons.

Figure 9: Deaths by Race and Region

COVID-19 Impact

- Preliminary reports suggest that rates in all groups are likely to have continued to rise through 2020 and the first 6 months of 2021, accelerated by the COVID-19epidemic.
- Anecdotal and intramural trauma center information since March 2020 suggests no decrease in the excess burden of opioid deaths among historically marginalized subgroups.
- However, quantitative access to this information remains unstable due to small numbers.

Summary. Non-fatal and fatal opioid overdose continues to be a major burden on the community and on public health systems, probably significantly accelerated by the COVID-19 pandemic. However, valid quantitative assessment continues to be difficult other than at the national level. In addition, as suggested above in Figure 8 Panels C and D, the focus on opioids potentially censors other forms of significant non-alcoholic substance abuse that may differentially impact historically marginalized communities.

Community Priority #3: Traumatic Brain Injury

The CDC ICRC research projects tests an innovative implementation-science-based strategy to improve Return to Learn Care (school accommodations based on concussion symptoms) for high school students with concussion.[41]

National and regional. Traumatic Brain Injury (TBI) can range from severe TBI that can result in life-altering disabilities or death to mild TBI, commonly recognized as concussion, that generally results in temporary symptoms. TBI is a major cause of death, accounting for 60,611 deaths (24.6% of all injury-related deaths) in 2019.[11] Of the 60,611 deaths, 25,500 (42.1%) were by a firearm, 18,394 (30.3%) were due to unintentional falls, and 10,067 (16.6%) were due to unintentional motor vehicle crashes.[10] More than four in every five of TBI firearm deaths were associated with suicides.[11]

Most TBI are non-fatal. CDC estimates from 2015 and 2017 suggest that of the roughly 2.5 million individuals treated annually for injuries that include TBI as a primary or secondary diagnosis, roughly 90% are treated in the ED alone and the rest are discharged after an inpatient stay.[42][43] Unintentional falls and motor vehicle crashes account for essentially 75% of all TBI-related hospitalizations (49.0 and 24.4%, respectively).[43] TBI-related hospitalizations are disproportionately associated with male sex, even when adjusted for age (Supplemental Figure 5), and age >65 years (Supplemental Figure 6).[42] Data on disparities of hospitalization for TBI by race/ethnicity are limited. However, AI/AN persons have the highest age-adjusted TBI death rates (23.2 vs 18.7 for White, 16.6 for Black, 8.0 for Asian/Pacific Islander and 9.8 for Hispanic persons; all per 100,000).[10] Racial and ethnic minorities are also reported to have poorer psychosocial, functional, and employment-related outcomes after a TBI compared to non-Hispanic White persons.[44] CDC also notes that persons experiencing homelessness are two to four-times as likely to have a history of any TBI and 10-times more likely to have history of moderate or severe TBI.[44]
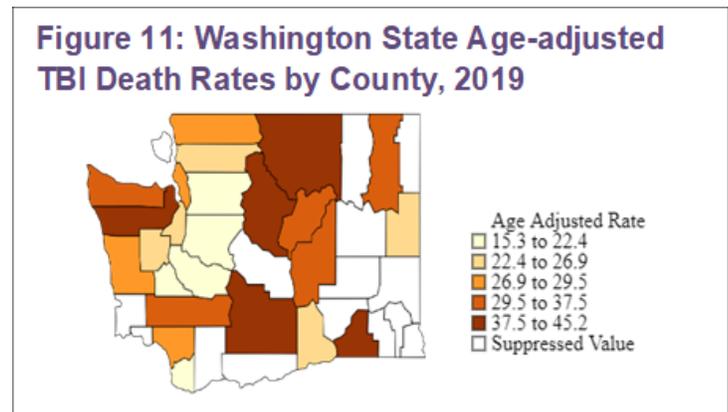

Figure 10: Mechanisms of TBI Related Death and Hospitalization in WA
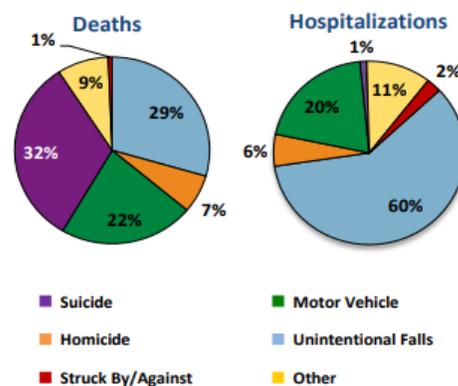
From Washington State Special Emphasis Report: Traumatic Brain Injury 2015.

WA State. The most recent data available from WA is from 2015 and shows that of the 6,262 TBIs admitted to a hospital system over the year, 1,527 (24.3%) were fatal.[45] These numbers, however, do not include the cases where the injuries were treated outside of hospitals or were not brought to hospitals. The leading causes of reported TBI varied by the severity of injury (Figure 10). As at the national

level, males and older adults, especially those ≥75, were disproportionately affected.[45] TBI hospitalization rates were not readily available on publicly accessible data sources, but TBI mortality was greatest among Indigenous persons (32.9 per 100,000), followed by non-Hispanic White (20.7 per 100,000) persons and more common in rural counties (Figure 11).[10]

Figure 11: Washington State Age-adjusted TBI Death Rates by County, 2019

Age Adjusted Rate
☐ 15.3 to 22.4
☐ 22.4 to 26.9
☐ 26.9 to 29.5
☐ 29.5 to 37.5
☐ 37.5 to 45.2
☐ Suppressed Value

Seattle/King County. TBI was not examined in the King County Community Health Needs Assessment for years 2021/2022.[15] However, 330 TBI-related deaths were reported in King County in 2019 (crude death rate, 15.3 per 100,000 persons).[10]

Concussion and Return-to-Learn (RTL). A recent assessment of national data estimates that 1.1-1.9 million concussion occur annually in the US in persons aged 18 years or younger.[46] King County data from 2011 estimates TBI incidence among youth as 304 per 100,000, with 97% being concussion.[47] While most (approximately 70%) concussions resolve within 4 weeks, physical, emotional, and cognitive symptoms during this time are not uncommon,[48][49][50] but 44 to 77% of school districts nationally do not have a formal RTL protocol to enable individual symptom-based accommodations.[51] A survey of 144 schools in WA State revealed that only eight (17%) of the school districts had any form of RTL guidance.[52] The array of unmet needs for successful RTL protocols included lack of policies around RTL, barriers to implementing accommodations, variation of communication patterns, and differing recommendations among stakeholders. In 2020, WA State passed legislation requiring K-12 schools to report concussion, but this has not been operationalized.

COVID-19 Impact. Reports of TBI incidence and outcomes in 2020 have not been made available. However, the COVID-19 pandemic and the concurrent lockdowns may cause a decrease in the incidence of lethal and non-lethal TBI due to fewer group sports activities and less vehicular travel during the lockdown.[53] The HIPRC Trauma Transfusion Research Interest Group is examining these issues in progress

but is limited by being single-center and having the same data quality problems associated with subgroup classifications and missing data seen in other aspects of this type of research. Given the hybrid approach to education during the pandemic, schools are not fully able to provide academic accommodations in the same way as they were before.

Summary. TBI dominates overall trauma incidence, outcomes, and mortality in the US at all ages, and what data are available suggest significant disparities among historically marginalized groups. Systems specifically designed to capture, monitor, and report on the range of TBI with relevant specificity are lacking at all levels and urgently need to be developed to understand the true public health impact of lethal and non-lethal TBI and the differential effects in subgroup populations and communities most affected by TBI from injury and violence.

Section B. The Hidden Burden of Injury and Inequality: Examples of How Gaps and Weaknesses in State and Local Data Collection Systems Can Hide or Obscure Assessments of the Risk for Injury and Violence, Worsening Inequality.

Here, we use a combination of currently used and community preferred data collection language.
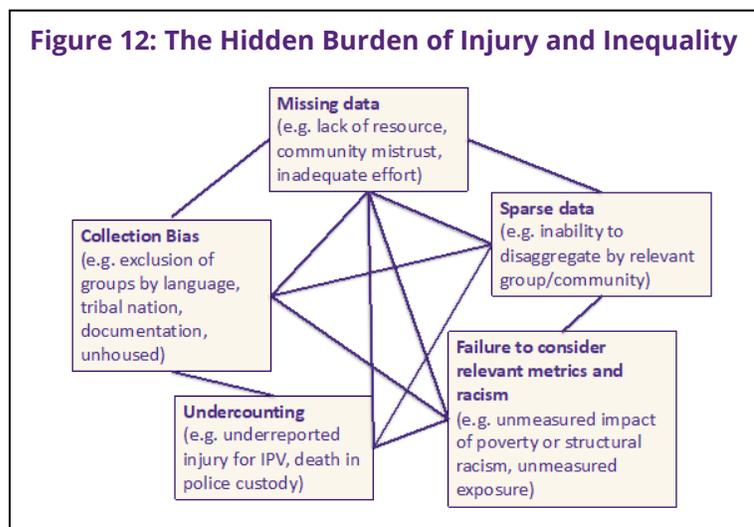
Sometimes, data that are ***not*** present are more suggestive than data which ***are*** present. This means that injury and violence remain unseen and unmeasured.

On the surface, the lack of useful data capture on fundamental injury and violence prevention might be surprising in the era of "big data", artificial intelligence and connectedness, but missing or suppressed data related to injury and violence prevention remains a significant problem (Figure 12). [54]

Sparse data and failure to collect relevant social variables. Our existing trauma registries collect data on injuries, injury care, and patient characteristics and contribute to the national trauma databank and the Trauma Quality Improvement Program of the American College of Surgeons. However, there are significant limitations. While the development and refinement of local and national trauma registries over the last 40 years have standardized data collection on the demographics and circumstances of injury, injury care, and outcomes, data are not collected on equity-related factors beyond race/ethnic identification, such as primary language spoken or income or on longer-term outcomes after hospital discharge. Systematically accounting for care factors and outcomes by health-equity measures is a critical step towards developing system-level interventions to alleviate health disparities. Including equity measures and longer-term tracking is important because injuries disproportionately impact Black, Indigenous, and

Figure 12: The Hidden Burden of Injury and Inequality

Missing data (e.g. lack of resource, community mistrust, inadequate effort)

Collection Bias (e.g. exclusion of groups by language, tribal nation, documentation, unhoused)

Sparse data (e.g. inability to disaggregate by relevant group/community)

Failure to consider relevant metrics and racism (e.g. unmeasured impact of poverty or structural racism, unmeasured exposure)

Undercounting (e.g. underreported injury for IPV, death in police custody)

persons of color, those with limited means and limited English proficiency, those who are geographically isolated, and those with alternative gender identity. These gaps and the lack of attention to community voices lead to missed opportunities to develop tailored and culturally resonant prevention interventions to address injury and violence related health inequities.

- <u>Lack of trauma registry data collection on sexual orientation and gender identity.</u> Developing systematic and patient-centered data collection processes and variables is an important aspect of improving health equity in our trauma systems.[55] [56] In 2020, and in collaboration with partners at Harborview Medical Center, HIPRC launched a study to understand patient perspectives on data collection for sexual orientation and gender identity in the trauma context. As part of this work, we first engaged with the trans/non-binary community who reached out to their networks (organizations and informal networks) to provide experiences and preferences for discussion or discussion of gender identity in the trauma care context. Results will be shared with Harborview Medical Center for direct application and utilized to inform a larger study for implementation more broadly. This work will provide direction to data collection systems on sexual orientation and gender identify so that injury and violence risk are accurately assessed, and tailored interventions may be developed.

- <u>Barriers to the inclusion of equity data elements in trauma registries.</u> The barriers to inclusion of data elements are not reported or well understood by organizations that oversee injury and violence data collection. During 2020-2021, we assessed perspectives of stakeholders, Emergency Department (ED) registration and Trauma Registry staff by conducting a Delphi process with experts at Harborview Medical Center (Level 1 adult and pediatric trauma center for the Pacific Northwest). Topics included process,
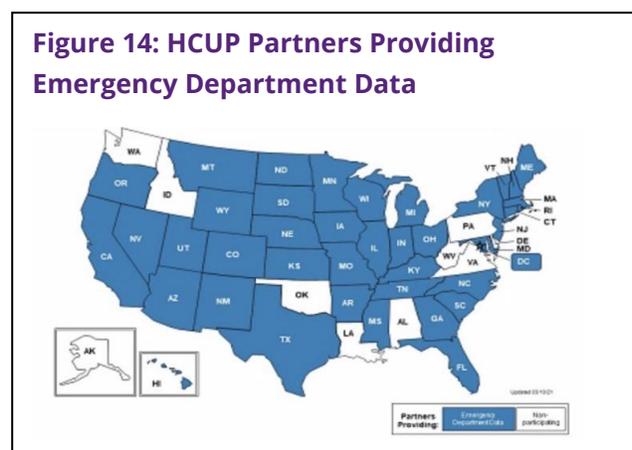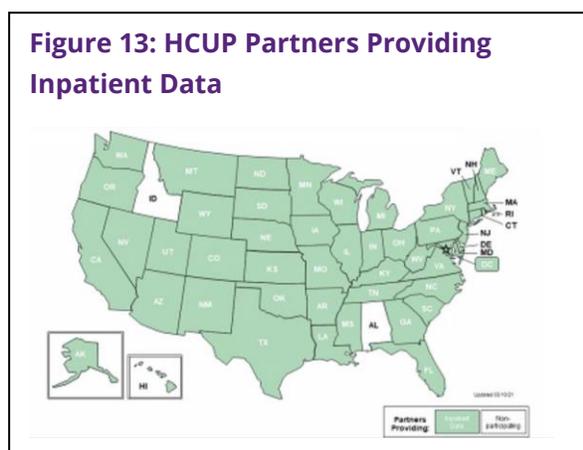
barriers/facilitators for equity-related data collection, electronic health record (EHR) entry, and trauma registry abstraction, and illuminating how limitations in existing technologies may be overcome.

- o Reported barriers were overall staff investment in changes, emergency department staff experiences with patients reacting suspiciously and misunderstanding data collection purposes, lack of discrete fields for Trauma Registry data extractors, and lack of national standardization of elements.
- o Reported facilitators were simplicity, quality improvement checks, stakeholder investment in the importance of modifying existing technology to collect equity elements, auto populated and designated electronic health record fields, cultural resonance training, scripts to explain equity data collection, and allowing patients to self-report sensitive items using technology.

Missing data on injury and violence in the Pacific Northwest

Missing data on injury-related hospitalization and emergency care.

In the Pacific Northwest, Idaho is one of only two states which fully lacks systematic data on hospital discharges (Figure 13).[57] A 2014 resolution which outlined plans to investigate the creation of such a system was never implemented. The lack of systematic data on emergency care and hospitalization has hindered planning

Figure 13: HCUP Partners Providing Inpatient Data

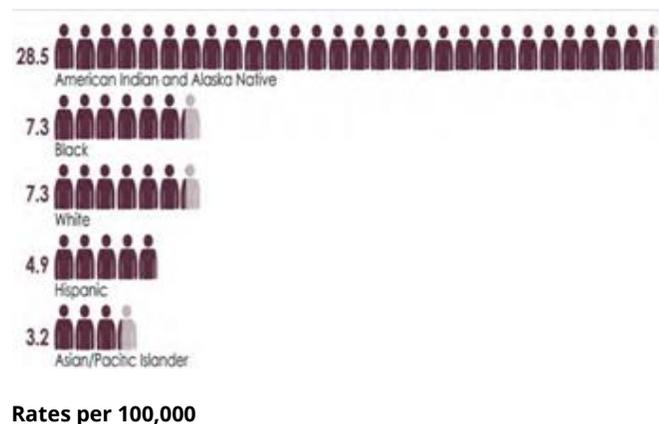**Figure 14: HCUP Partners Providing Emergency Department Data**

ranging from estimating cost savings for primary enforcement seat belt legislation to planning for health care impact and anticipation of demands and costs

associated with the COVID-19pandemic (personal communication Ebel, 2008). Alaska, WA State, and Idaho do not contribute data to the Nationwide Emergency Department Sample (Figure 14).[58]

Some areas of violence and injury, particularly that involving firearms, remain significantly understudied due to national policies blocking access to data and funding (See also Section A). In our trauma catchment area, as noted in Part A of this report, Alaska has the highest firearm death rate in the nation. Limited funding for research is compounded by barriers to accessing what little data is available, which in turn is limited by heterogeneity. Basic public health questions such as comparing the health outcomes after gun purchase, have been limited by the fact that data on firearm purchases are unavailable. [59]

Data loss and Indigenous communities. Washington State has 29 federally recognized tribes; each is a sovereign government. Through the Centennial Accord, the state of WA State and Indigenous communities formally work together on a government-to-government basis to address common problems, including prevention of injury and violence. For example, tribal members work

Figure 15: Traffic Fatality Rate by Race/Ethnicity, WA, 2008-2017

28.5 — American Indian and Alaska Native
7.3 — Black
7.3 — White
4.9 — Hispanic
3.2 — Asian/Pacific Islander

Rates per 100,000

as partners with the Washington Traffic Safety Commission (WTSC), aligned with the Target Zero mission to eliminate serious injury and death from traffic. However, under-reporting and non-reporting result in significant estimate gaps. What data do exist point to enormous disparities in the rate of traffic deaths assessed by race/ethnicity (Figure 15).[60] Using race variables extracted from death certificates between 2008–2017, the traffic fatality rate was 28.5 per 100,000 among AI/AN persons, a rate almost four times higher than the rate for the next highest race/ethnic group for whom data were available. Data on non-fatal road injury for Indigenous communities are not collected at all since race/ethnicity data are only coded on death certificates. Even for fatal injuries, there is significant

underreporting. The WTSC notes: "WSDOT, in partnership with BIA, used U.S. Census data to include reservation boundaries in its data collection and reporting program. Of the 89 AIAN crash deaths from 2015–2017, 44 (49%) occurred on reservations. Target Zero partners suspect that this number is underreported due to gaps in data sharing between WA State and Indigenous communities. Additionally, several tribal representatives have shared those fatalities and serious injuries occurring on their reservations in the recent past exceeded what has been reported to the state." [60]

Epidemiologic evidence can hint at where data are likely to be missing. In an examination of death certificate data in WA, pedestrian fatality rates are six times higher for Indigenous vs. non-Indigenous individuals. Though some—but not all—tribal reservations are in rural areas, a high percentage of the residents walk, bicycle, and use other non- motorized transportation. However, geo-data linked to crash location on reservations, regardless of the race/ethnicity of those involved, suggest that pedestrian fatalities occurring on reservation lands comprised just 7.8% of statewide pedestrian fatalities. This apparent contradiction likely demonstrates significant underreporting of fatalities and serious injuries occurring on non-state roadways within reservations. Missing data from tribal communities belies the large and growing burden of pedestrian and bicyclist fatalities occurring on reservations, which increased by a staggering 360% between 2015-2017.[61] While more recent data show racial disparities in pedestrian hospitalization rates, disaggregated data for indigenous communities are not presented.

Bias introduced by data collection and presentation methods

<u>The limits of collecting patient histories only in English.</u> Conservative estimates indicate that 13.3% of Washington's population is foreign born, 18.8% speak a language other than English at home, and at least 8% report having limited English proficiency.[62] Significant disparities in health outcomes are well documented for persons with limited English proficiency, stemming from poor access to care and a variety of other social determinants of health.[55][56][62] Despite these known disparities, obtaining accurate data on interpreter services available in healthcare settings and provider practices in using interpreters to take patient histories is difficult. Less obvious but equally important, the information thus collected is fed into well-established protocols serving the tiered system of trauma center, state, and national trauma registries on which the National Trauma Databank and the Trauma Quality Improvement Program of the American College of Surgeons are based.[63] One of the major limitations of these systems is that they do not collect information on equity-related factors beyond race, such as primary language spoken.

<u>The problem of language access in trauma care.</u> In on-going collaboration (2019-2021) with the Washington State Coalition for Language Access, HIPRC members formed the Language Access Research for Community Health Coalition aimed at addressing language access disparities. The group has conducted and presented research at the local and national level and continues to work together to identify community needs and inform language access policy. Hospital websites are an important resource for patients with limited English proficiency seeking information about a facility's language assistance services. We sought to identify the types of such services described on hospital websites in a diverse state and compare them by hospital characteristics.[64] We found that of 93 hospitals, 10.8% provided translated websites. Interpreter services were mentioned on 81.7% of websites; access required navigation through 1-4 English webpages. Larger bed-size, higher revenue, and more admissions were positively associated with providing language services information (p<0.01), whereas county-level population of those with limited English proficiency was not (p=0.17).

Many hospital websites are not translated or lack easily accessible information about language assistance services and consequently may not be a useful resource to patients with limited English proficiency requiring assistance with access to care, discharge instructions, or follow up appointments.

Challenges with current taxonomy. Narratives matter and during preparation of this report, we found ourselves using terms that are outdated and not endorsed by Community. This was particularly problematic in Section A, where we summarized existing data and identified equity gaps. For example, existing data collection systems refer to Indigenous persons as American Indian or Alaska Native. Existing data sources and databases do not use community preferred language to characterize communities and conditions. Use of existing language to describe communities perpetuates biases and contributes to inequality. This work is evolving, and data collection systems must adapt to meet these community needs.[65][66] This section is included to provide a deep narrative to help transform the way we collect injury and violence data so that we do not perpetuate inequities through data analysis, messages, stories and simple narration.

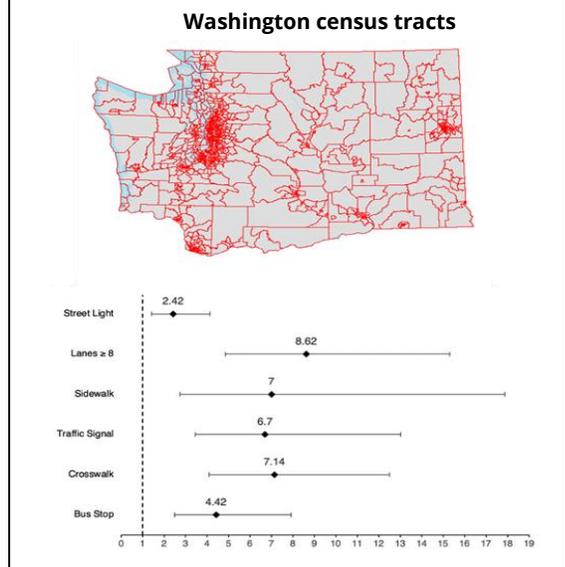# Failure to consider racism and relevant metrics

Hardscape barriers to safe and active transportation. WA State experienced an increase in overall traffic injury 2015-2017 vs 2012-2014, with a 23% increase in traffic fatalities.[67] According to the Pedestrian Safety Advisory Council of WA State, pedestrian injury is not only concentrated near urban areas but specifically closer to intersections.[68] A 2021 report by Smart Growth America examining data regarding fatal crashes involving pedestrians from 2010-2019 found empirical evidence that persons in low-income communities were disproportionately represented in the statistics, even after controlling for differences in population size and walking rates.[69] The fatality rate in the lowest income neighborhoods was nearly twice that of middle-income census tracts and almost three times that of higher-come neighborhoods.

High school students participated in the 2020 and 2021 HIPRC summer program. They performed a statewide assessment using Google-Street View and WA state census tracts and matched 300 cases with 300 controls by census tract and road size, using geographical Information Software (GIS). Case intersections were defined as those where a pedestrian was severely injured or killed; control intersections were randomly selected within the same census tract. Locations focused on intersections only.

The students observed that of the 430 locations studied (mostly King County), 31% of all intersections had no crosswalk, and 21% of all pedestrian injuries occurred at a stop sign with no crosswalk. As shown in Figure 16, street features are associated with pedestrian injuries, and implementing crosswalks alone are NOT sufficient to keep pedestrians safe when crossing intersections. Intersection size and presence of sidewalks have the strongest risk association. Street safety features do not work perfectly. The 2021 high school student cohort recommended an *equity-based approach* and consideration of:

Figure 16: Street Features and Crude Odds of Pedestrian Injury

- Validated pedestrian hybrid beacons, which are traffic control devices that consist of two red lenses above a single yellow lens that help pedestrians in crossing a street at locations; [70]
- High visibility signalized crosswalks, reported to facilitate an increase in safe street crossings and calm traffic volume and speed in underserved neighborhoods; [71]
- Building raised crosswalks, previously reported to reduce pedestrian crashes by 45%, and increasing yielding to pedestrians crossing from approximately 10% before installation of the project to 55% after installation. Raised crosswalks slow traffic, enhance crosswalk visibility, and make the crossing easier for pedestrians who may have difficulty stepping up and down curbs. [72][73]

Mobility justice requires addressing social barriers to active transportation that vary by experiences of racism. We partnered with researchers who engaged youth of color and community leaders from the Beacon Hill community of South Seattle to understand safe and active transportation needs in the context of Seattle's plan to build an urban trail in South Beacon Hill. These youth highlighted that barriers to safe transportation include not only built environment factors we already study (lighting, curb cuts, unmaintained vacant lots), but also social and environmental factors we have not historically examined but need to incorporate going forward.[74] Significant concerns reported were police harassment and lack of resources to help when someone else is experiencing a mental health crisis because police harassment concerns preclude asking public safety for help. In focus groups, community leaders highlighted the importance of collecting input from diverse stakeholders foster a sense of community in mobility, such that built environment changes such as COVID safe streets be implemented with a mobility justice framework [75].

Figure 17

To Address Health Inequities, Black Folks Need the Right to Move without Harm

By Barbara Baquero , Kate Hoerster , and KL Shannon · June 4, 2020

Share

Douglas Pullen pictured with his mask, out for a walk in his Seattle neighborhood. His story and

Absence of sidewalks and pedestrian infrastructure are associated with historically racist policies and increased risk of injury for vulnerable road users. In King County and Seattle, pedestrian and bicyclists now represent over half of the fatal traffic injuries. Walking and use of public transportation is increasingly common, and critical as an equalizing measure for families who must live outside of the main economic zones to have affordable shelter. Some of the highest risk areas for injury are those in Central, South and West Seattle; areas which historically housed families of color. This was not by accident but reflected racist policies and practices such as practices of "redlining," shown in Figure 18, which also limited home ownership, suppressed home values, eroded family savings and the intergenerational transmission of wealth for families of color.

In Seattle, persons of color had difficulty finding housing outside of the Central District and the International District; both were redlined areas. Many families were eventually forced to relocate further and further North and South from the Seattle city center, a migration which has been exacerbated in recent years by skyrocketing

Figure 18: Redlining and Racially Restrictive Covenants

- Redlining "risk" areas
  - Green "best"
  - Blue "still desirable"
  - Red "hazardous"
- Racially restrictive covenants
  - Light green

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property prices and housing costs. The map above indicates areas where sidewalk investment occurred; notice that neighborhoods north and south of Seattle, as well as in areas where redlining occurred, have fewer sidewalks which might make walking safer (Figures 18,19).

Figure 19: Where the Sidewalks End in Seattle

Alternatives to School Resource Officers to Prevent the School-to-Prison Pipeline in King County Public High Schools. In 2020, HIPRC and King County began conversations to understand how to decrease violence in public schools. As part of this discussion, in 2021, King County asked HIPRC to evaluate the national landscape of school resource officer utilization, including examination of available data to evaluate model effectiveness. We have learned that the national landscape on school resource officers varies. Funds flow, roles and responsibilities, and trainings of school resource officers is highly variable across WA state. Unfortunately, accurate data on behavioral health needs, violence, firearm possession in schools, and arrest types are not easily available from schools or enforcement. For King County to decide on alternatives to school resource officers in public high schools, data on safety, finances, and equity measures will need to be examined, and community and student voices need to be heard to ensure community well-being.

Section C. Implications and next steps for strengthening consideration of health equity in injury and violence prevention research, training and outreach.

Here, we use community preferred language.

Twenty-six years ago, HIPRC was founded as a collaborative effort to partner rigorous science with expertise in public health and community, an emphasis on addressing real-world problems, and a commitment to train the next generation of research scientists. These roots have nurtured the development of our research focus to achieve injury-related health equity across the life span, which is the guiding arc for the work we undertake as an ICRC. This section describes five steps that are needed to understand and address the gaps and shortfalls outlined prior sections with a view to inform research with a particular focus on and partnership with communities whose members have historically borne the heaviest burden of injury and violence. Our commitment to working in the real world in partnership is reflected in the HIPRC mission statement:

Together, we have the power to prevent harm and suffering from injury and violence.

Improvements to injury data collection and analysis are needed. Strategies include incorporation of validated self-reported measures of race, gender and ethnicity, addressing artificial barriers to inclusion of different language communities, and explicit inclusion and measurement of structural racism.

We must develop and implement approaches for measuring and addressing structural racism. Existing data sets on injury may include data on race, ethnicity or poverty, all of which are utilized to identify racial disparities in health and outcomes. Nevertheless, injury morbidity and mortality does not grow from biology, but rather the conditions in which families and individuals live, work and grow. Recently, more attention has been paid to more fundamental concepts such as structural racism as an explanation for racial disparities in injury outcomes, as discussed in the example of historical redlining, lack of pedestrian infrastructure, and high pedestrian injury rates above. New approaches to measure and integrate

structural racism using indicators which measure infrastructure, housing, health care, education, employment, and criminal justice are being developed.

Community partnerships are at the heart of defining and informing the research agenda, ensuring that work addresses identified community needs. Few data collection efforts have been undertaken with input and partnership from communities. As this report has discussed, and as the burgeoning inequalities which have become more glaring during the COVID pandemic indicate, community involvement is the critical element. Listening to and partnering with the community will improve the quality of injury

data, and most importantly, will ensure that research efforts are pointed towards interventions which are both needed and welcomed. This is hard work, and it isn't easy, particularly in a climate of growing mistrust. Yet it is also likely to be more sustainable and ultimately more effective. Research and evaluation are a critical part of this effort because communities cannot afford to invest effort in wasteful or ineffective efforts.

The research agenda, educational mission and administrative structure should be motivated to actions which prevent, treat, or rehabilitate injury, and must work towards the elimination of injury inequality. Most community needs assessments focus on what data are available; an innovation in this report is to highlight areas in which critical data is missing or lacks fidelity to address inequalities. These gaps are also an opportunity for meaningful research. We are committed to ensuring that research proposals include diverse participants, community involvement, analyses to understand and address inequality, and dissemination strategies to share results with partners who can put them to work. Most state and regional data is collected by large state agencies; there are opportunities to partner with the Departments of Health, Boards of Health, Public Health Officials, Governor's Highway Traffic Safety Offices, Trauma Registries, Departments of Licensing, Transportation and others to improve the collection and presentation of data to quantify and identify injury and violence disparities. With this work, and the partnerships it engenders, there are opportunities to tailor programming, investment and interventions to meet needs, prevent injury and counter inequality. Teaching the next generation of researchers about opportunities to contribute to policy is another critical step, and one that is also being demanded by the next generation of injury researchers.

Targeted communication strategies are needed to reach communities that are most affected by injury and violence. Earlier this year, HIPRC shared our approach towards broadening communication and outreach strategies with other ICRCs. It prompted a humbling but productive discussion. For example, most centers do not have media capacity in languages other than English, though all have the capacity to translate pamphlets or fliers, which are generally not that effective in any case. This limits more meaningful communication and dissemination through television (e.g., Univision, Telemundo), radio, and increasingly, through dedicated social media channels. There are also opportunities to work with longstanding community groups who already do this well, such as the diverse Boards of Health in King County. No ICRC center, HIPRC included, nor our colleagues, currently have access to metrics to assess and measure media impact in diverse communities. These are critical gaps and areas for improvement. As we address these gaps, the impact of each research project will be better tailored to underserved communities, and the impact of groundbreaking research will be multiplied.

Report Conclusion

HIPRC's injury and violence prevention work is grounded in an enduring commitment to equity and anti-racism(https://hiprc.org/about/iheal/). This commitment requires that we be guided by the lived experience of those communities most harmed by structural racism, who know best what needs to change, and yet who are often furthest from power to effectuate the necessary changes to the status quo.

The impact of injury and violence remains heavy and has been further exacerbated by the isolation and inequalities ushered in by the COVID-19 pandemic and response. To complement how the needs assessments inform this report, we incorporate the HIPRC charge, which has been encouraged by the HIPRC Community Advisory Board to direct the focus our analysis to marginalized persons and communities to guide actions.

There is currently no coordinated, standardized pro-equity approach to injury and violence-related data collection at local, statewide, regional or national levels. This lack of a standardized pro-equity approach weakens our ability to hold ourselves and each other accountable for making progress in tackling the inequities in the status quo, and, if unaddressed, makes us complicit in allowing perpetuation of structural racism and other forms of structural bias and marginalization.

Improvements to injury data collection and analysis are urgently needed. Strategies include incorporation of validated self-reported measures of race, gender and ethnicity, addressing artificial barriers to inclusion of different language communities, and explicit inclusion and measurement of structural racism. Community partnerships are at the heart of defining and informing the research agenda, ensuring that work addresses identified community needs. The research agenda should be motivated to actions which prevent, treat, or rehabilitate injury, and must work towards the elimination of injury and violence inequality. Engagement with research to inform and shape policies which impact injury and health equity, and targeted communication strategies are needed to reach underserved communities.

Our Path Forward

The HIPRC commits to the adoption and implementation of mechanisms to ensure that approaches to changes in injury and violence-related data collection are community-led, and accountable to those communities most harmed by structural racism, and that those partnerships have significant representation as our partners. We also acknowledge that the harms of racism are often compounded by other forms of structural bias and marginalization. Taking responsibility for necessary transformative pro-equity changes in existing injury and violence data collection methods will require the setting of standardized, universal goals that intentionally and expressly target those communities that have historically been marginalized in the collection of injury and violence-related data, [76] what Professor John A. Powell, of the UC Berkeley Law School's "Othering & Belonging Institute", has termed "targeted universalism".[2] We commit to the following four high priority actions in injury and violence prevention, as we approach 2022:

- Applying an express, embedded race equity template and analysis to the redesign and decision making about changes to injury and violence-related data collection.
- Directly understanding the needs and priorities of our communities most affected by injury and violence.
- Developing protocols that ensure that the lenses and analyses applied to the data are customized to recognize the unique historic and demographic attributes of each community in ways that are resonant and accountable to those communities most affected by inequity in the status quo.
- Sharing this report and our commitment with partners who also strive to reduce injury and violence in our communities.

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We acknowledge the legacy of indigenous genocide and African slavery
that have shaped many of the disparities we document here.
This work is dedicated to the struggle against these same forces.

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Supplementary Material

A. Influence of the Injury and Health Equity Across the Lifespan (iHeal) Initiative at HIPRC.

Health equity has been referred to as the forgotten aim of the Institute of Medicine's influential report on the new healthcare system of the 21st century.[75] Our work to ground HIPRC efforts in research, training and outreach in health equity uniquely leverages existing partnerships and builds new coalitions to create a national agenda for health equity in injury and violence research, training and outreach toward measurable, large-scale, and sustained impact. As a result, our work focuses on injury prevention, violence prevention and intervention, improving communication, care transitions, community capacity building, and culturally relevant engagement for our most marginalized patient populations who experience disproportionate rates of injury and violence, and multiple socioeconomic barriers to health and recovery after injury and violence. The iHeal initiative shapes HIPRC's center-wide focus on health equity, which is guided by the HIPRC CAB. Below are select examples of how iHeal initiatives promote equity across all HIPRC administrative, research, education and training, and outreach activities, involving HIPRC staff and faculty and trainees:

Supplemental Table A: Influence of iHeal initiatives at HIPRC	
2017	Inaugural iHeal symposium to identify next steps for addressing disparities in injury and violence.
2018	Adaptation of National Academy of Sciences social determinants of health model for injury and violence prevention (Figure 1).
2018	Formation of the Language Access Research for Community Health (LARCH) Coalition aimed at addressing language access disparities.
2019	Awarded National Institutes of Minority Health and Health Disparities (NIMHHDR21MD013486 and 3R21MD013486-01S1) to address critical gaps in our current trauma data collection systems that prohibit identification of successful and large-scale prevention and intervention targets to address injury disparities, to improve recruitment of diverse patients into trauma research; to develop and test the feasibility of a culturally sensitive data collection instrument and process that can be included in the existing trauma registry systems to capture health equity measures and longer-term outcomes.
2019	Identification of suicide prevention as the number 1 community problem in WA State. In response, we conducted a suicide prevention campaign. Conducted campaigns in Spanish, English and Vietnamese to support DOH efforts with COVID-19 containment, Stop the Bleed, TBI, Window falls. Development of a three-intervention firearm injury prevention toolkit. Training of Somali communities in Stop the Bleed for hemorrhage control.
2020	Introduction of works-in-progress norms, resulting in 33% of training sessions addressing health equity.
2021	Achieved implementation of a social justice framework for learner selection, increasing trainee diversity by 33%.

B. Supplemental Tables and Figures

Supplemental Table 1: Crude Death Rate by Suicide, National and State, 2019

| Demographics	USA	WA
Sex		
Male	23.1	26.2
Female	6.2	7.0
Race/Ethnicity		
White	18.8	19.7
Black	7.4	11.7
Indigenous	22.1	20.0
Asian/Pacific Islander	7.5	8.7
Hispanic	7.2	7.8
Age Group		
0 – 9 years	0.0	Suppressed
10 – 19 years	6.6	7.4
20 – 29 years	17.2	18.2
30 – 39 years	18.1	17.5
40 – 49 years	16.8	22.4
50 – 59 years	20.2	23.7
60 – 69 years	16.8	20.4
70 – 79 years	16.7	22.5
80+ years	19.4	25.1
Rurality		
Metro Area	13.7	16.3
Non-metro area	19.1	19.3

Supplemental Table 2: National Level Falls-related Death Rates by Race/Ethnicity and Age Group

Age group	All	White	Black	Hispanic	Indigenous	Asian/Pasifika
All ≥65 years	12.3	67.8	23.8	9.6	35.6	35.2
65-69 years	12.5	13.0	9.4	9.6	11.9	7.6
70-74 years	22.0	23.3	13.4	16.6	18.7	15.1
75-79 years	44.4	47.5	22.5	27.8	39.8	30.2
80-84 years	91.8	99.1	37.9	56.3	67.3	60.8
85 + years	265.1	287.4	87.0	143.8	147.0	148.3

Supplemental Table 3: Age-adjusted Opioid Death Rates by State, 2019

Location	Rate	Range	Deaths	Location	Rate	Range	Deaths
Nebraska	8.7	6.9 to 11.0	161	Illinois	21.9	21.1 to 57.0	2790
South Dakota	10.5	6.9 to 11.0	86	North Carolina	22.3	21.1 to 57.0	2266
Texas	10.8	6.9 to 11.0	3136	South Carolina	22.7	21.1 to 57.0	1127
North Dakota	11.4	11.1 to 13.5	82	Vermont	23.8	21.1 to 57.0	133
Iowa	11.5	11.1 to 13.5	352	Michigan	24.4	21.1 to 57.0	2385
Georgia	13.1	11.1 to 13.5	1408	Florida	25.5	21.1 to 57.0	5268
Arkansas	13.5	11.1 to 13.5	388	Indiana	26.6	21.1 to 57.0	1699
Mississippi	13.6	13.6 to 16.0	394	Arizona	26.8	21.1 to 57.0	1907
Oregon	14	13.6 to 16.0	615	Missouri	26.9	21.1 to 57.0	1583
Montana	14.1	13.6 to 16.0	143	Louisiana	28.3	21.1 to 57.0	1267
Wyoming	14.1	13.6 to 16.0	79	Rhode Island	29.5	21.1 to 57.0	307
Minnesota	14.2	13.6 to 16.0	792	Maine	29.9	21.1 to 57.0	371
Kansas	14.3	13.6 to 16.0	403	New Mexico	30.2	21.1 to 57.0	599
California	15	13.6 to 16.0	6198	Tennessee	31.2	21.1 to 57.0	2089
Idaho	15.1	13.6 to 16.0	265	New Jersey	31.7	21.1 to 57.0	2805
Washington	15.8	13.6 to 16.0	1259	New Hampshire	32	21.1 to 57.0	407
Hawaii	15.9	13.6 to 16.0	242	Massachusetts	32.1	21.1 to 57.0	2210
Alabama	16.3	16.1 to 18.5	768	Kentucky	32.5	21.1 to 57.0	1380
Oklahoma	16.7	16.1 to 18.5	645	Connecticut	34.7	21.1 to 57.0	1214
Alaska	17.8	16.1 to 18.5	132	Pennsylvania	35.6	21.1 to 57.0	4377
Colorado	18	16.1 to 18.5	1079	Maryland	38.2	21.1 to 57.0	2369
New York	18.2	16.1 to 18.5	3617	Ohio	38.3	21.1 to 57.0	4251
Virginia	18.3	16.1 to 18.5	1547	District of Columbia	43.2	21.1 to 57.0	311
Utah	18.9	18.6 to 21.0	571	Delaware	48	21.1 to 57.0	435
Nevada	20.1	18.6 to 21.0	647	West Virginia	52.8	21.1 to 57.0	870
Wisconsin	21.1	21.1 to 57.0	1201				

Supplemental Figure 1: Crude National Suicide Death Rate by Race and Age, US 2019
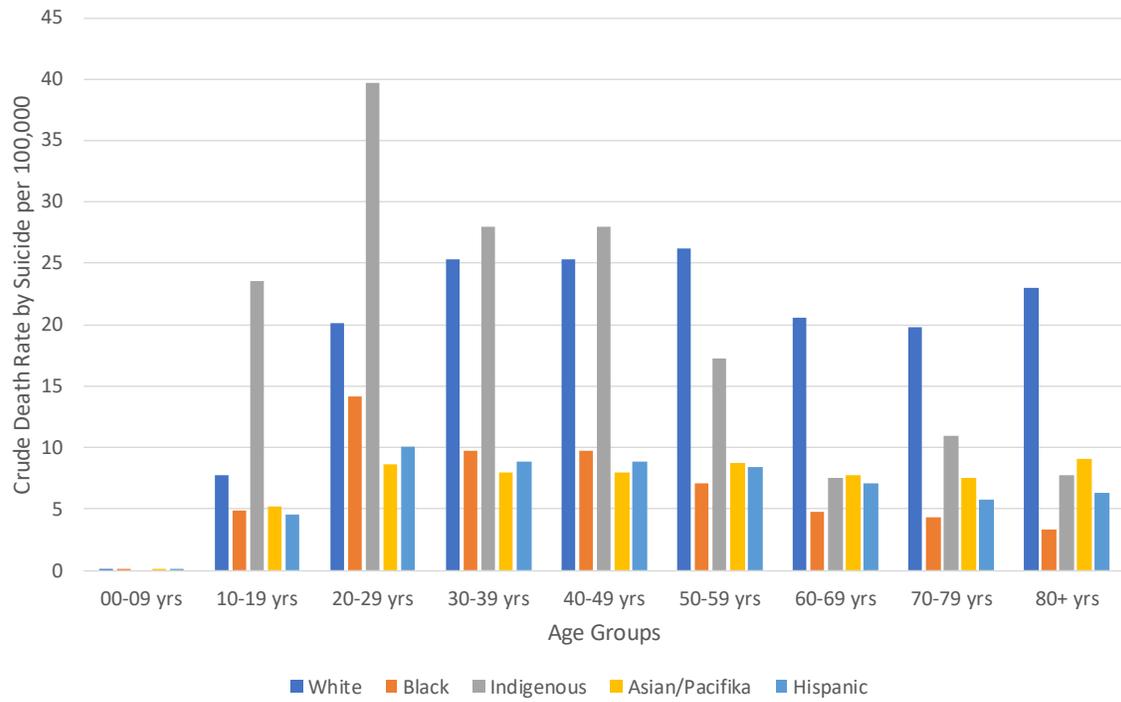
Supplemental Figure 2: Violence-related Death Rates by County, US 2008-2014

2008-2014, United States
Smoothed Age-adjusted Death Rates per 100,000 Population
Firearm, Violence-related, All Races, All Ethnicities, Both Sexes, All Ages
Annualized Age-adjusted Rate for United States: 9.97
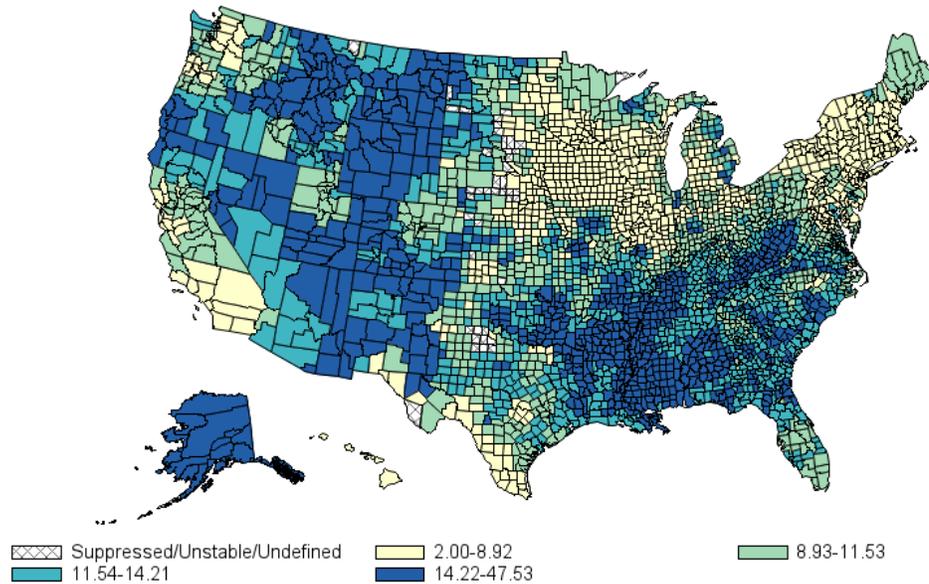
Legend:
- Suppressed/Unstable/Undefined
- 2.00-8.92
- 8.93-11.53
- 11.54-14.21
- 14.22-47.53

Reports for All Ages include those of unknown age.
* Rates based on 20 or fewer deaths may be unstable. These rates are suppressed for counties (see legend above); such rates in the title have an asterisk
The standard population for age-adjustment represents the year 2000, all races, both sexes.
Rates appearing in this map have been geospatially smoothed.

Produced by: the Statistics, Programming & Economics Branch, National Center for Injury Prevention & Control, CDC
Data Sources: NCHS National Vital Statistics System for numbers of deaths; US Census Bureau for population estimates.

Supplemental Figure 3: Falls-related Death Rate by County, US, 2008-2014

2008-2014, United States
Smoothed Death Rates per 100,000 Population
Fall, All Intents, All Races, All Ethnicities, Both Sexes, Ages 65-85+ Years
Annualized Crude Rate for United States: 55.15
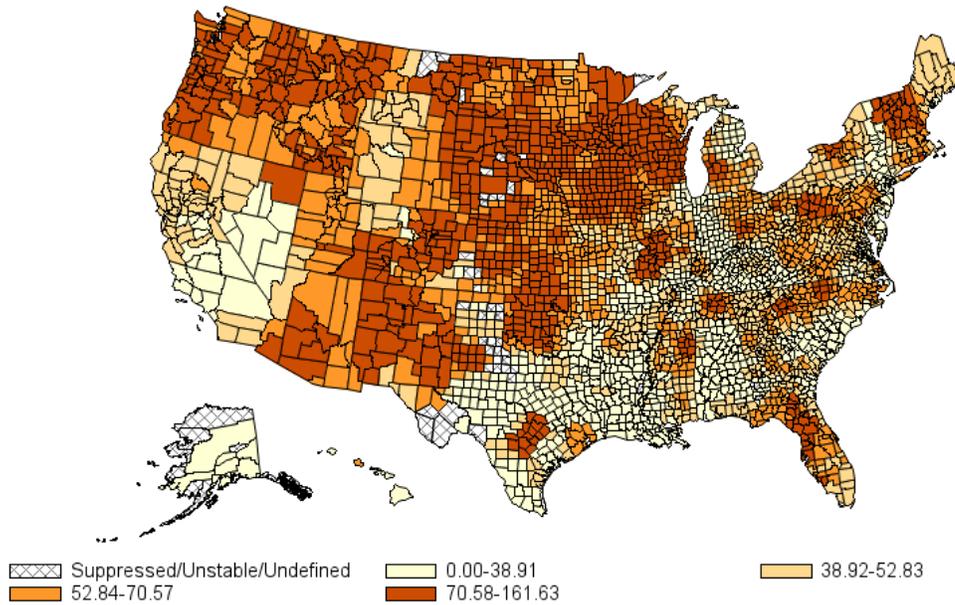
Legend:
- Suppressed/Unstable/Undefined
- 0.00-38.91
- 38.92-52.83
- 52.84-70.57
- 70.58-161.63

Reports for All Ages include those of unknown age.
* Rates based on 20 or fewer deaths may be unstable. These rates are suppressed for counties (see legend above); such rates in the title have an asterisk.

Rates appearing in this map have been geospatially smoothed.

Produced by: the Statistics, Programming & Economics Branch, National Center for Injury Prevention & Control, CDC
Data Sources: NCHS National Vital Statistics System for numbers of deaths; US Census Bureau for population estimates.

Supplemental Figure 4: Comparative Data on Falls-related Crude Death Rates, 2015-2019

US Crude death rates/10^5 by race/ethnicity 2015-2019

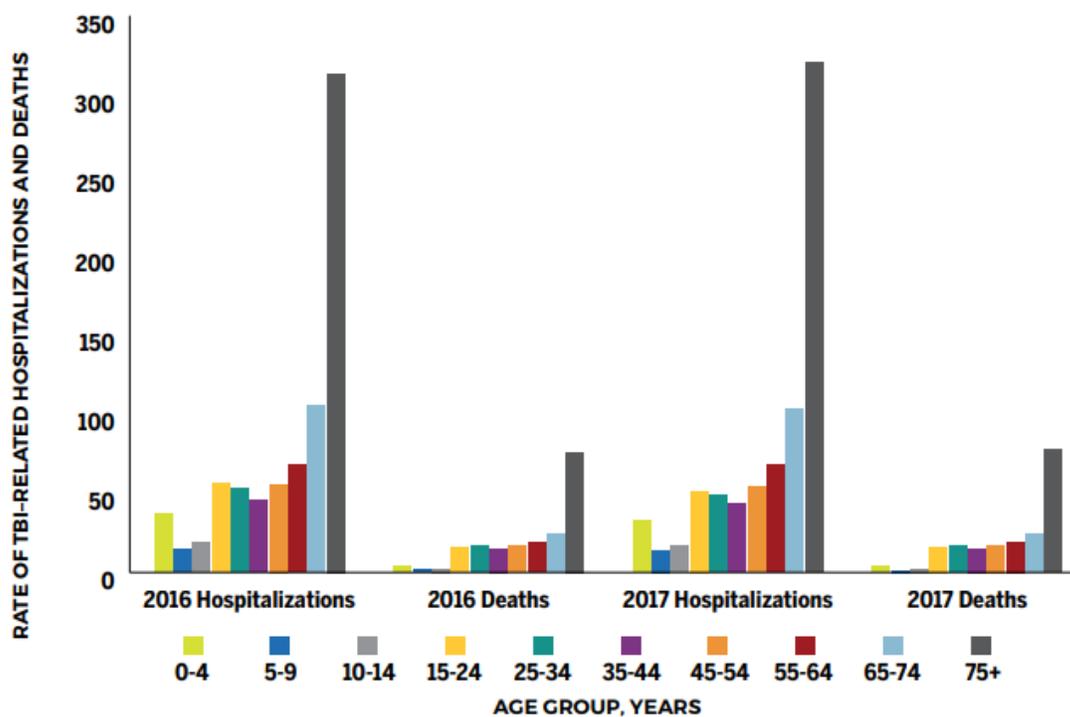WA state crude death rates/10^5 by race/ethnicity   2015-2019
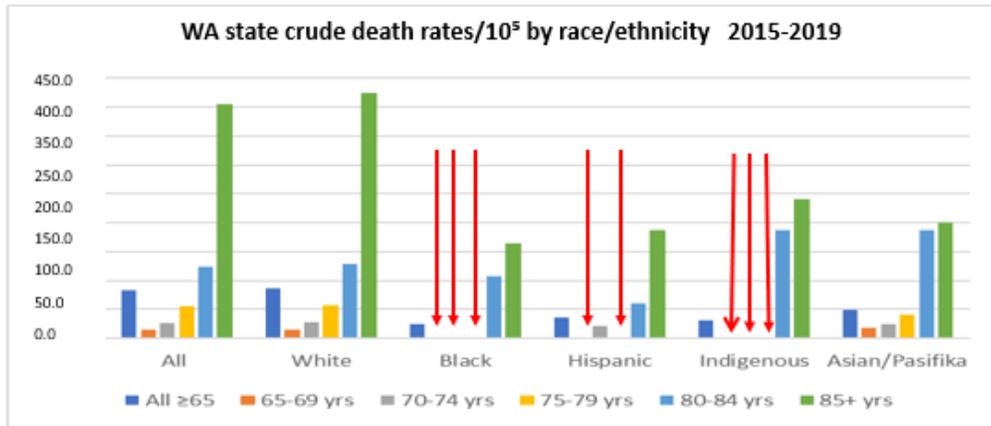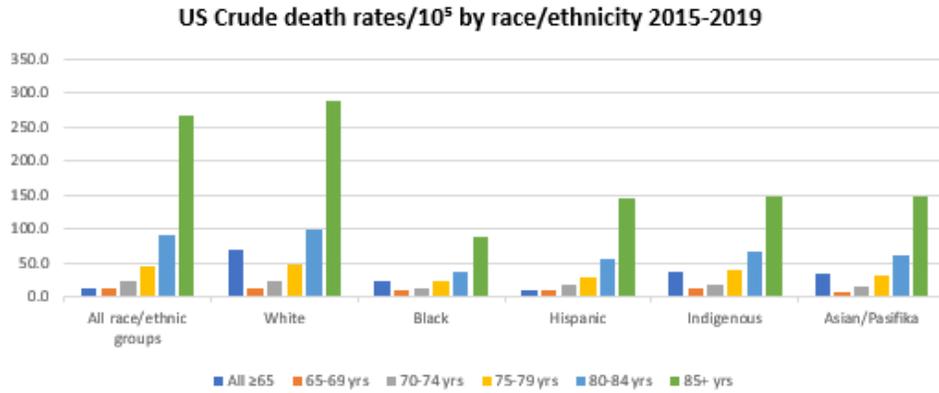
Supplemental Figure 5: National Level Data on Mechanism of TBI-related Hospitalizations, US, 2016-2017
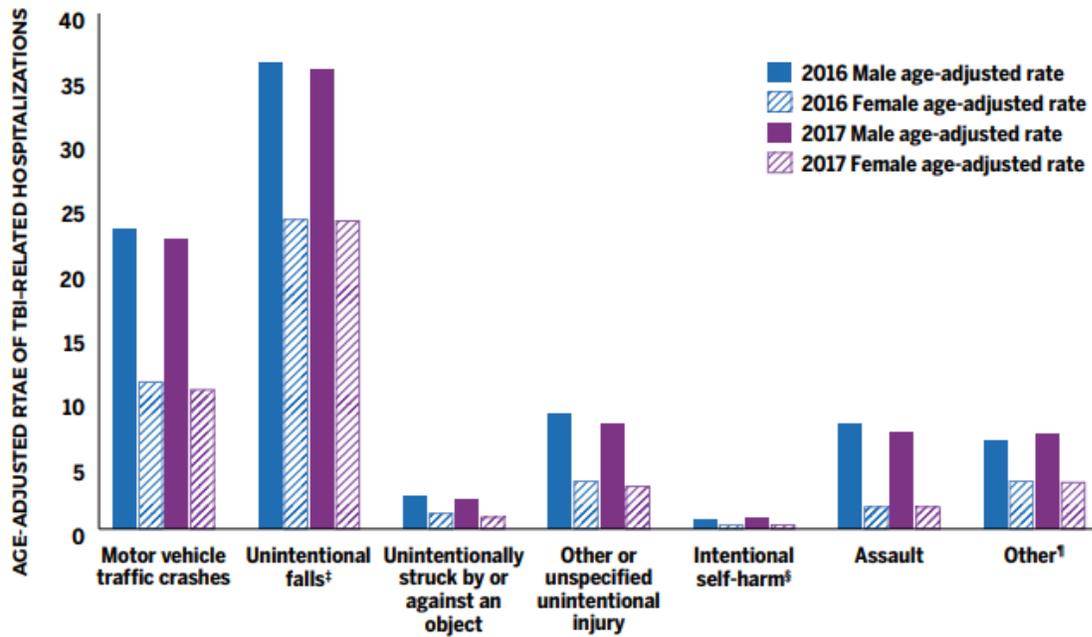
From CDC Report to Congress: Traumatic Brain Injury in the United States: Epidemiology and Rehabilitation (2015).

Supplemental Figure 6: National Level Data on TBI-related Hospitalizations and Deaths by Age Group, US, 2016-2017

From CDC Report to Congress: Traumatic Brain Injury in the United States: Epidemiology and Rehabilitation. (2015).