Executive Summary

The Center for Health Affairs, now WellLink, and Amazon Web Services (AWS) signed a three-year agreement in July 2022 to create and operate in Cleveland, Ohio, the first Social Determinants of Health Innovation Hub (***SDoH Hub***). This SDoH Hub is designed to help one person at a time and address population disparities such as housing, medical care, neighborhoods free of firearm violence, education, climate change, digital access, food, jobs, and transportation.

The SDoH Hub goals are the following:

Goal 1. WellLink and AWS will collaborate to create a secured data infrastructure where the data is owned and controlled by Cleveland organizations.

Goal 2. WellLink and AWS will convene stakeholders in Northeast Ohio (NEO) and globally from government, private sector, and the public sector to use the AWS data infrastructure created through SDoH Hub to address the root cause of poverty and disparities—structural racism. Using this framework, WellLink will use the AWS platform to solve disparities through insights supported by data.

Initially focused on firearm violence and behavioral health, the SDoH Hub used suicide data for 2017 - 2022 from the Cuyahoga County Medical Examiner. During this period, there were 1,006 suicides in the county. Of the total suicides, 535 were with firearms. Nearly 70% of the suicides among African Americans occurred with firearms and the rate is nearly 52 % for Whites.

One short-term solution to stopping firearm violence and suicide is to fund and implement a suicide prevention model with two parts. First, apply a collaborative model designed to coordinate behavioral health services across school settings, the juvenile justice system, and the mental health care provider community. Second, intensely focus on several zip codes in Cleveland where resources and programs are offered to support and prevent suicides among adolescents and young adults facing behavioral health crises.

Mid-term solutions to eliminate firearm violence focus on increasing access to services through greater availability of therapists who reflect the communities being served and increasing coverage and affordability to needed services. Long-term solutions will focus on programs and policies related to economic mobility such as unemployment, housing instability, and lack of transportation. Other disparities such as lack of digital access and food insecurities can be addressed; and public health priorities such as access to medical care, climate change, infant mortality, maternal morbidity and mortality, and lead poisoning.

Introduction

The Center for Health Affairs, now WellLink, and Amazon Web Services (AWS) signed a three-year agreement in July 2022 to create and operate in Cleveland, Ohio, the first Social Determinants of Health Innovation Hub (***SDoH Hub***). This SDoH Hub is designed to help one person at a time and address population disparities such as housing, medical care, neighborhoods free of firearm violence, education, climate change, digital access, food, jobs, and transportation.

The SDoH Hub is focused on solutions through research, analytics, and measurable outcomes—not more documentation of disparities. In this way, community residents, government, private sector, and nonprofits can develop actionable solutions such as the creation of jobs and making investments in neglected neighborhoods.

The SDoH Hub goals are the following:

Goal 1. WellLink and AWS will collaborate to create a secured data infrastructure where the data is owned and controlled by Cleveland organizations.

Goal 2. WellLink and AWS will convene stakeholders in Northeast Ohio (NEO) to use the data infrastructure created through SDoH Hub to address the root cause of poverty and disparities—structural racism.[1] These stakeholders will be organized into an Advisory Council (see Attachment 1) that advocates for the community good; and ensure transparency and accountability.

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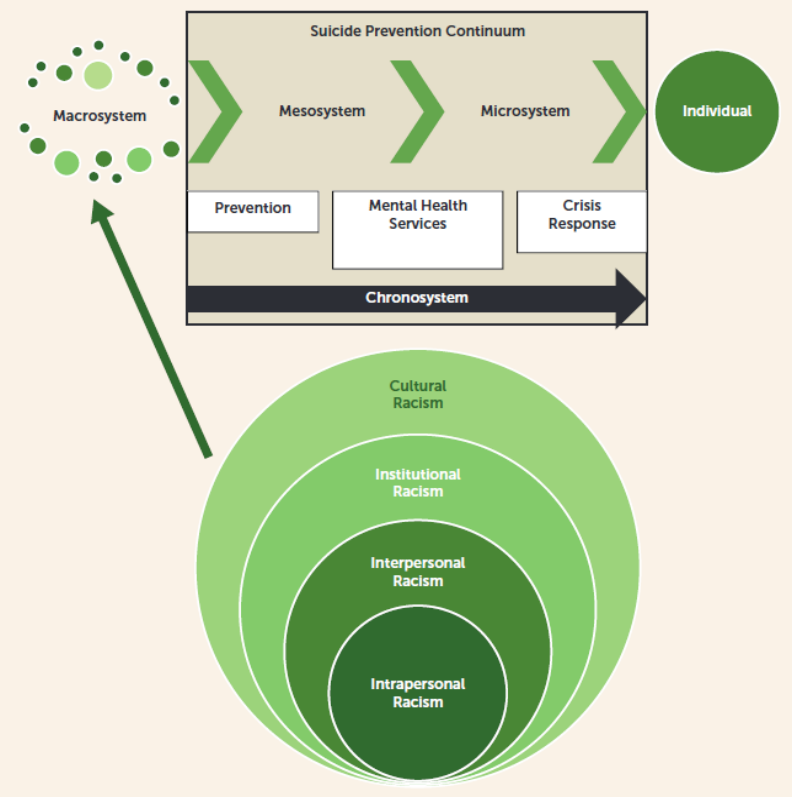
[1] *Structural racism involves interconnected institutions, whose linkages are historically rooted and culturally reinforced. It refers to the totality of ways in which societies foster racial discrimination, through mutually reinforcing inequitable systems (in housing, education, employment, earnings, benefits, credit, media, healthcare, criminal justice, and so on) that in turn reinforce discriminatory beliefs, values, and distribution of resources, which together affect the risk of adverse health outcomes.* – Bailey et al. (2017).

In using the framework of structural racism (Figure 1) to address the root causes of disparities, AWS provided to WellLink the technology platform, funding for computing access, and cloud computing subject matter experts for solving these disparities through insights supported by data.

FIGURE 1. The Structural Racism and Suicide Prevention Systems Framework



Alvarez et al. (2022)

While initially focused on firearm violence and behavioral health, the SDoH Hub will also focus on other health disparities such as economic mobility tied to climate change, education, housing, jobs, and transportation; social needs such as childcare and social isolation; and public health priorities such as access to medical care, infant mortality, maternal morbidity and mortality, and lead poisoning.

Through the SDoH Advisory Council, data-driven insights will help inform and identify programs and policies to improve the health of individuals and populations in time spans ranging from immediate to long-term.

By December 2022, the health data lake was designed and created. Through March 2023, publicly available data was collected, organized, and analyzed from over 50 publicly available

data sources such as the Centers for Disease Control and Prevention (CDC), Cuyahoga County Medical Examiner's Office (CCME), the Federal Bureau of Investigation (FBI) and National Gun Archive. (Other accomplishments for year one are summarized in Attachment 2.) Analyzing and illustrating the firearm violence data revealed that nearly 60% of suicides in NEO are from firearms in contrast with the national average of 50%. (Betz et al., 2021).

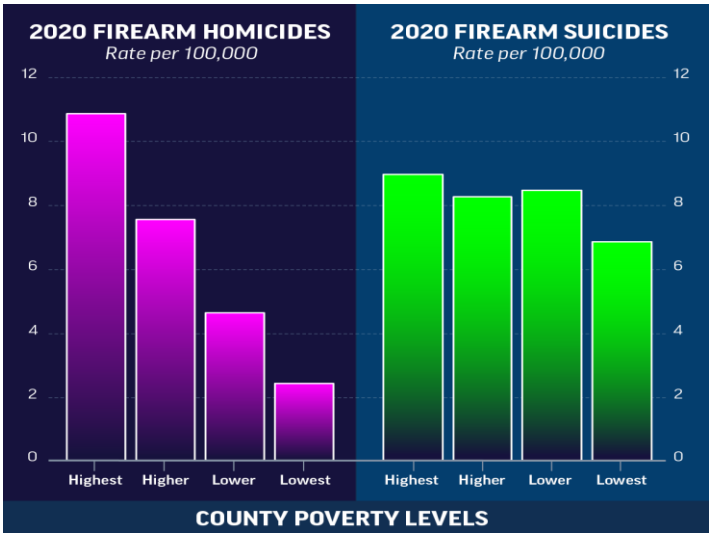
Additional insights from the NEO firearm violence data include the following.

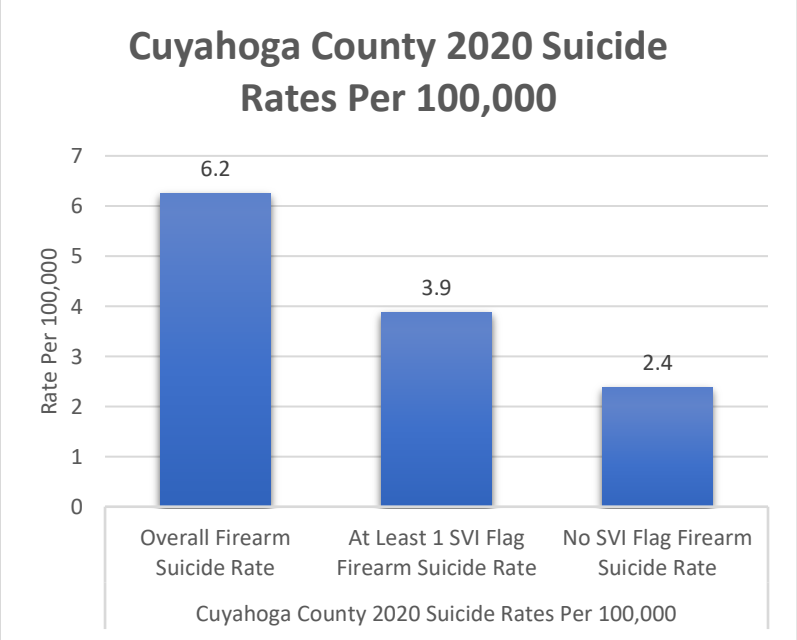
> Historically redlined neighborhoods and the social vulnerability index (SVI) are predictive of inevitable and higher rates of firearm violence. *Redlining practices of the 1930s potentially contribute to increased rates of firearm violence through changes to neighborhood environments, namely through preclusion from homeownership, poverty, poor educational attainment, and concentration (i.e. segregation) of Black communities. These downstream mediating factors serve as points for policy interventions to address urban firearm violence.* – (Poulson et al., 2021).

The following CDC data show that racism results in poverty; and the latter is correlated with high rates of firearm violence.

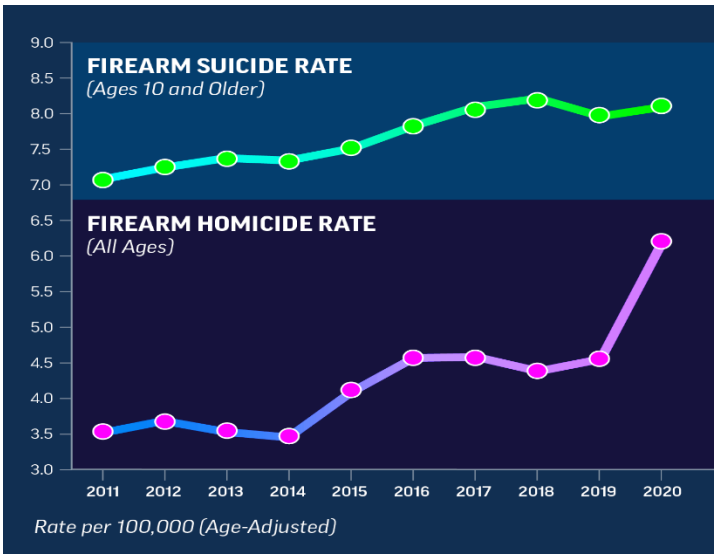
> *In 2020, counties with the highest poverty level had firearm homicide rates 4.5 times as high and firearm suicide rates 1.3 times as high as counties with the lowest poverty level.*
>
> *The largest increase in firearm homicides was among Black people (39%). The largest increase in firearm suicides was among American Indian and Alaska Native people (42%).* (Centers for Disease Control and Prevention)

In addition, poverty is associated with higher firearm violence. **(**CDC https://www.cdc.gov/vitalsigns/firearm-deaths/index.html)

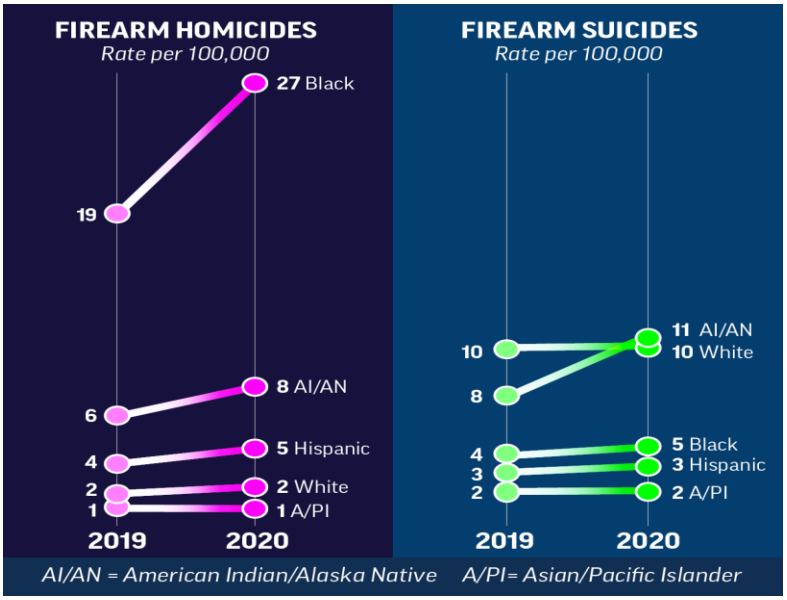




Over time and despite various national and local efforts to address firearm safety and behavioral health awareness, firearm violence and suicides remained high in the U.S.—including Cuyahoga County; and data indicate an upward trend—especially since 2020 during the COVID pandemic. **(**CDC https://www.cdc.gov/vitalsigns/firearm-deaths/index.html)



The CDC data show that firearm violence disproportionately impacts melanated populations. **(**CDC https://www.cdc.gov/vitalsigns/firearm-deaths/index.html)



Reducing and eliminating firearm violence requires policies and programs that apply a structural racism framework. Without this framework, disparities will persist, accelerate the decline of communities, and consume scarce economic resources.

Data-Informed Insights About Firearm Violence and Behavioral Health

The most rapid increase in firearm violence is youth suicides with guns. On a national level, youth suicide is the second leading cause of death in the U.S., i.e., *"…among youth in the US who die, over 25% die from suicide."* – The American Academy of Pediatrics https://www.aap.org/en/patient-care/blueprint-for-youth-suicide-prevention/

Data analysis through the SDoH Hub shows that firearm suicide among youth as young as 12 is rapidly increasing in Northeast Ohio (NEO). For example, data show that in NEO firearm violence primarily impacts young melanated males and was concentrated in two zip codes: 44102 and 44105—at least through year end 2021. (City of Cleveland, 2022)

SVI Status	% of Suicides		% Suicides w/ Firearm		Median Age of Suicides	
	Black	White	Black	White	Black	White
No Vulnerability	2.6%	37.6%	65.20%	53.1%	41	50
At Least 1 Vulnerability	18.1%	41.7%	69.7%	50%	35	49

Figure 2: Data Source from the Cuyahoga County Medical Examiner

Using suicide data for 2017 - 2022 from the Cuyahoga County Medical Examiner (Figure 2), there were 1,006 suicides in the county with 787 males and 219 females. Of the total suicides, 535 were with firearms; and, of this number, 467 (87%) were males and 68 (13%) were females. For African Americans, 69.8% of the suicides occurred with firearms and the rate is 51.7% for Whites.

When looking at the relationship between suicides and social vulnerability indicators in the county such as single-parent households, the percentage of melanated population, the percentage of households with no vehicles, the percentage of persons below 150% poverty; and the percentage of civilian unemployed, the rate with which at least one of these indicators were present is nearly identical for the African American population. Interestingly, the percentage of households with no vehicles was a significant vulnerability indicator among the 18–30-year-old African American males; and the percentage of civilian unemployed was the single most significant vulnerability indicator for the White male population.

Recommendation to Address Firearm Violence and Behavioral Health: Fund and Evaluate Y-CITs in NEO

In the U.S. on any given year:

- 1 in 5 U.S. adults experience mental illness each year;
- 1 in 20 U.S. adults experience serious mental illness each year;
- 1 in 6 U.S. youth aged 6-17 experience a mental health disorder each year;
- 50% of all lifetime mental illness begins by age 14, and 75% by age 24 (NAMI, 2023).

These behavioral health challenge can result in deaths by suicide.

> *Suicide is a complex public health issue that requires the implementation of multiple interventions to address the constellation of risk and protective factors that may exist in students' lives. The school setting provides numerous opportunities for contribution to a comprehensive multi-tiered approach to suicide prevention, especially for youth who reside in communities with limited mental health resources. The implementation of such school-based suicide prevention efforts advances a culture of care that encourages help-seeking and connectedness among youth.* – Ayer et al., 2022.

Firearm Violence and Firearm Suicides Are Complex

Stopping firearm violence that includes suicides requires the application of the structural racism framework to develop a comprehensive prevention approach focused on reducing inequities. Strategies should address the underlying physical, social, economic, and structural conditions known to increase firearm homicide and suicide risks. Some prevention strategies will be more immediate, and others will have more long-term effects (Centers for Disease Control and Prevention).

National and international studies show that one short-term solution to stopping firearm violence and suicide is to fund and implement suicide prevention models and strategies that address fragmentation of behavioral health services across school settings, the juvenile justice system, and among mental health providers. Such coordinated efforts "…have potential…to help students with mental health issues, suicide prevention, and even recovery after events such as school shootings, drug abuse, and bullying" (Markey et al., 2011).

One logical setting in which to focus on suicide prevention is in school settings. Data show, however, that substantial barriers prevent students who are most at-risk and in dire need for a comprehensive array of services such as clothing, housing, medical care, and access to behavioral health counseling do not receive them (Nadeem et al., 2016). Despite these challenges, funding and operating suicide prevention in school settings augmented by resources for students and their parents before, during, and after the crisis can be extremely impactful. One study showed that there are seasonal variations in youth suicides with observed peaks during the Fall and Spring segments of the school year (Poland & Ferguson, 2022). Given these findings and given that adolescents spend nearly half of their time in school settings, focusing on school-based suicide prevention is logical. Using this rationale, communities and states such as Florida supported legislation and funding to launch suicide prevention (Moore et al, 2021). Unfortunately, most—if not all—of these efforts do not include a structural racism framework that addresses the root cause of violence and suicide.

While funding and launching suicide prevention strategies using a structural racism framework is new and innovative, critics may say that there is no solid body of evidence that such models reduce suicides and firearm violence.

> *Although evidence exists that school-based programmes to prevent suicide among adolescents improve knowledge, attitudes, and help-seeking behaviours, no evidence yet exists that these prevention programmes reduce suicide rates. Further well designed, controlled research is required before such programmes are instituted broadly to populations at risk.* – Cusimano & Sameem, 2011.

Such criticism is valid and must be addressed strategically. Therefore, it is imperative to fund and conduct empirical research as part of the funding and launch of suicide prevention strategies in Cleveland.

Short-Term (3 – 6 months) Solution to Eliminate Youth Firearm Violence

- Use the SDoH Hub as the foundation for a multi-sector partnership and collaborative model for suicide prevention.
    - Pilot the coordinated and collaborative suicide prevention model in three zip codes in Cleveland: 44102, 44105, and 44108.
        - Focus on two populations: School-age individuals from 10 – 18 y.o.; and those residing in community settings from 19 – 30 y.o. More discrete age ranges were suggested, e.g., 7 – 16 and 17 – 30. Staff will re-work the data into other age categories to analyze the emerging patterns.

- Focus first on specific settings: Schools, youth service organizations, and health care providers.
- Later expand to other community and social settings.

- Comprehensive community partnerships: Using an inventory of existing programs and resources available for intervention, response, and support, organize and convene these organizations and programs to build a collaborative and coordinated prevention model. The following sectors will need to support and fund this effort.
  - Governments (City, County, State, and Federal)
  - Nonprofits and community-based organizations (see Attachment 2)
  - For profits

- Data, evaluation, and assessment: To measure and document the existing suicide prevention ecosystem, researchers and program leaders will establish a baseline assessment of suicide prevention systems and process. In this way, interventions and impacts will be measured against conditions prior to the prevention model operating.
  - Establish baseline conditions
  - Measure impacts and outcomes

Mid-Term Solution (6 – 18 months) to Eliminate Firearm Violence

- Increase access to services—especially in school settings given that the National Association of School Psychologists recommend a ratio of school psychologists to students is 1:500 and the national ratio is 1:1,211 while some states are approaching ratios of 1:5,000—especially in rural and historically underserved schools (Council of State Governments, 2023).
- Accredit, contract, and deploy melanated and culturally sensitive providers.
- Coordinate referrals across all sectors of the service ecosystem.
- Measure impacts and outcomes from current baseline to ensure positive results.

Long-Term (18+ months) Solution to Eliminate Firearm Violence

- Policies to improve economic mobility.
  - Basic income program
  - Childcare
  - Climate change
  - Digital access

  - Education
  - Food
  - Green space
  - Housing
  - Jobs and workforce
  - Tax credits
  - Transportation

- Support and stimulate the economy of Northeast Ohio.
  - Promote new policies: First, increase per capita public assistance. For example, one study shows that increasing per capita spending by $45 per year on public assistance translated into 3,000 fewer suicides per year in the U.S.—a decrease of 10% (Flavin & Radcliff, 2009). Second, increase Supplemental Nutrition Assistance Program (SNAP) participation. A recent study shows that increasing SNAP participation by 4.5% during the years 2000 – 2015 could have saved 31,600 people from suicide (Rambotti, 2020).
  - Develop an economic development plan.
  - Promote jobs for a new economy.

Next Phase of the Work: Launch Solutions to Address Economic Mobility

The Behavioral Health and Firearm Violence Work Groups will complete the plan to launch the suicide prevention model between September 2023 and April 2024 for solutions to firearm violence and behavioral health with the current co-chairs Edward Barksdale, MD; Daniel Flannery, PhD; Claude Jones, DO; and Daniel Lettenberger-Klein.

In addition, the SDoH Advisory Council will launch the Economic Mobility Work Group with Jessica Colombi and Kevin Goodman as co-chairs. The Economic Mobility Work Group and will create the following subgroups that include subject matter experts.

- Basic income and tax credits
- Climate change
- Digital access
- Education
- Food access and stability
- Green Space

- Housing—safe, affordable, and long-term
- Jobs focused on the emerging economy and affording a career path
- Transportation that is reliable, convenient, safe, and accessible

Each subgroup will be led by at least one person serving as a chair. These subgroups will work over the October 2023 – June 2024 timeframe for completing their initial report with draft recommendations that will be sent to the SDoH Advisory Council.

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Attachment 1: Members of the SDoH Advisory Council

Organization	Last Name	First Name	Sector
Baldwin-Wallace University	Banik, PhD	Swagata	Education
Begun Center for Violence Prevention, Case Western University	Flannery, PhD	Daniel	Education
Benjamin Rose Institute on Aging	Bell	Orion	Health Care
Bluebridge	Goodman	Kevin	Technology
Catholic Charities, Diocese of Cleveland	Robles	Fredy	Advocacy
Center for Achieving Equity	Chappelle	Sandra	Workforce
Center for Community Solutions	Campbell	Emily	Advocacy
City of Cleveland	Fernando	Roy	Data and Technology
Cleveland City Council	Colombi	Jessica	Policy
Cleveland Clinic	Jehi, MD	Laura	Hospital
Cleveland Dept. of Public Health	Wills	Lita-Marie	Policy
Cleveland Foundation	Wilson	Leon	Foundation
Cleveland Leadership Center	Crosely	Marianne	Advocacy
Cleveland Peacemakers Alliance	Watkins	Myesha	Violence
Credible Mind	Clayton	Nichols	Data and Technology
Cuyahoga Metro Housing Authority	Wade	Jeffrey	Housing
Grace Hospital	Hennis	Michelle	Health Care
Greater Cleveland Food Bank	Warzocha	Kristin	Food
Greater Cleveland RTA	Caver, PhD	Floun'say	Transportation
JumpStart	Thomas	Teleange	Economic Mobility
The Lesbian Gay Bisexual Transgender Community Center of Greater Cleveland	Harris	Phyllis	Advocacy
Magnet	Karp, PhD	Ethan	Economic Mobility
MetroHealth	De Luca, PhD	Susan	Behavioral Health
MetroHealth	Jacono	Julie	Health Care
Northeast Ohio Coalition for the Homeless	Knestrick	Chris	Housing
Northeast Ohio Black Health Coalition	Hall	Yvonka	Health Care
Office of Governor Dewine	Gillcrist	Michelle	Policy
Office of the County Executive	Roberts	Sabrina	Economic Mobility
Partnership For A Safer Cleveland	Walker	Michael	Violence
Red Cross	Parks	Michael (Mike)	Health Care
St. Vincent Medical Center	Olmstead	Thom	Health Care
Stella Maris	Lettenberger-Klein	Daniel	Behavioral Health
TeamNeo	Koehler	William	Workforce
The Village of Healing Center	Gaines	Tenisha	Health Care
University Hospital	Provonost, MD	Peter	Health Care
University Hospital	Barksdale, MD	Edward	Health Care
YMCA	Hilk	Tim	Advocacy
WellLink	Byas, Sr., PhD	Kim	SDoH Leader
WellLink	Lane	Brian	CEO
WellLink	Meta	Endrit	Director, Data and Technology
Amazon Web Services	Gonzalez	Nelson	Head of Global Impact Computing
Amazon Web Services	Shaikh, PhD	Abdul	Global Leader for Population Health

Attachment 2: Behavioral Health Work Group of the SDoH Advisory Council

Co-Chair	Daniel Lettenberger-Klein	Stella Maris	CEO
Co-Chair	Lisa Ramirez, PhD	MetroHealth	Child & Adolescent Psychologist
Members	Swagata Banik, PhD	Baldwin-Wallace University	Dean
	Angela Cecys	Cleveland Department of Public Health	Senior Strategist for Public Safety and Health
	Sandra Chappelle	Center for Achieving Equity	Founder
	Susan De Luca, PhD	Population Health Institute, MetroHealth	Associate Professor of Psychiatry
	Roy Fernando	City of Cleveland	Office of Mayor, Chief Technology Officer
	Michelle Gillcrist	Office of Governor Dewine	Regional Liaison
	Phyllis Harris	The Lesbian Gay Bisexual Transgender Community Center of Greater Cleveland	Executive Director
	Katie Jenkins	NAMI Cleveland	Executive Director
	Chris Knestrick	Northeast Ohio Coalition for the Homeless	Executive Director
	Pouria Mojabi	Supportiv	Co-Founder
	Clayton Nichols	Credible Mind	COO
	Sabrina Roberts	Office of the County Executive	Senior Advisor
	Thom Olmstead	St. Vincent Medical Center	Executive Director of External Affairs
	Lita-Marie Wills	Cleveland Department of Public Health	Commissioner, Health Equity and Social Justice

Attachment 3: Firearm Violence Work Group of the SDoH Advisory Council

Role	Person	Organization	Title
Co-chair	Edward Barksdale, MD	University Hospitals and Health System	Professor and Chief Division of Pediatric Surgery; and former president, American Pediatric Surgery Association
Co-chair	Daniel Flannery, PhD	Begun Center for Violence Prevention, Case Western Reserve University	Director
Members			
	Manreet Bhullar	Cuyahoga County Medical Examiner's Office	Forensic Epidemiologist
	Thomas Gilson, MD	Cuyahoga County Medical Examiner's Office	Chief Medical Examiner
	Aki Jackson	Community Outreach/ Violence Interrupters	Volunteer and Community Representative
	Katie Jenkins	NAMI Cleveland	Executive Director
	Chethan Sathya, MD	Gun Violence Center, Northwell Health	Director and Pediatric Surgeon
	Jeffrey Tyler	Federal Bureau of Investigation	Assistant Special Agent in Charge
	Michael Walker	Partnership For A Safer Cleveland	Executive Director
	Myesha Watkins	Cleveland Peacemakers Alliance	Executive Director

Attachment 4

Year 1 (September 2022 – August 2023) Milestones of the SDoH Innovation Hub

- Meetings
  - Advisory Council meetings: March 15 and June 16
  - Behavioral Health and Gun Violence Work Groups met in March, May, July.
  - More than 200+ meetings with state and national organizations to compose the 50+ SDoH Advisory Council.

- Grant opportunities
  - Submitted grants
    - April 2023: City of Cleveland ARPA
    - May 2023: Economic Development Administration, Department of Commerce, ARPA-H as part of the Cleveland Innovation District and the Ohio Aerospace Institute
  - Pursuit of additional grants planned in 2023 and beyond.

- Presentations and Press

  - 3/16: The following press releases and media stories on the SDoH Innovation Hub.

  The Center for Health Affairs Launches Groundbreaking Social Determinants of Health Innovation Hub in Cleveland Powered by Amazon Web Services (prnewswire.com)

  AWS, Center for Health Affairs launch social determinants of health innovation hub (beckershospitalreview.com)

  Center for Health Affairs establishes Social Determinants of Health Innovation Hub, powered by Amazon Web Services | Crain's Cleveland Business (crainscleveland.com)

  A first-of-its-kind data hub is being created in Cleveland | Ideastream Public Media

  - 8/9: Presentation at Cleveland Thrives conducted by the Cleveland Leadership Council

Attachment 5: Community Participants for Y-CITs

- Center for Achieving Equity
- Center for Health Affairs
- City of Cleveland: Cleveland City Council; Cleveland Dept. of Public Health; Cleveland Police Dept.; Cleveland Public Schools; Mayor's Office
- Cleveland Clinic
- Cleveland Foundation
- Cleveland Leadership Center
- Cleveland Peacemakers Alliance
- Credible Mind
- Cuyahoga County: Alcohol, Drug Addiction and Mental Health Services (ADAMHS) Board of Cuyahoga County; Office of the County Executive; Medical Examiner's Office; Metropolitan Housing Authority; Sherriff's Department
- Fund for Our Economic Future
- Gund Foundation
- The Lesbian Gay Bisexual Transgender Community Center of Greater Cleveland
- MetroHealth System
- National Alliance on Mental Illness (NAMI) – Cleveland
- Northeast Ohio Coalition for the Homeless
- Office of Governor DeWine
- Partnership for a Safer Cleveland
- Population Health Institute
- Public members
- St. Luke's Foundation
- St. Vincent Charity Community Health Center
- Supportiv
- University Hospitals