

Ecologic Study

A study in which the units of analysis are populations or groups of people, not individuals.

2 x 2 Table

2 x 2 Table

	Lung Cancer	No Lung Cancer	
Cigarette Smoking			
No Cigarette Smoking			

Hypothetical Ecologic Study

Relationship Between

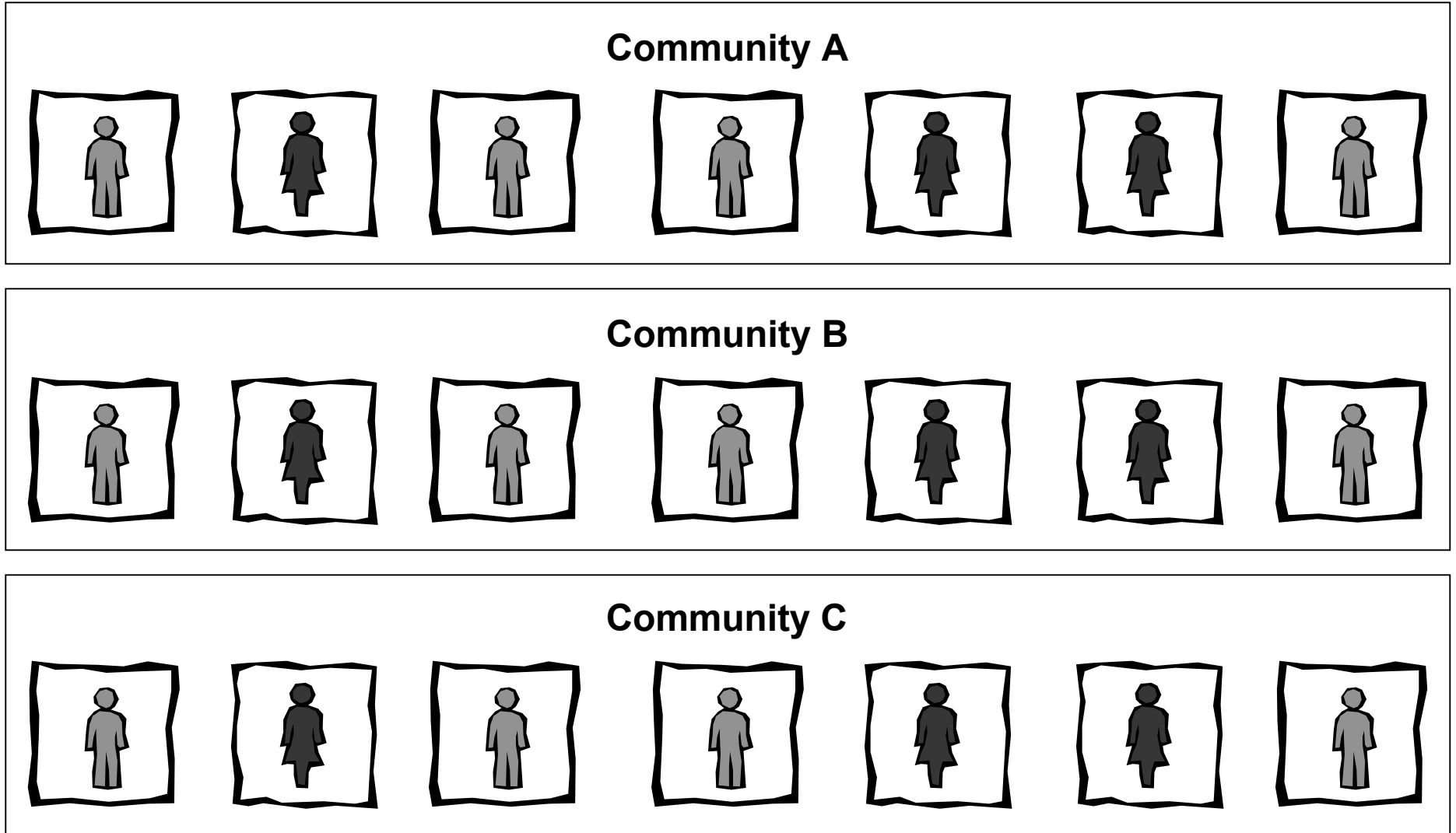
Income and Auto Accident

3 communities

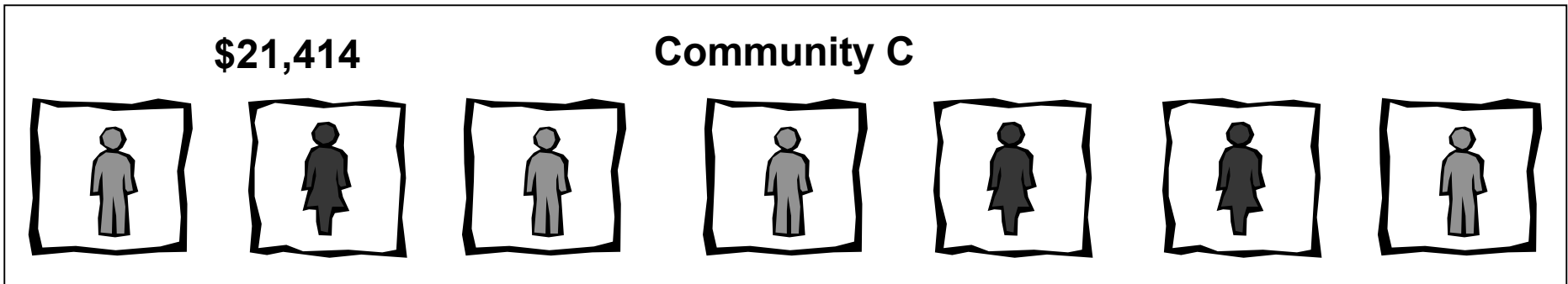
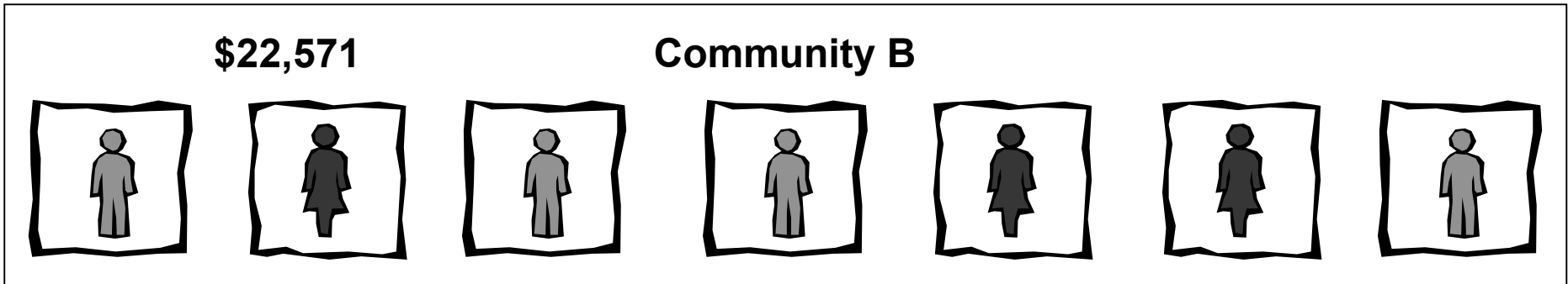
each with a population of 7 people

This hypothetical ecologic study is described in AV Diez-Roux's article, "Bringing Context Back into Epidemiology: Variables and Fallacies in Multilevel Analysis," in the *American Journal of Public Health*, 1998;88:216–222.

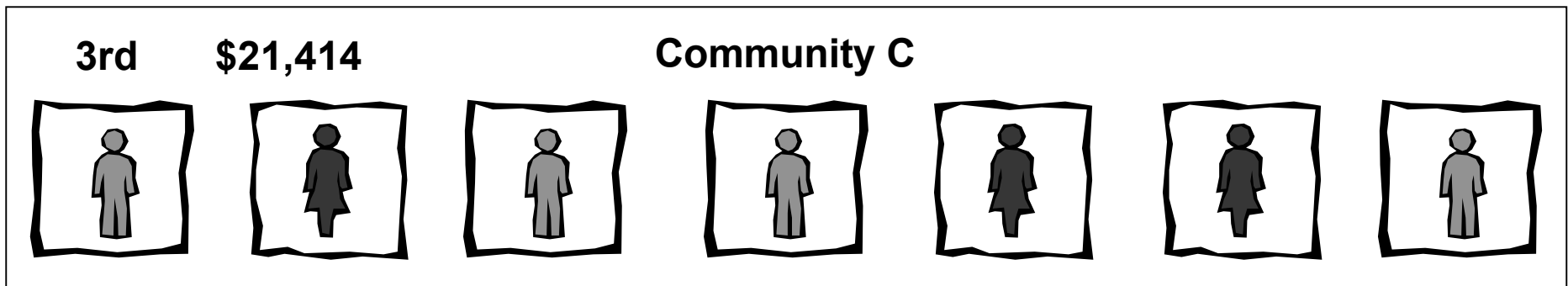
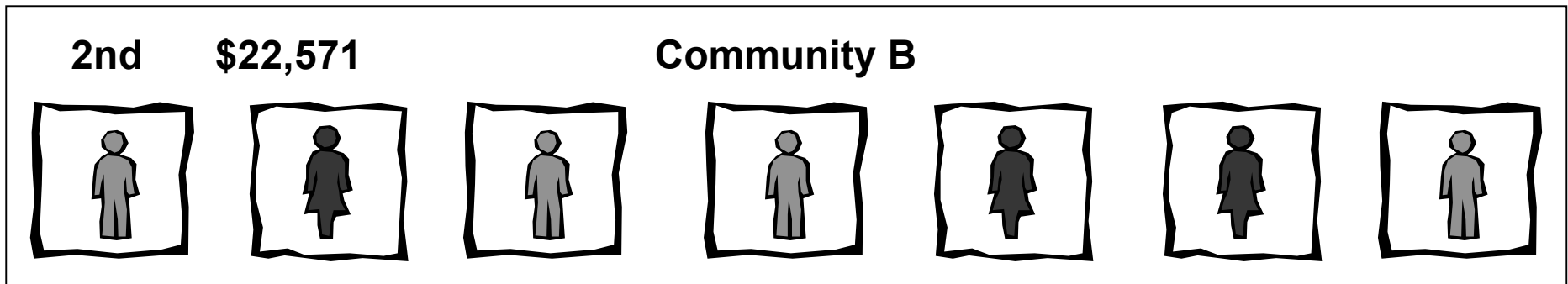
Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



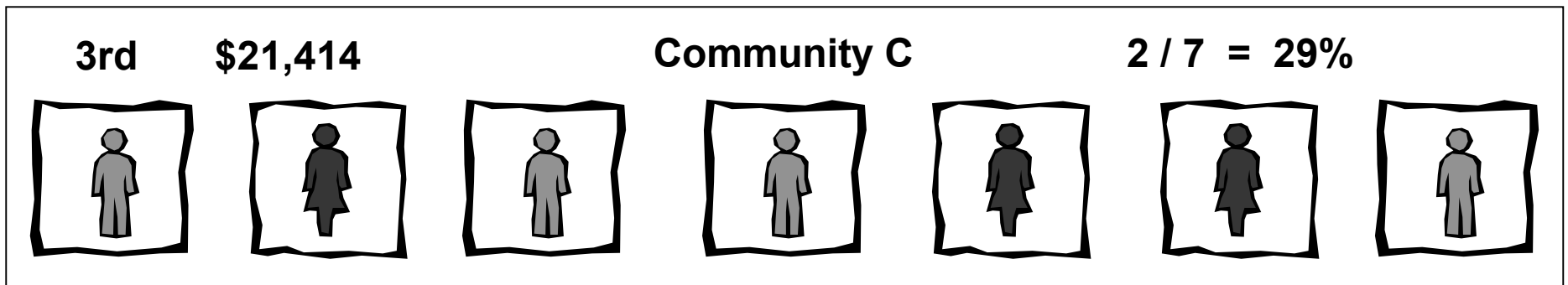
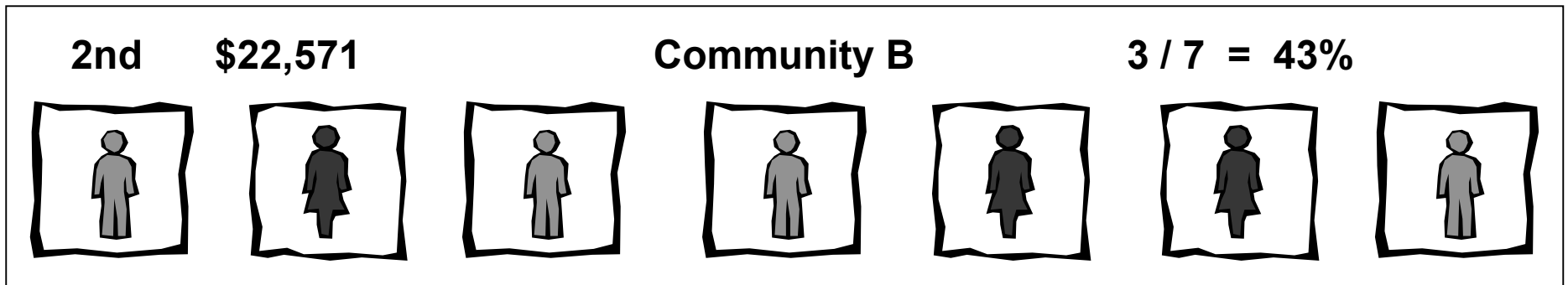
Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



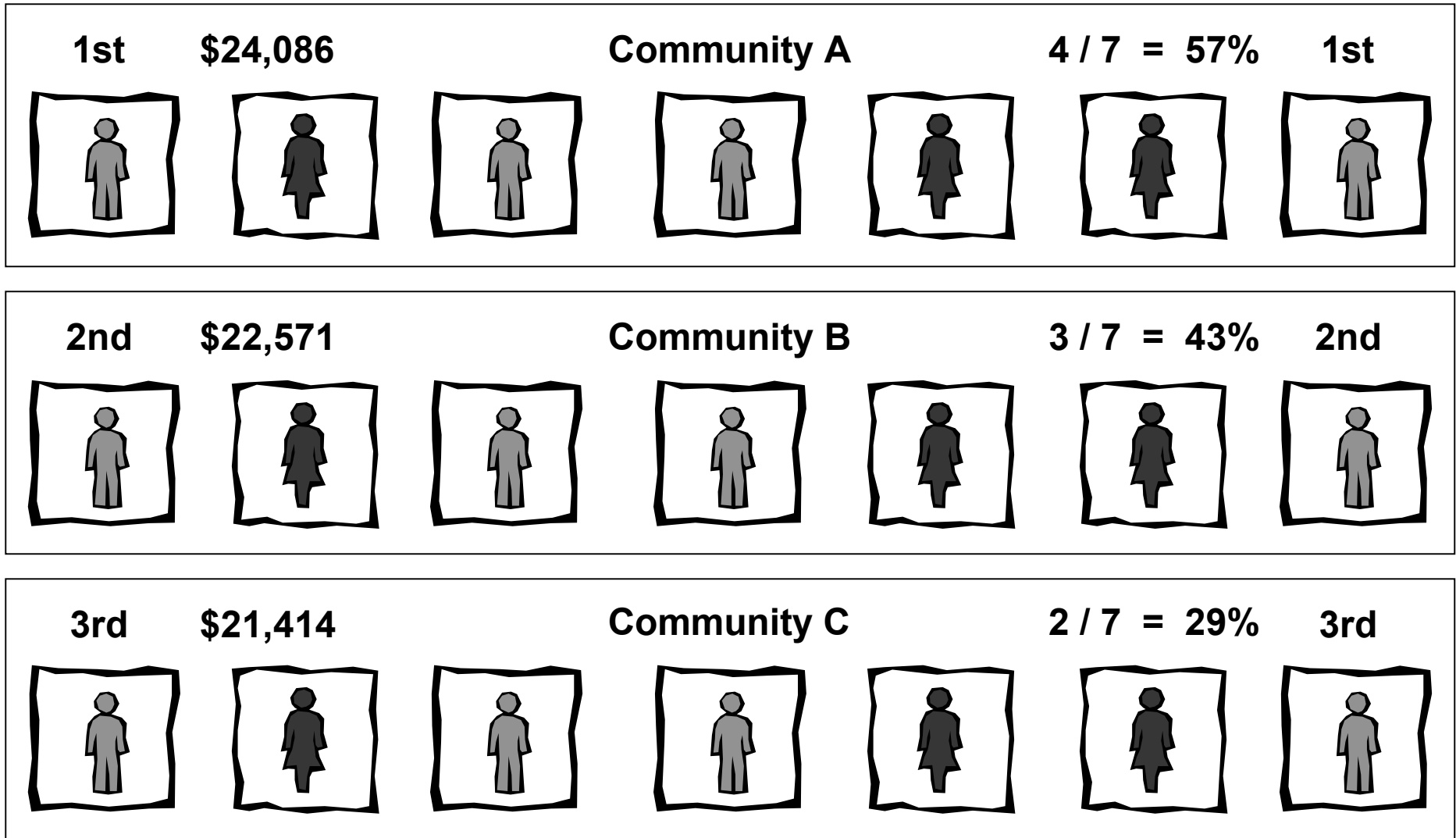
Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



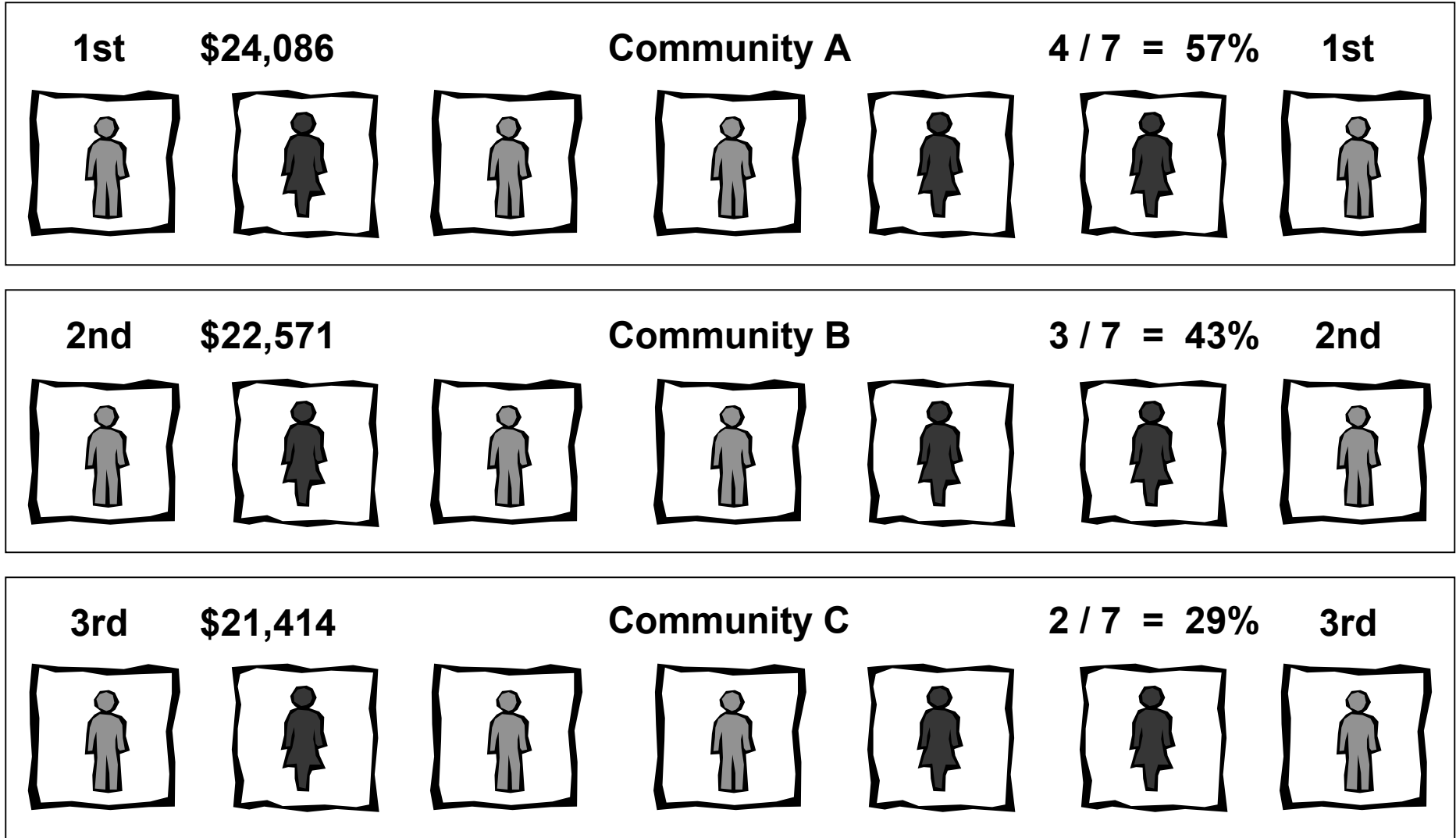
Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



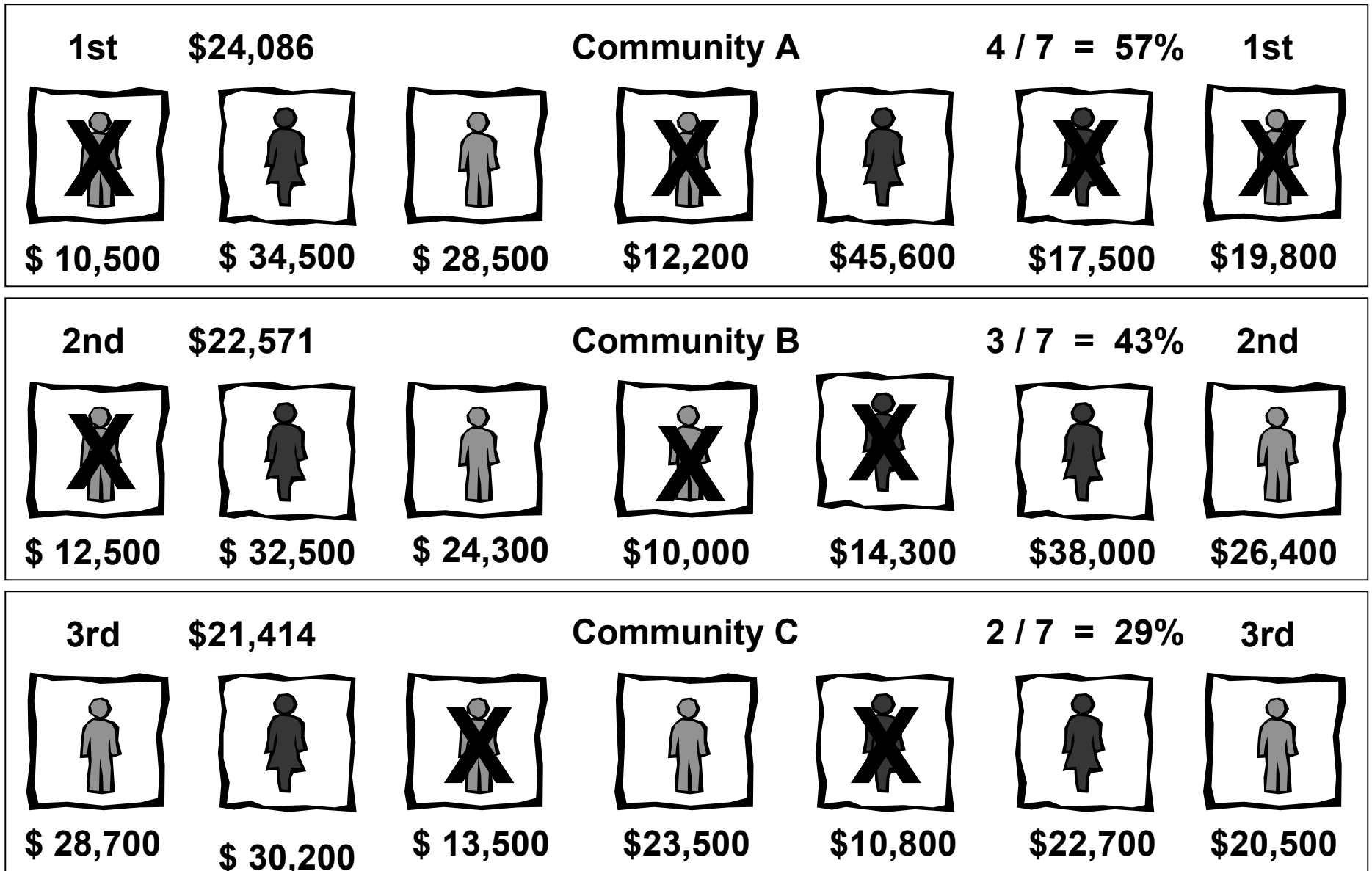
2 x 2 Table

	Auto Accident	No Auto Accident	
More than \$20,000			
Less than \$20,000			

Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



Hypothetical Ecologic Study — Relationship Between Income and Auto Accident



2 x 2 Table

	Auto Accident	No Auto Accident	
More than \$20,000	0	12	12
Less than \$20,000	9	0	9

Ecologic Fallacy

“ . . . an error in inference due to a failure to distinguish between units of analysis. An association between variables at the group unit of analysis may not exist at the individual unit of analysis.”

Real Ecologic Study

Relationship Between Religion and Suicide

Prussian Communities in the late 19th Century

This ecological study is described in H. Morgenstern's article, "Ecologic Studies in Epidemiology: Concepts, Principles, and Methods," in the *Annual Review of Public Health*, 1995;16: 61–81 and in E. Durkheim's book, *Suicide: A Study in Sociology*, published by Free Press in 1951.

Real Ecologic Study

Relationship Between Religion and Suicide

Prussian Communities in the late Nineteenth Century

The greater the percent of Protestants in a community, the greater the community's suicide rate.

Real Ecologic Study

Relationship Between Religion and Suicide

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Inferred that being Protestant was a risk factor for suicide

Ecologic Fallacy

“ . . . an error in inference due to a failure to distinguish between units of analysis. An association between variables at the group unit of analysis may not exist at the individual unit of analysis.”

Real Ecologic Study

Relationship Between Religion and Suicide

Prussian Communities in the late Nineteenth Century

The greater the percent of Protestants in a community, the greater the community's suicide rate.

Inferred that being Protestant was a risk factor for suicide

Most of the suicides within a community were committed by Catholics who, when in the minority, felt socially isolated and were therefore at higher risk of suicide.

Variables Used in Study of Smoking and Lung Cancer

Subject Selection

- Males and/or females
- Occupational groups
- Hospitalized cases
- Autopsy series
- Total lung cancer deaths in an area
- National sampling lung cancer deaths

Methods of Interviewing

- Mailed questionnaires
- Personal interviews subjects/relatives
- Personal interviews controls: professional
- Personal interviews controls

Tobacco-Use History

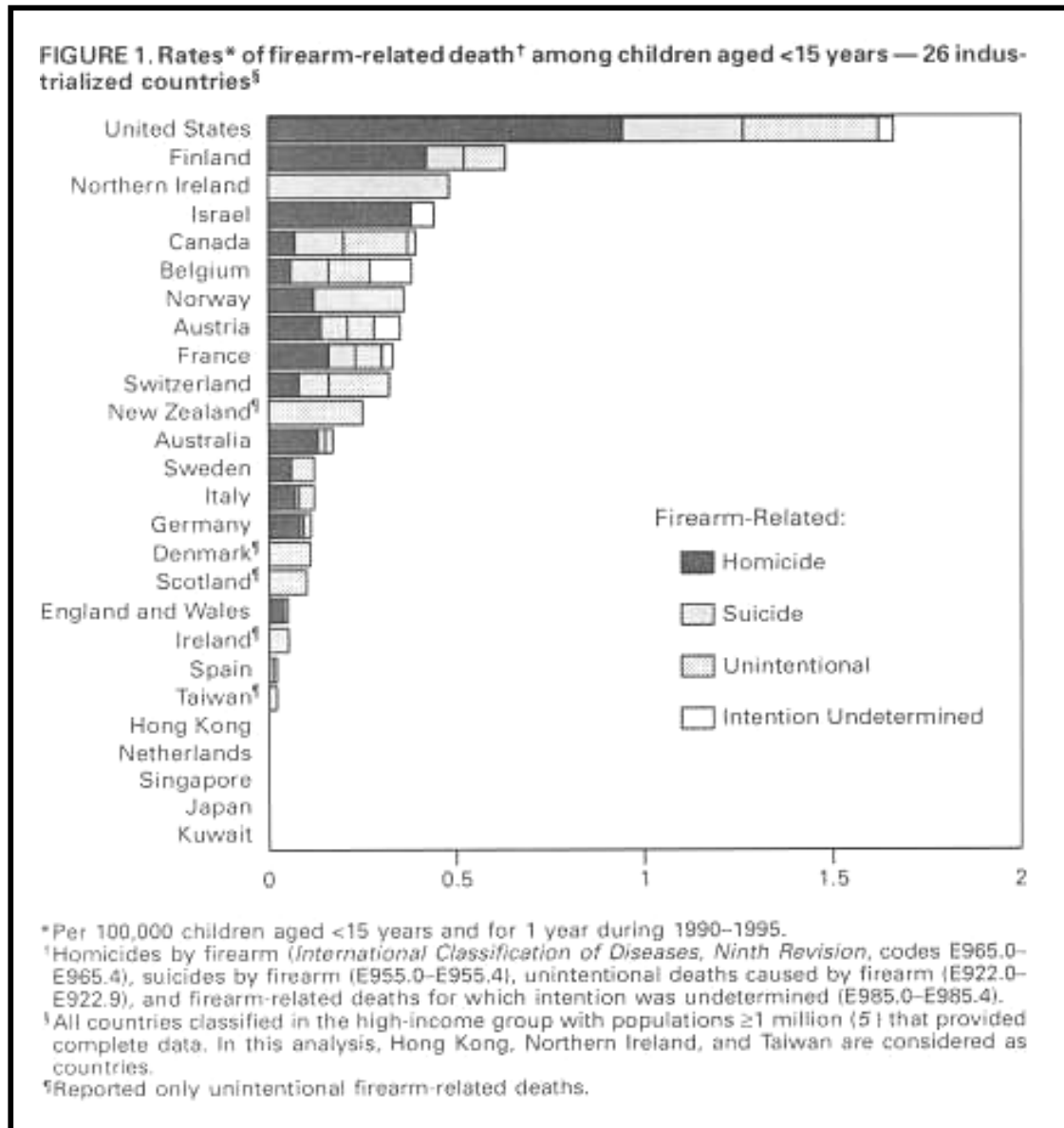
- Type of smoking
- Amount and type
- Amount, type and duration
- Inhalation practices

Control Selection

- Age matched
- Healthy individuals
- Patients hospitalized for other cancers
- Patients hospitalized for other diseases
- Deaths from causes other than cancer
- Sampling of general population

Other Variables Concurrently Studied

- Geographic distribution
- Occupation
- Marital status
- Coffee and alcohol consumption
- Other nutritional factors
- Parity
- War gas exposure
- Other pathologic conditions
- Hereditary factors
- Air pollution
- Previous respiratory conditions



“Rates of Homicide, Suicide, and Firearm-Related Death Among Children — 26 Industrialized Countries,
 ” *Morbidity and Mortality Weekly Report*, February 7, 1997:101–105.

Harvard Injury Control Research Center



Matthew Miller, MD, MPH, Sc.D., a general internist and medical oncologist, received his Doctor of Science degree in Health Policy and Management from the Harvard School of Public Health. He is currently an associate director of the Harvard Injury Control Research Center where his research has focused on gun availability at colleges, the association of cigarette smoking to suicide, and the relationship between firearms availability and violent death.

Harvard Injury Control Research Center



The rates of unintentional firearm deaths would be highest in places where firearms were most available and lowest in places where firearms were least available.

WISQARS Provides Customized Reports of Injury-Related Data

<http://www.cdc.gov/ncipc/wisqars/>

The screenshot shows the WISQARS website interface. At the top left is the CDC logo with the tagline "SAFER • HEALTHIER • PEOPLE™". To the right of the logo are navigation buttons for "CDC Home", "Search", and "Health Topics A-Z". Below the logo is a search box labeled "Search Injury" with a "Search" button. The main header reads "National Center for Injury Prevention and Control" with sub-navigation buttons for "Facts", "Data", "Publications", "Funding", "Search", and "Contact Us". The main content area features the heading "Welcome to WISQARS™" followed by a description: "WISQARS™ (Web-based Injury Statistics Query and Reporting System) is an interactive database system that provides customized reports of injury-related data." To the right of this text is a stylized graphic of a cat's face with whiskers, labeled "WISQARS™".

<http://www.cdc.gov/ncipc/wisqars>

CDC
SAFER • HEALTHIER • PEOPLE™

CDC Home Search Health Topics A-Z


National Center for Injury Prevention and Control

Facts Data Publications Funding Search Contact Us

search injury

Search

Welcome to WISQARS™



WISQARS™ (Web-based Injury Statistics Query and Reporting System) is an interactive database system that provides customized reports of injury-related data.

WISQARS Fatal

Presents U.S. injury mortality data.

- GO Fatal Injury Reports**
Tables of injury deaths and death rates by particular causes of injury mortality
- GO Leading Causes of Death Reports**
Charts of deaths by common causes of death
- GO Years of Potential Life Lost (YPLL)**
Charts of years of potential life lost (premature death) by specific causes of injury mortality and common causes of death

WISQARS Nonfatal

Provides national estimates of nonfatal injuries treated in U.S. hospital emergency departments

- GO Nonfatal Injury Reports**
Tables of national estimates of injuries and injury rates by particular injury causes
- GO Leading Causes of Nonfatal Injury Reports**
Charts of national estimates of injuries by common causes of injury

The screenshot shows the CDC National Center for Injury Prevention and Control website. At the top left is the CDC logo with the tagline 'SAFER • HEALTHIER • PEOPLE™'. To the right are links for 'CDC Home', 'Search', and 'Health Topics A-Z'. Below the logo is a navigation bar with 'Facts', 'Data', 'Publications', 'Funding', 'Search', and 'Contact Us'. On the left side, there is a menu for 'WISQARS Home' with sub-links: 'WISQARS Fatal', 'FAQs', 'Help', 'Mortality Reports', 'Leading Causes of Death Reports', and 'YPLL Reports'. Below the menu is a 'Search Injury' button. The main content area is titled 'Fatal Injuries: Mortality Reports' and asks 'Are you interested in data from 1999 and later or from 1998 and earlier? *'. Below this is a 'Year(s) of Data Options' section with two radio button options: 'Data from 1999 and later' and 'Data from 1998 and earlier'. The second option is circled in black.

CDC
SAFER • HEALTHIER • PEOPLE™

CDC Home Search Health Topics A-Z

National Center for Injury Prevention and Control
Facts Data Publications Funding Search Contact Us

WISQARS Home
WISQARS Fatal

- [FAQs](#)
- [Help](#)
- [Mortality Reports](#)
- [Leading Causes of Death Reports](#)
- [YPLL Reports](#)

Search Injury

Fatal Injuries: Mortality Reports

Are you interested in data from 1999 and later or from 1998 and earlier? *

Year(s) of Data Options

[Data from 1999 and later](#)

[Data from 1998 and earlier](#)

CDC
SAFER • HEALTHIER • PEOPLE™

CDC Home Search Health Topics A-Z

National Center for Injury Prevention and Control

Facts Data Publications Funding Search Contact Us

[WISQARS Home](#)
[WISQARS Fatal](#)

- [FAQs](#)
- [Help](#)
- [Mortality Reports](#)
- [Leading Causes of Death Reports](#)
- [YPLL Reports](#)

Search Injury

Search

Fatal Injuries: Mortality Reports

Change to Age Output Options

As of 2003, CDC's Injury Center has updated WISQARS with bridged-race intercensal (years between censuses) population estimates by state for years 1991 through 1999. Provided by CDC's National Center for Health Statistics, these population estimates are available by 5-year age groups, state, race, ethnicity, and gender, but not by individual (single) year of age. ([More Information >](#)) The U.S. Census Bureau is working on intercensal estimates by single year of age. When the estimates become available, WISQARS will be updated. **Until then, rates by single year of age are temporarily unavailable for the years 1991 through 1998.**

Select your age output preference. If you have no age output preferences, select Output by 5-Year Age Groups.

Output by 5-Year Age Groups	Output by Single Year of Age
<input checked="" type="radio"/> Data from 1998 and prior (rates available)	<input type="radio"/> Data from 1998 and prior (death counts only)

Injury Mortality Reports

- [Advanced Options](#)
- [Data from 1999 and later](#)
- [Help](#)

WISQARS

- [Home](#)
- [Injury Mortality Reports](#)
- [Leading Causes of Death](#)
- [Years of Potential Life Lost \(YPLL\)](#)

Search Injury

Search

National Center for Injury Prevention and Control

WISQARS Injury Mortality Reports, 1981-1998

Choose your Report Options, then click the Submit Request button.

For more information about an option or a category of options, click on the underlined name or phrase. To return to this page, click on the "back" button in your browser toolbar.

Report Options

1. What was the intent or manner of the injury? (Select one)

- All Intents
- Unintentional
- Violence-related
 - Homicide and Legal intervention
 - Homicide
 - Legal Intervention
- Suicide
- Undetermined intent

2. What was the cause or mechanism of the injury? (Select one)

- | | |
|--|---|
| <input checked="" type="radio"/> All injury | <input type="radio"/> Overexertion |
| <input type="radio"/> All injury and adverse effects | <input type="radio"/> Poisoning |
| Adverse Effects | <input type="radio"/> Struck by / against |
| <input type="radio"/> Adverse effects, overall | <input type="radio"/> Suffocation |

Search

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects**
 - Adverse effects, overall
 - Medical care, adverse effects
 - Drugs, adverse effects
- Bites and stings
- Cut / Pierce
- Drowning / Submersion
- Fall
- Fire / Heat**
 - Fire / Burn
 - Fire / Flame
 - Residential fire / Flame
 - Hot object / Substance
 - Firearm
 - Non-Firearm
 - Machinery
 - Natural / Environmental
- Overexertion
- Poisoning
- Struck by / against
- Suffocation
- Transportation-Related**
 - Motor vehicle, overall
 - Motor vehicle, traffic (categorized by injured person)
 - Motorcyclist
 - Occupant
 - Pedal cyclist
 - Pedestrian
 - Unspecified
 - Pedal cyclist
 - Pedal cyclist, other
 - Pedestrian
 - Pedestrian, other
 - Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

- Firearm
- Non-Firearm
- Machinery
- Natural / Environmental
- Pedestrian, other
- Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

3. Select specific options.

Census Region/State

United States ▼

Year(s) of Report

1998 ▼ to 1998 ▼

Race

All Races ▼

Hispanic Origin

All ▼

Sex

Both Sexes ▼

Output Options

Standard Output ▼

Submit Request or Reset

Advanced Options (not required)

Select age groups

All Ages (includes unknown age)

Age Groups 0-4 ▼ to 0-4 ▼

3. Select specific options.

Census Region/State

United States ▼

Year(s) of Report

1998 ▼ to 1998 ▼

Race

All Races ▼

Hispanic Origin

All ▼

Sex

Both Sexes ▼

Output Options

Standard Output ▼

Submit Request or Reset

Advanced Options (not required)

Select age groups

All Ages (includes unknown age)

Age Groups 0-4 ▼ to 0-4 ▼

Compare injury rates using age-adjusting.

Select Standardized Year for Age-Adjusting:

Use 2000 ▼ as the Standard Year.

No Age-Adjusting Requested

Advanced Options (not required)

Select age groups

All Ages (includes unknown age)

Age Groups to

Compare injury rates using age-adjusting.

Select Standardized Year for Age-Adjusting:

Use as the Standard Year.

No Age-Adjusting Requested

1990

Select output group(s)

1. 3.
2. 4.

or

Compare injury rates using age-adjusting.

Select Standardized Year for Age-Adjusting:

- Use as the Standard Year.
- No Age-Adjusting Requested

State

Select output group(s)

- | | |
|--------------------------------------|--------------------------------------|
| 1. <input type="text" value="None"/> | 3. <input type="text" value="None"/> |
| 2. <input type="text" value="None"/> | 4. <input type="text" value="None"/> |

or

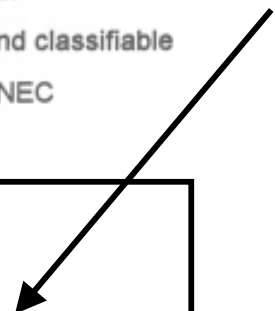
The screenshot shows the CDC logo at the top left with the tagline 'SAFER • HEALTHIER • PEOPLE'. To the right are links for 'CDC Home', 'Search', and 'Health Topics A-Z'. Below the logo is the text 'National Center for Injury Prevention and Control'. Further down are links for 'NCIPC Home', 'WISQARS Home', 'Help', and 'Contact Us'. The main heading reads '1998, United States Unintentional Firearm Deaths and Rates per 100,000' with subtext 'All Races, Both Sexes, All Ages' and 'ICD-9 Codes: E922'.

State	Number of Deaths	Population	Crude Rate	Age-Adjusted Rate**
Alabama	42	4,404,701	0.95	0.98
Alaska	5*	619,932	0.80*	0.68*
Arizona	22	4,883,342	0.45	0.47
Arkansas	13*	2,626,289	0.49*	0.49*
California	52	32,987,675	0.16	0.16
Colorado	9*	4,116,639	0.21*	0.21*
Connecticut	6*	3,365,352	0.17*	0.18*
Delaware	3*	763,335	0.39*	0.37*
District of Columbia	2*	565,230	0.35*	0.28*
Florida	24	15,486,559	0.15	0.15
Georgia	31	7,863,536	0.39	0.41
Hawaii	2*	1,215,233	0.16*	0.15*
Idaho	8*	1,252,330	0.63*	0.58*
Illinois	29	12,271,847	0.24	0.24
Indiana	27	5,998,880	0.45	0.44
Iowa	10*	2,902,872	0.34*	0.36*
Kansas	13*	2,660,598	0.48*	0.49*
Kentucky	30	3,985,390	0.75	0.80

* Rates based on 20 or fewer deaths may be unstable. Use with caution.

- Firearm
- Non-Firearm
- Machinery
- Natural / Environmental
- Pedestrian, other
- Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

1981 to 1998



3. Select specific options.

Census Region/State

United States ▼

Year(s) of Report

1998 ▼ to 1998 ▼

Race

All Races ▼

Hispanic Origin

All ▼

Sex

Both Sexes ▼

Output Options

Standard Output ▼


Submit Request or Reset

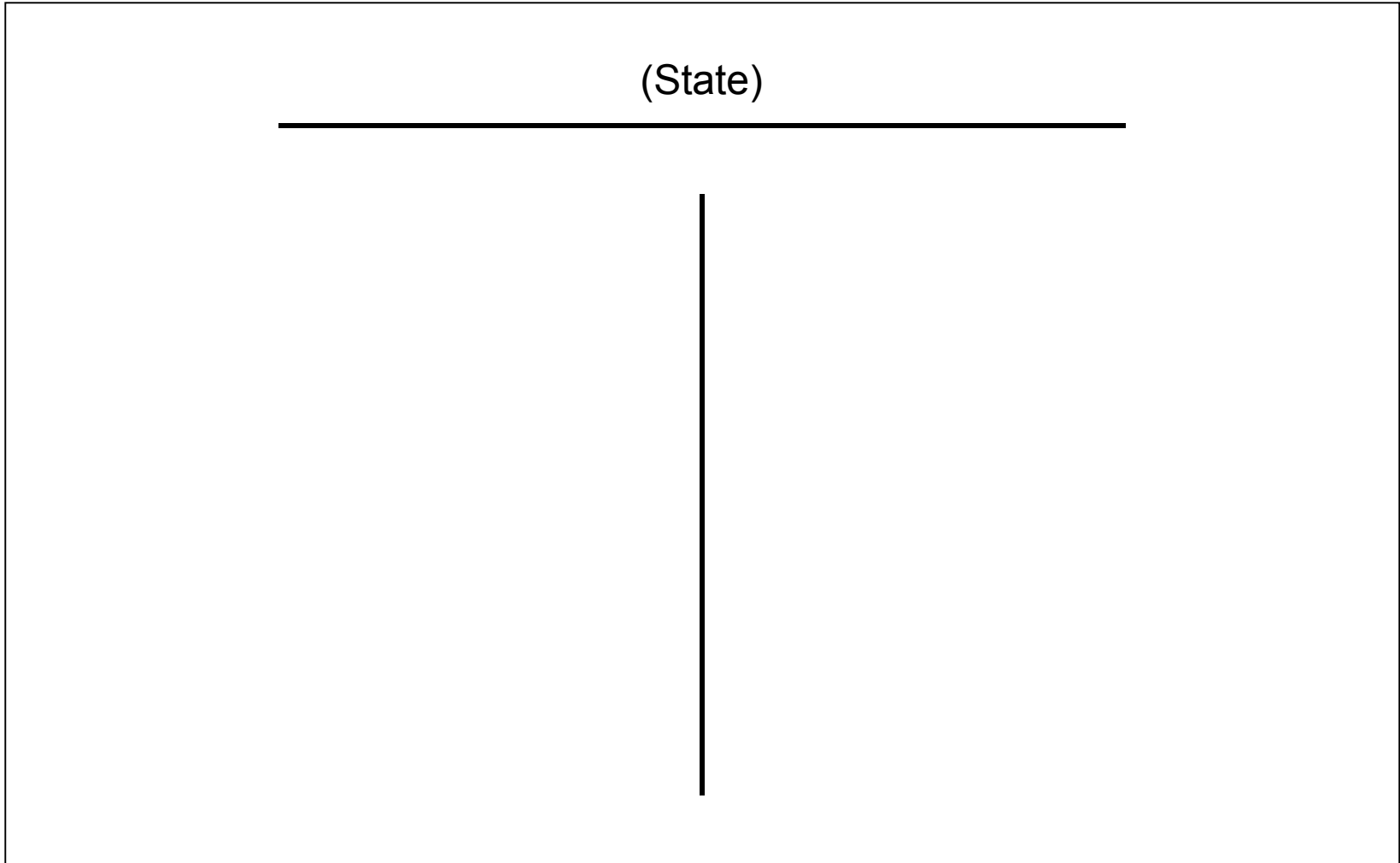
Advanced Options (not required)

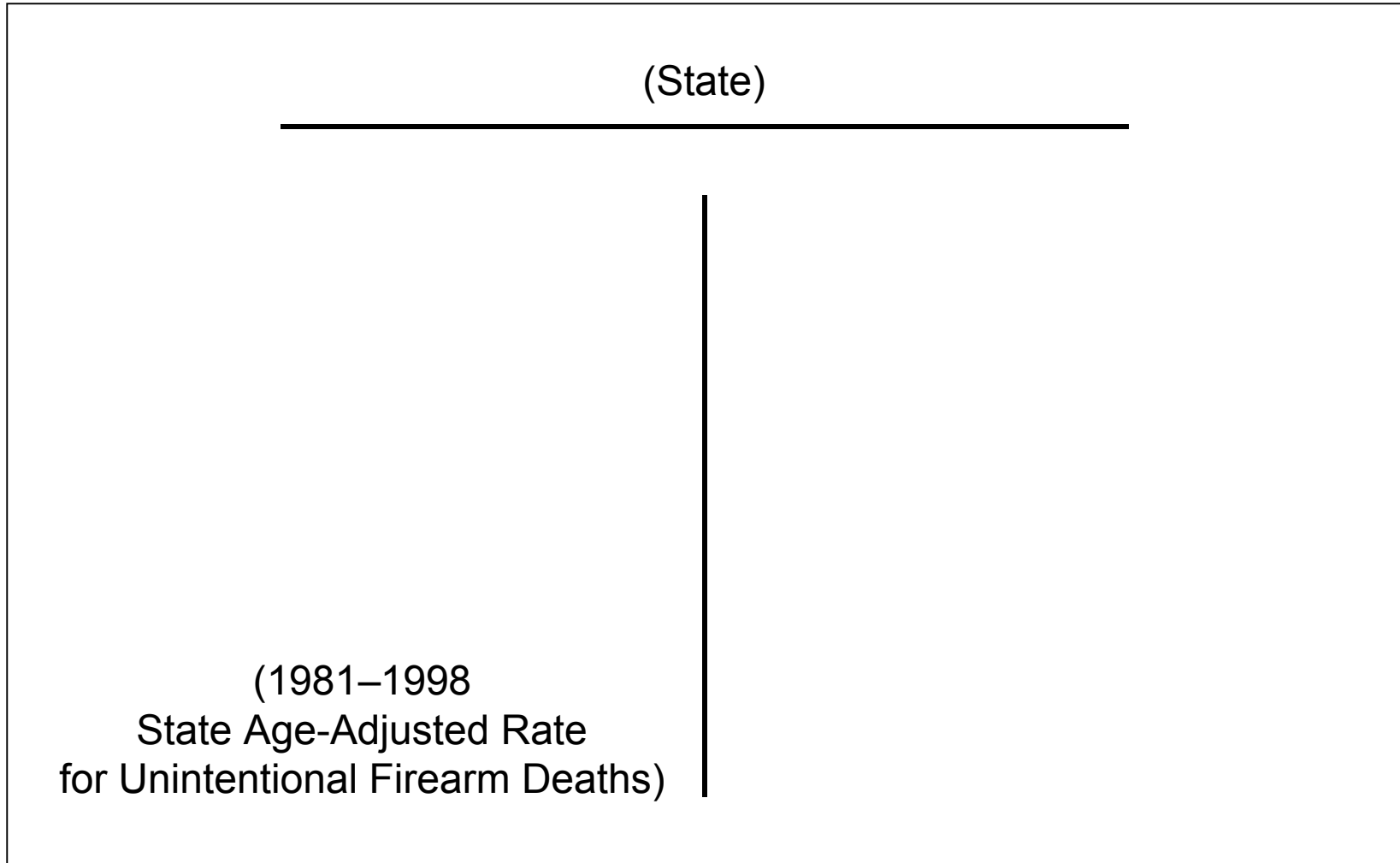
Select age groups

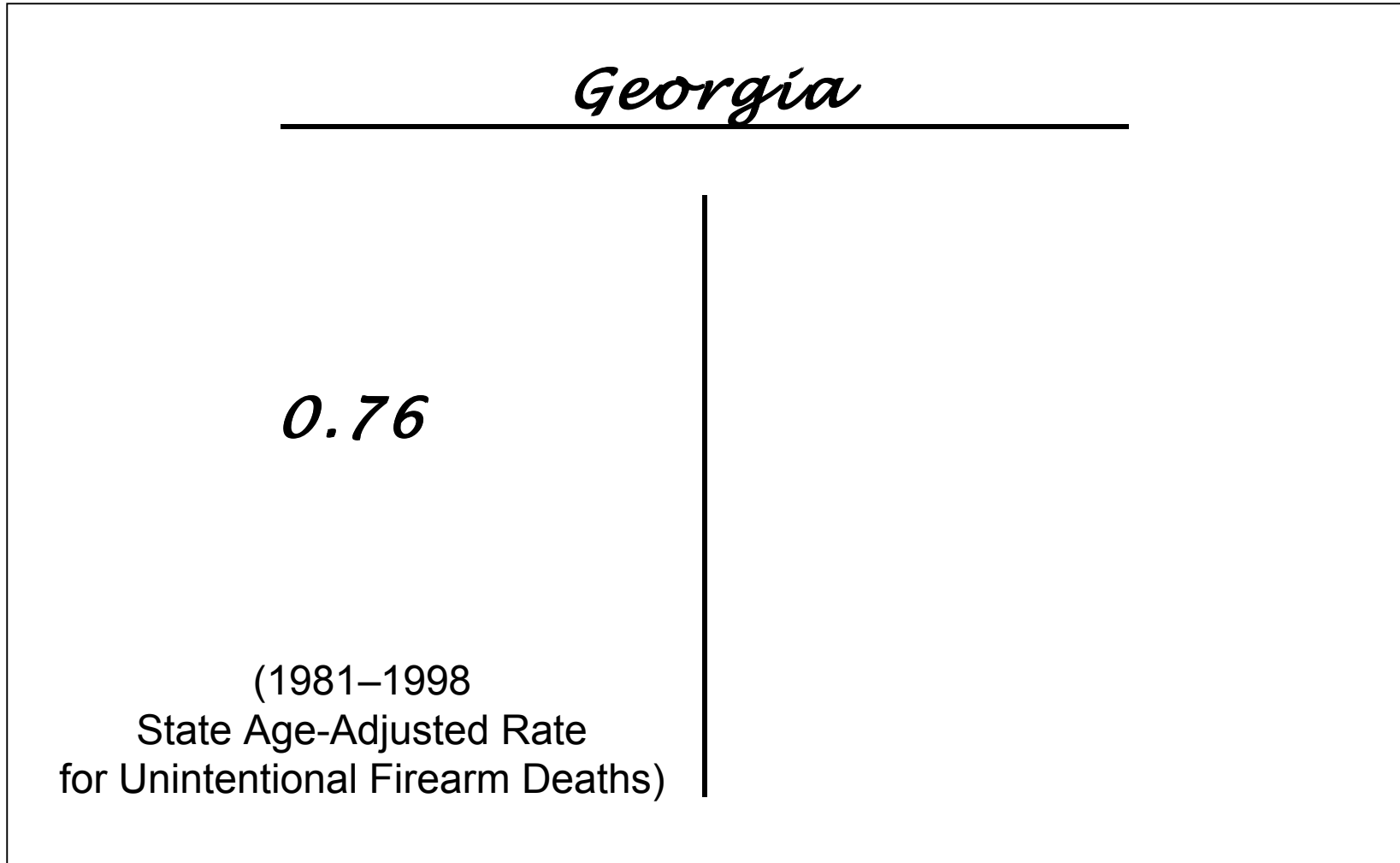
All Ages (includes unknown age)

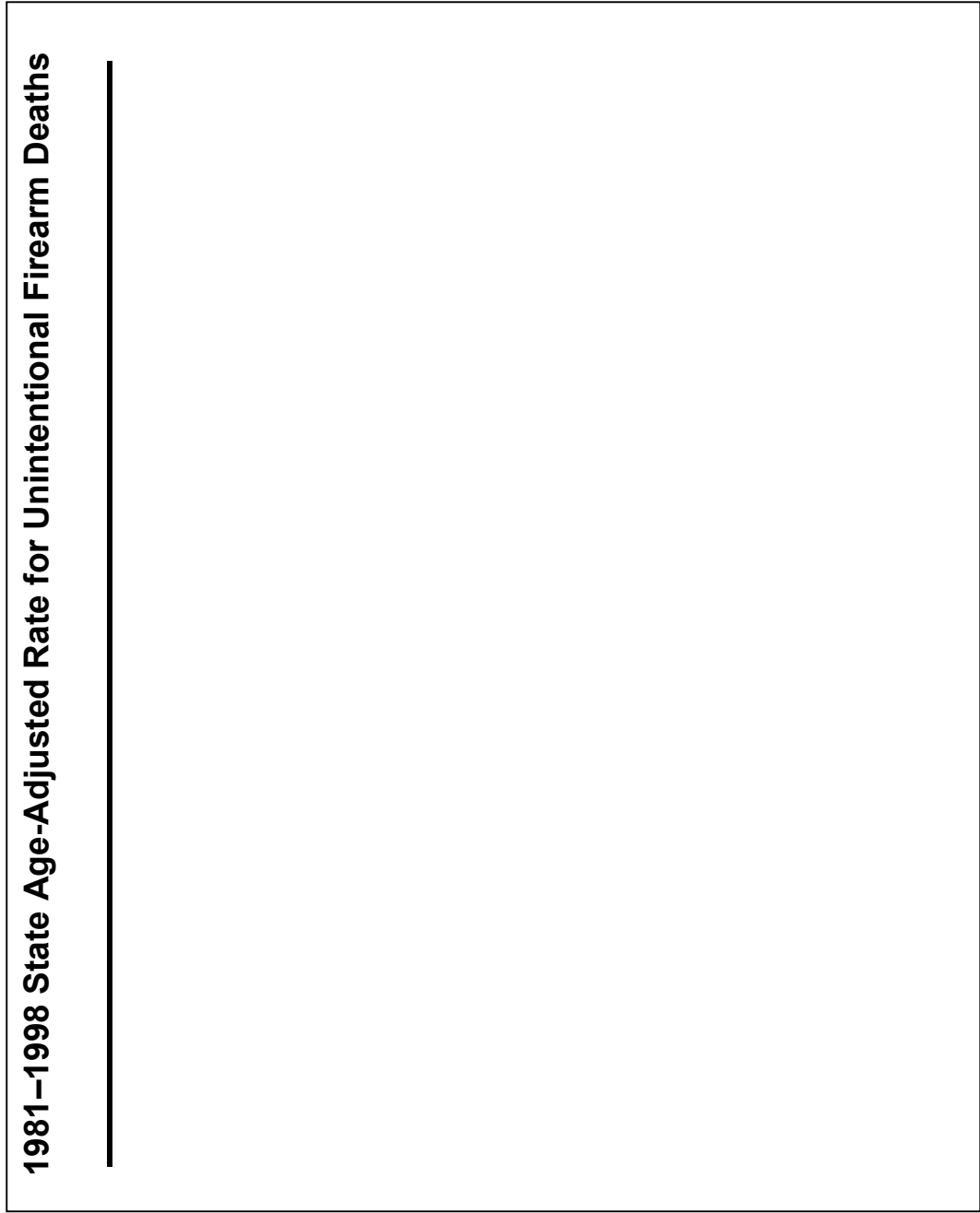
Age Groups 0-4 ▼ to 0-4 ▼

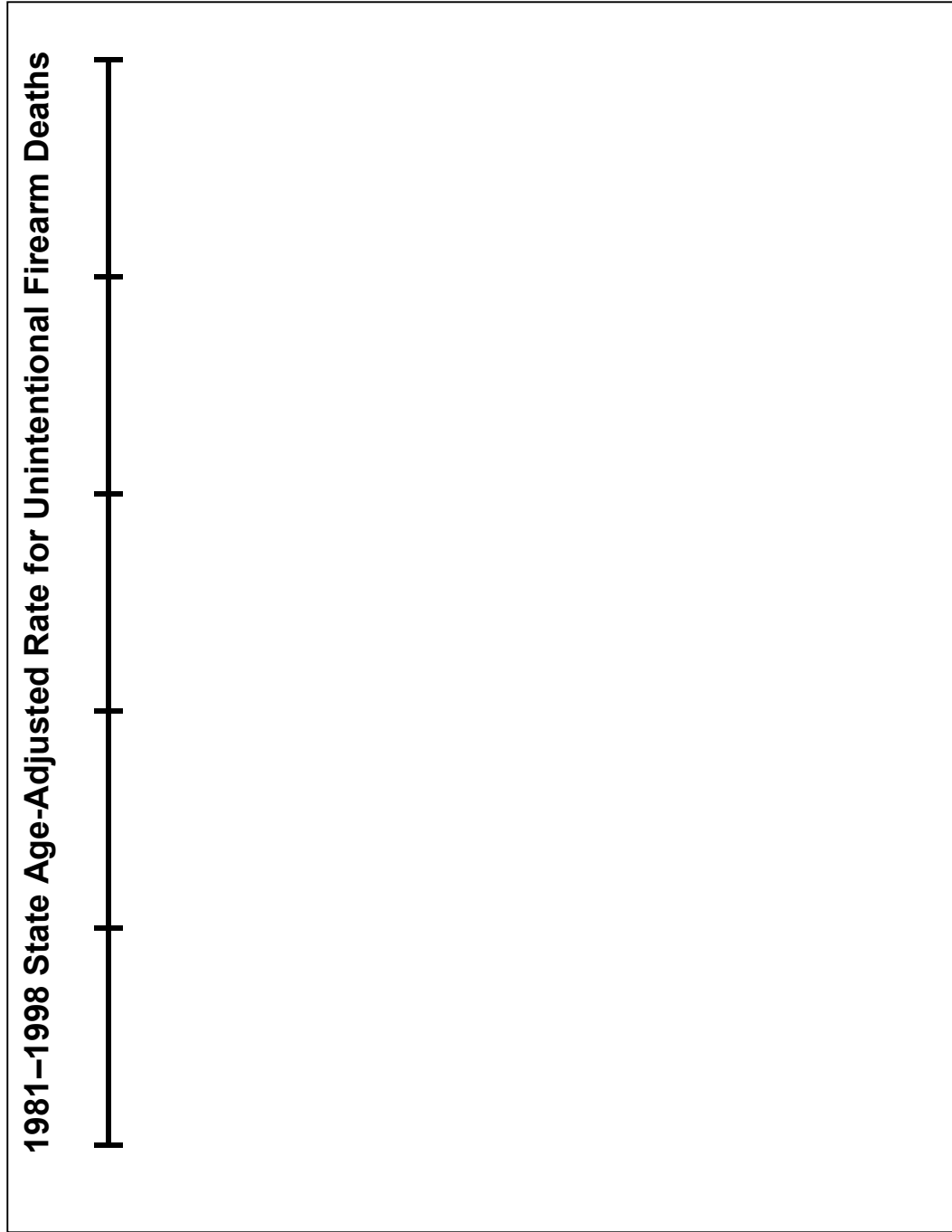
 CDC Home Search Health Topics A-Z					Home Contact Us	
National Center for Injury Prevention and Control					Suicide Deaths and Rates per 100,000 All Races, Both Sexes, All Ages ICD-9 Codes: E950-E959	
NCIPC Home WISQARS Home Help Contact Us					Crude Rate	Age-Adjusted Rate**
State	Number of Deaths	Population***	Crude Rate	Age-Adjusted Rate**		
Alabama	8,915	73,939,772	12.06	12.11	0.95	0.98
Alaska	1,552	9,936,083	15.62	16.48	0.80*	0.68*
Arizona	11,797	67,156,014	17.57	17.75	0.45	0.47
Arkansas	5,582	43,342,111	12.88	12.94	0.49*	0.49*
California	66,458	522,657,082	12.72	13.08	0.16	0.16
Colorado	10,501	61,994,213	16.94	17.23	0.21*	0.21*
Connecticut	5,286	58,731,240	9.00	8.78	0.17*	0.18*
Delaware	1,464	12,057,170	12.14	12.10	0.39*	0.37*
District of Columbia	826	10,973,900	7.53	7.01	0.35*	0.28*
Florida	35,790	230,683,600	15.51	14.61	0.15	0.15
Georgia	14,570	118,254,660	12.32	12.65	0.39	0.41
Hawaii	2,042	19,942,289	10.24	10.35	0.16*	0.15*
Idaho	3,113	19,098,036	16.30	17.16	0.63*	0.58*
Illinois	20,536	209,666,383	9.79	9.85	0.24	0.24
Indiana	12,294	101,349,054	12.13	12.23	0.45	0.44
Iowa	5,950	51,077,850	11.65	11.54	0.34*	0.36*
Kansas	5,518	45,026,259	12.26	12.34	0.48*	0.49*
Kentucky	8,946	67,753,820	13.20	13.27	0.75	0.80

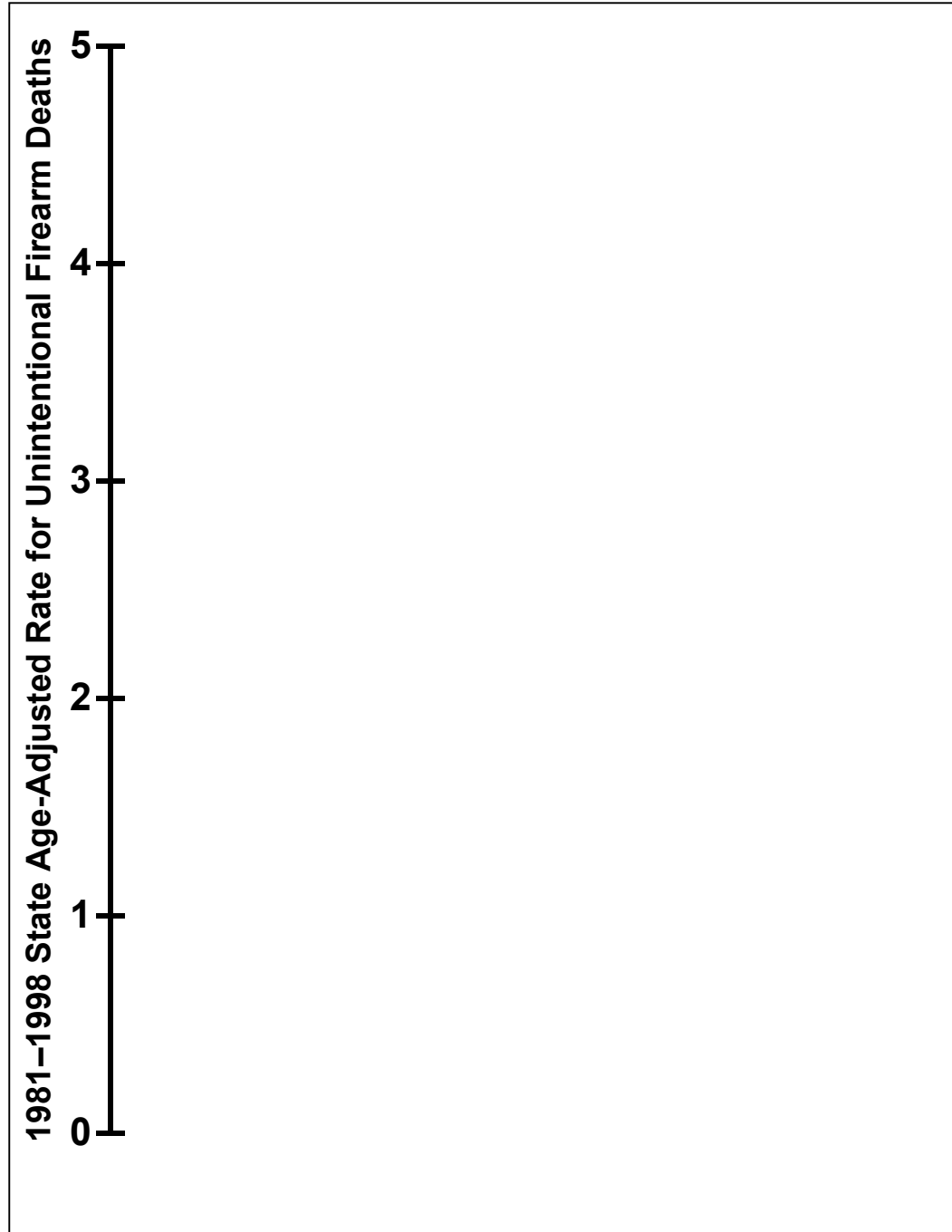


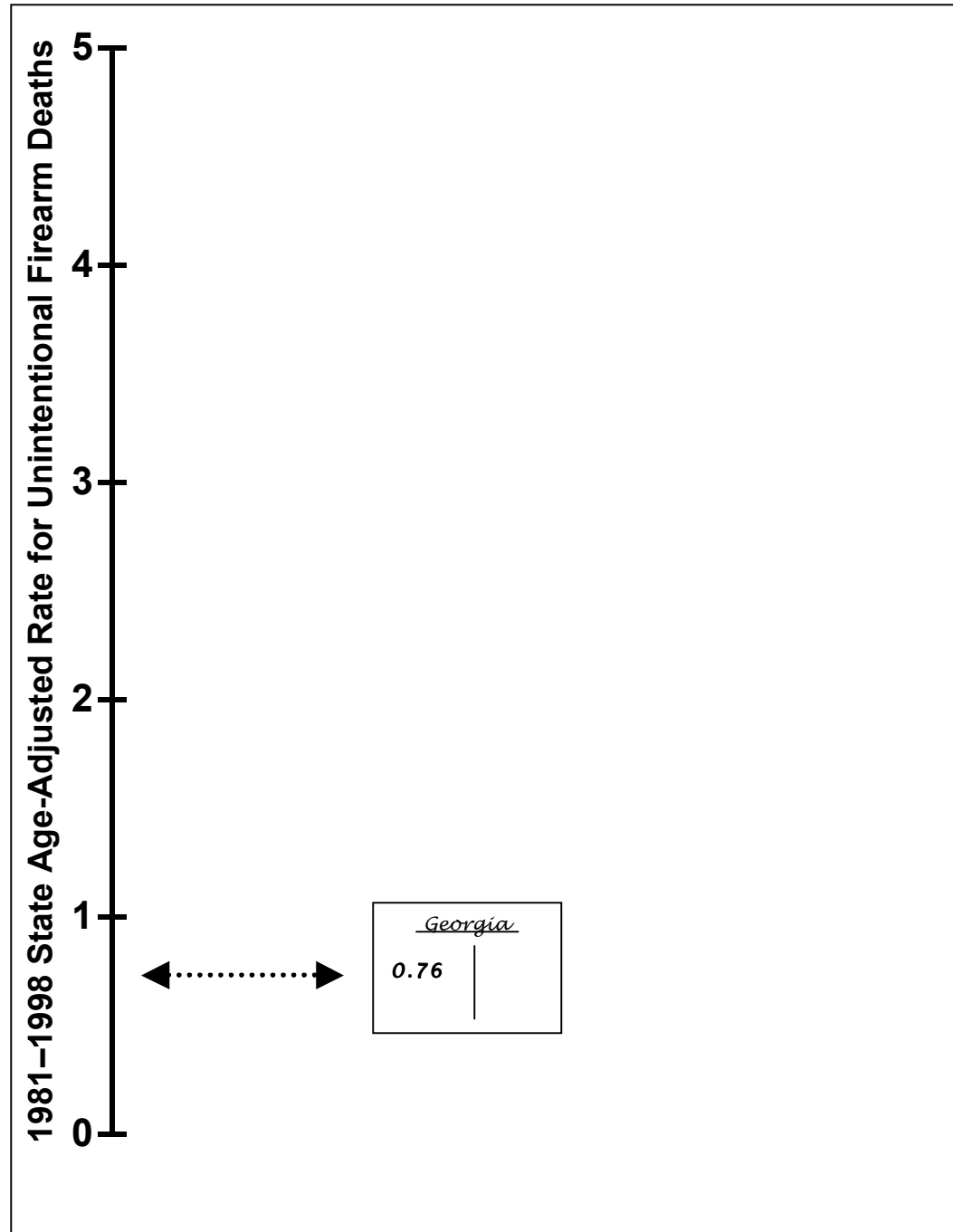












Outlier

“An observation differing so widely from the rest of the data as to lead one to suspect that a gross error may have been committed.”

Harvard Injury Control Research Center



The rates of unintentional firearm deaths would be highest in places where firearms were most available and lowest in places where firearms were least available.

Cook's Index

Average of
the percentage of all suicides committed with a firearm and
the percentage of all homicides committed with a firearm.

Construct

An abstract or general idea
inferred or derived from specific instances.

Did not have
“... any particular
intuitive value.”

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Did not have
“... any particular
intuitive value.”

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

General Social Surveys
Behavioral Risk Factor Surveillance System

Correlation Coefficient


A measure of association that ranges from 1.0 (complete agreement) through 0.0 (no relation) to -1.0 (complete disagreement).

Did not have
“... any particular
intuitive value.”

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Correlation ? (The degree to which variables change together)

General Social Surveys .87 


Behavioral Risk Factor Surveillance System


Did not have
“... any particular
intuitive value.”

Cook's Index

$$\frac{\% \text{ of all suicides committed with a firearm} + \% \text{ of all homicides committed with a firearm}}{2}$$

Correlation ? (The degree to which variables change together)

General Social Surveys .87 

Behavioral Risk Factor Surveillance System .83 

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

$$\frac{\begin{array}{l} \text{Total number of suicides committed with a firearm} \end{array}}{\begin{array}{l} \text{Total number of suicides from all causes} \end{array}}$$

% of all *suicides* committed with a firearm



<http://www.cdc.gov/ncipc/wisqars>

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Total number of suicides committed with a firearm

Total number of suicides from all causes

Total number of suicides committed *with a firearm*

CDC
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CDC Home Search Health Topics A-Z

National Center for Injury Prevention and Control
Facts Data Publications Funding Search Contact Us

Injury Mortality Reports

- [Advanced Options](#)
- [Data from 1999 and later](#)
- [Help](#)

WISQARS

- [Home](#)
- [Injury Mortality Reports](#)
- [Leading Causes of Death](#)
- [Years of Potential Life Lost \(YPLL\)](#)

Search Injury

Search

WISQARS Injury Mortality Reports, 1981-1998

Choose your Report Options, then click the Submit Request button.

For more information about an option or a category of options, click on the underlined name or phrase. To return to this page, click on the "back" button in your browser toolbar.

Report Options

1. What was the intent or manner of the injury? (Select one)

- All Intents
- Unintentional
- Violence-related
 - Homicide and Legal intervention
 - Homicide
 - Legal Intervention
 - Suicide
- Undetermined intent

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects
 - Adverse effects, overall
- Overexertion
- Poisoning
- Struck by / against
- Suffocation

Total number of suicides committed *with a firearm*

Search

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects**
 - Adverse effects, overall
 - Medical care, adverse effects
 - Drugs, adverse effects
- Bites and stings
- Cut / Pierce
- Drowning / Submersion
- Fall
- Fire / Heat**
 - Fire / Burn
 - Fire / Flame
 - Residential fire / Flame
 - Hot object / Substance
 - Firearm
 - Non-Firearm
 - Machinery
 - Natural / Environmental
- Overexertion
- Poisoning
- Struck by / against
- Suffocation
- Transportation-Related**
 - Motor vehicle, overall
 - Motor vehicle, traffic (categorized by injured person)
 - Motorcyclist
 - Occupant
 - Pedal cyclist
 - Pedestrian
 - Unspecified
 - Pedal cyclist
 - Pedal cyclist, other
 - Pedestrian
 - Pedestrian, other
 - Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

10,945

Total number of suicides committed with a firearm

Total number of suicides from all causes

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Total number of suicides committed with a firearm

Total number of suicides from all causes

Total number of suicides *from all causes*

The screenshot shows the CDC National Center for Injury Prevention and Control website. The main heading is "WISQARS Injury Mortality Reports, 1981-1998". Below this, there is a section titled "Report Options" with two questions. The first question, "1. What was the intent or manner of the injury?", has several radio button options, with "Suicide" circled in red. The second question, "2. What was the cause or mechanism of the injury?", also has several radio button options.

WISQARS Injury Mortality Reports, 1981-1998

Choose your Report Options, then click the Submit Request button.

For more information about an option or a category of options, click on the underlined name or phrase. To return to this page, click on the "back" button in your browser toolbar.

Report Options

1. What was the intent or manner of the injury? (Select one)

- All Intents
- Unintentional
- Violence-related
 - Homicide and Legal intervention
 - Homicide
 - Legal Intervention
 - Suicide
 - Undetermined intent

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects
 - Adverse effects, overall
- Overexertion
- Poisoning
- Struck by / against
- Suffocation

Total number of suicides *from all causes*

Search

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects**
 - Adverse effects, overall
 - Medical care, adverse effects
 - Drugs, adverse effects
- Bites and stings
- Cut / Pierce
- Drowning / Submersion
- Fall
- Fire / Heat**
 - Fire / Burn
 - Fire / Flame
 - Residential fire / Flame
 - Hot object / Substance
- Firearm
- Non-Firearm
- Machinery
- Natural / Environmental
- Overexertion
- Poisoning
- Struck by / against
- Suffocation
- Transportation-Related**
 - Motor vehicle, overall
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 - Unspecified
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 - Pedal cyclist, other
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 - Pedestrian, other
 - Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

Total number of suicides committed with a firearm

14,570

Total number of suicides from all causes

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

10,945

Total number of suicides committed with a firearm

14,570

Total number of suicides from all causes

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

10,945
Total number of suicides committed with a firearm

14,570
Total number of suicides from all causes

= .751

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

75.1%

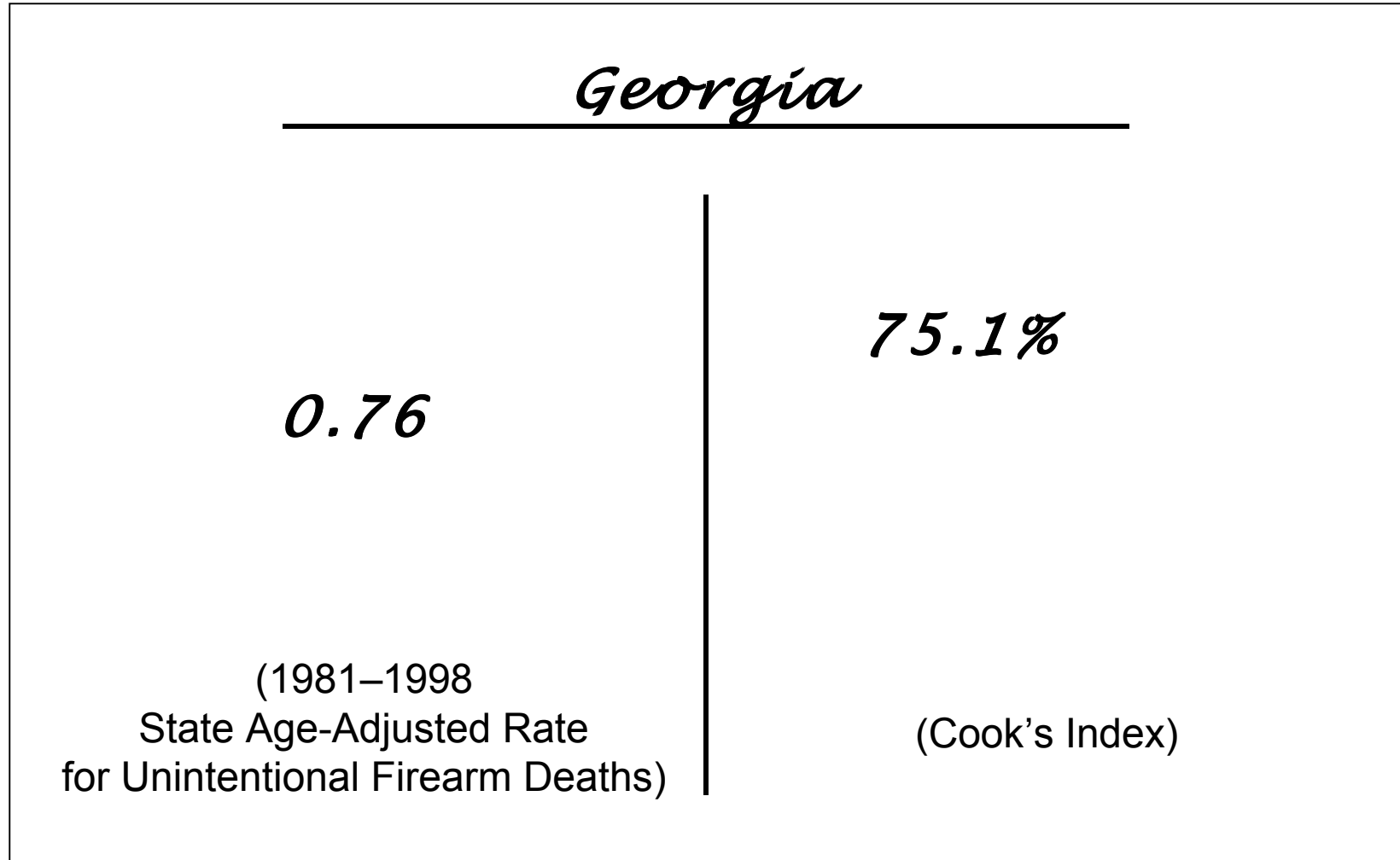
Georgia

10,945
Total number of suicides committed with a firearm

14,570
Total number of suicides from all causes

= .751

% of all *suicides* committed with a firearm



Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Total number of homicides committed with a firearm

Total number of homicides from all causes

Total number of homicides committed *with a firearm*

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Injury Mortality Reports

- [Advanced Options](#)
- [Data from 1999 and later](#)
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WISQARS

- [Home](#)
- [Injury Mortality Reports](#)
- [Leading Causes of Death](#)
- [Years of Potential Life Lost \(YPLL\)](#)

Search Injury

Search

WISQARS Injury Mortality Reports, 1981-1998

Choose your Report Options, then click the Submit Request button.

For more information about an option or a category of options, click on the underlined name or phrase. To return to this page, click on the "back" button in your browser toolbar.

Report Options

1. What was the intent or manner of the injury? (Select one)

- All Intents
- Unintentional
- Violence-related
 - Homicide and Legal intervention
 - Homicide
 - Legal Intervention
 - Suicide
- Undetermined intent

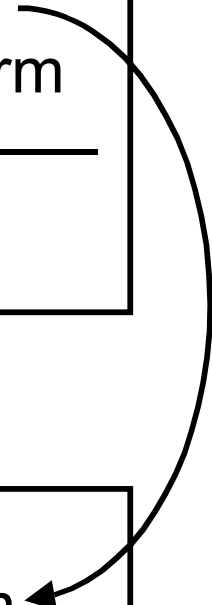
2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects
 - Adverse effects, overall
- Overexertion
- Poisoning
- Struck by / against
- Suffocation

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

$$\frac{\begin{array}{l} \text{Total number of homicides committed with a firearm} \end{array}}{\begin{array}{l} \text{Total number of homicides from all causes} \end{array}}$$



Total number of homicides committed *with a firearm*

Search

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects**
 - Adverse effects, overall
 - Medical care, adverse effects
 - Drugs, adverse effects
- Bites and stings
- Cut / Pierce
- Drowning / Submersion
- Fall
- Fire / Heat**
 - Fire / Burn
 - Fire / Flame
 - Residential fire / Flame
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 - Pedal cyclist, other
 - Pedestrian
 - Pedestrian, other
 - Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

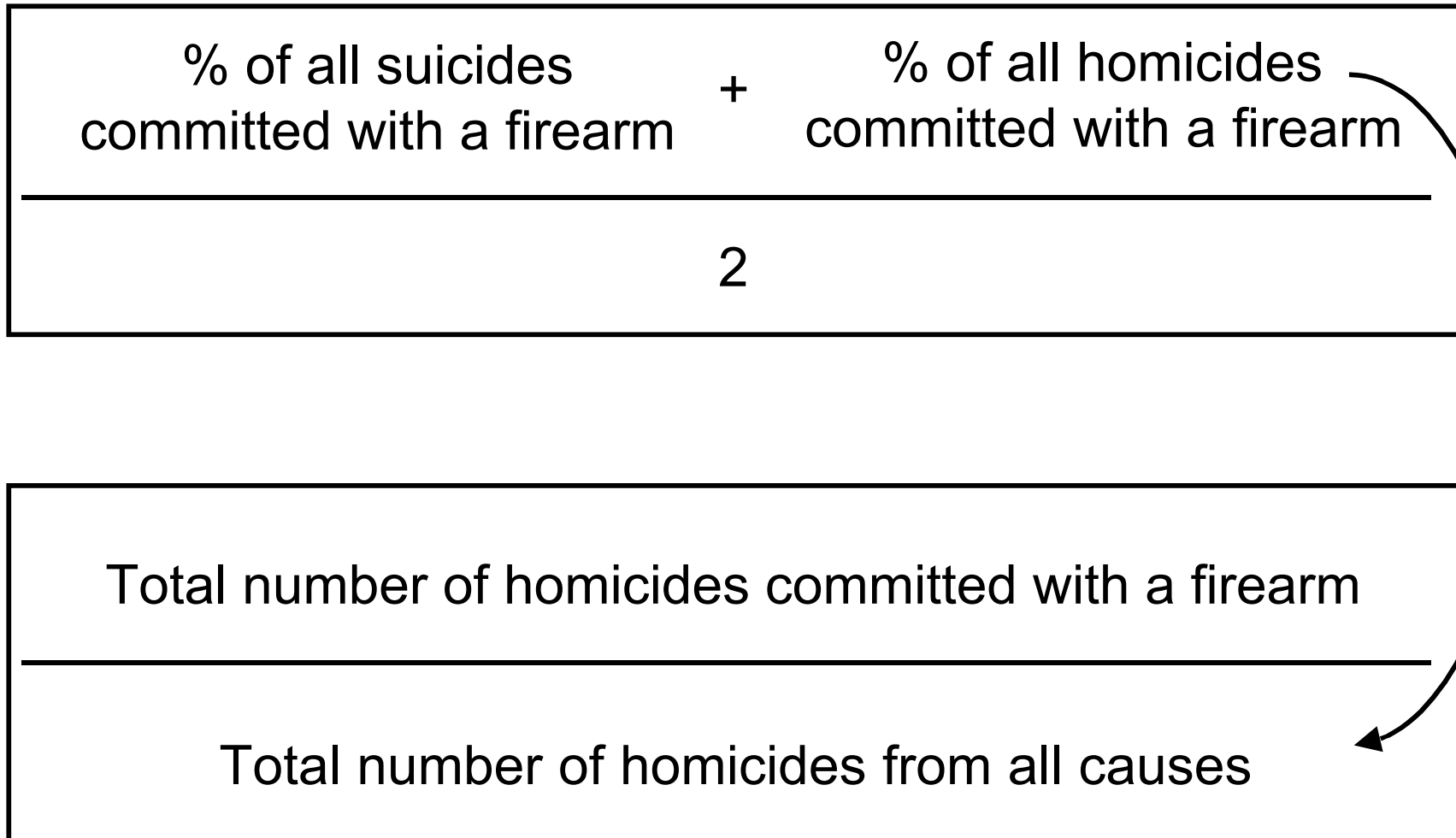
Georgia

9,408

Total number of homicides committed with a firearm

Total number of homicides from all causes

Cook's Index



Total number of homicides *from all causes*

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Injury Mortality Reports

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WISQARS

- [Home](#)
- [Injury Mortality Reports](#)
- [Leading Causes of Death](#)
- [Years of Potential Life Lost \(YPLL\)](#)

Search Injury

Search

WISQARS Injury Mortality Reports, 1981-1998

Choose your Report Options, then click the Submit Request button.

For more information about an option or a category of options, click on the underlined name or phrase. To return to this page, click on the "back" button in your browser toolbar.

Report Options

1. What was the intent or manner of the injury? (Select one)

- All Intents
- Unintentional
- Violence-related
 - Homicide and Legal intervention
 - Homicide
 - Legal Intervention
 - Suicide
- Undetermined intent

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects
 - Adverse effects, overall
- Overexertion
- Poisoning
- Struck by / against
- Suffocation

Total number of homicides *from all causes*

Search

2. What was the cause or mechanism of the injury? (Select one)

- All injury
- All injury and adverse effects
- Adverse Effects**
 - Adverse effects, overall
 - Medical care, adverse effects
 - Drugs, adverse effects
- Bites and stings
- Cut / Pierce
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 - Unspecified
 - Pedal cyclist
 - Pedal cyclist, other
 - Pedestrian
 - Pedestrian, other
 - Transport, other
- Other specified and classifiable
- Other specified / NEC
- Unspecified

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

$$\frac{\begin{array}{l} \text{Total number of homicides committed with a firearm} \\ \hline \mathbf{13,930} \end{array}}{\begin{array}{l} \text{Total number of homicides from all causes} \end{array}}$$

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

$$\frac{\begin{array}{l} \mathbf{9,408} \\ \text{Total number of homicides committed with a firearm} \end{array}}{\begin{array}{l} \mathbf{13,930} \\ \text{Total number of homicides from all causes} \end{array}}$$

Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

Georgia

$$\frac{\begin{array}{l} \mathbf{9,408} \\ \text{Total number of homicides committed with a firearm} \end{array}}{\begin{array}{l} \mathbf{13,930} \\ \text{Total number of homicides from all causes} \end{array}} = \mathbf{.675}$$

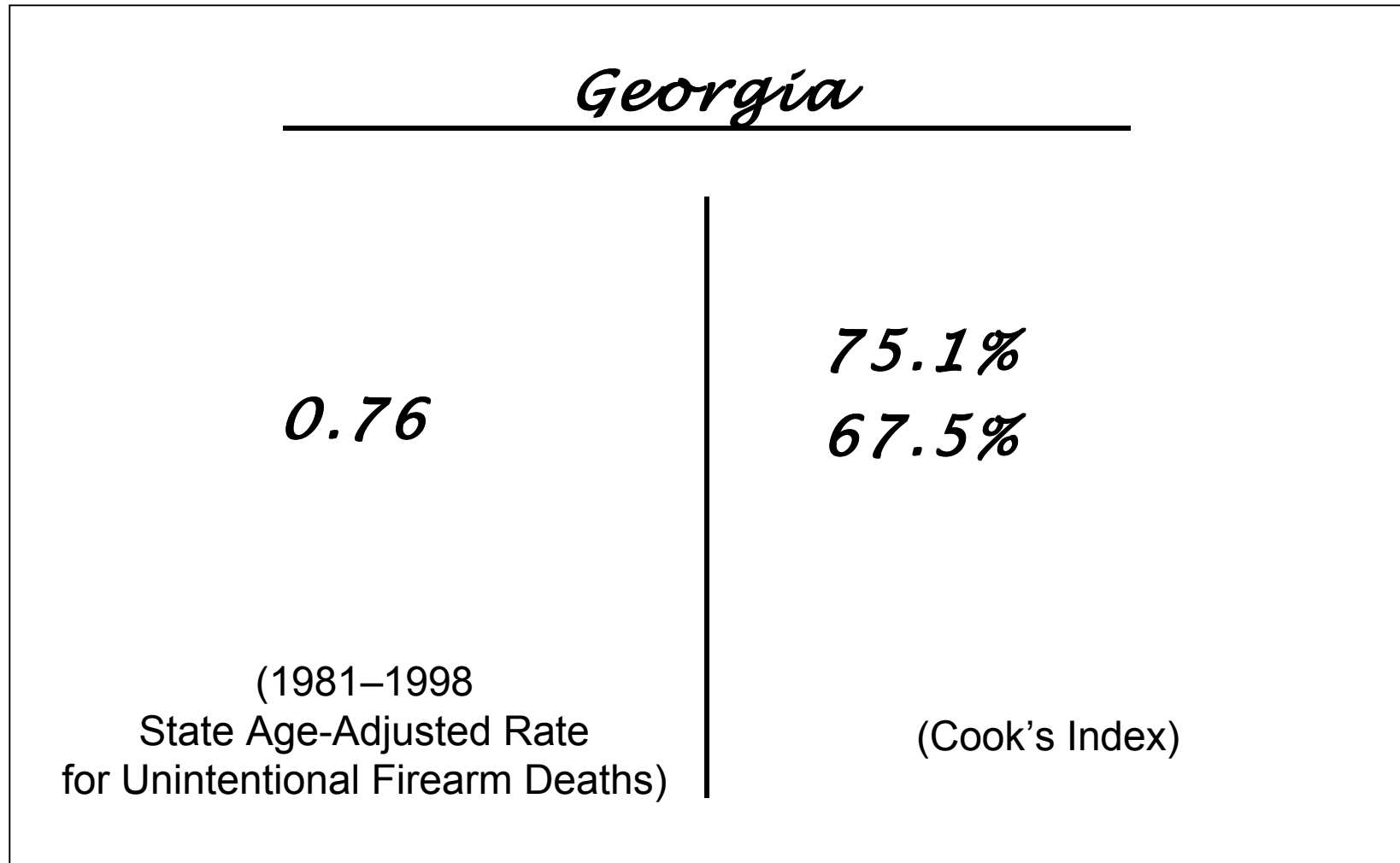
Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

67.5%

Georgia	9,408
Total number of homicides committed with a firearm	
<hr/>	
	13,930
Total number of homicides from all causes	
	= .675

% of all *homicides* committed with a firearm



Cook's Index

$$\frac{\begin{array}{l} \% \text{ of all suicides} \\ \text{committed with a firearm} \end{array} + \begin{array}{l} \% \text{ of all homicides} \\ \text{committed with a firearm} \end{array}}{2}$$

(Note: The image contains large, semi-transparent watermarks of '75.1%' and '67.5%' overlaid on the terms 'suicides' and 'homicides' respectively.)

Cook's Index

Georgia

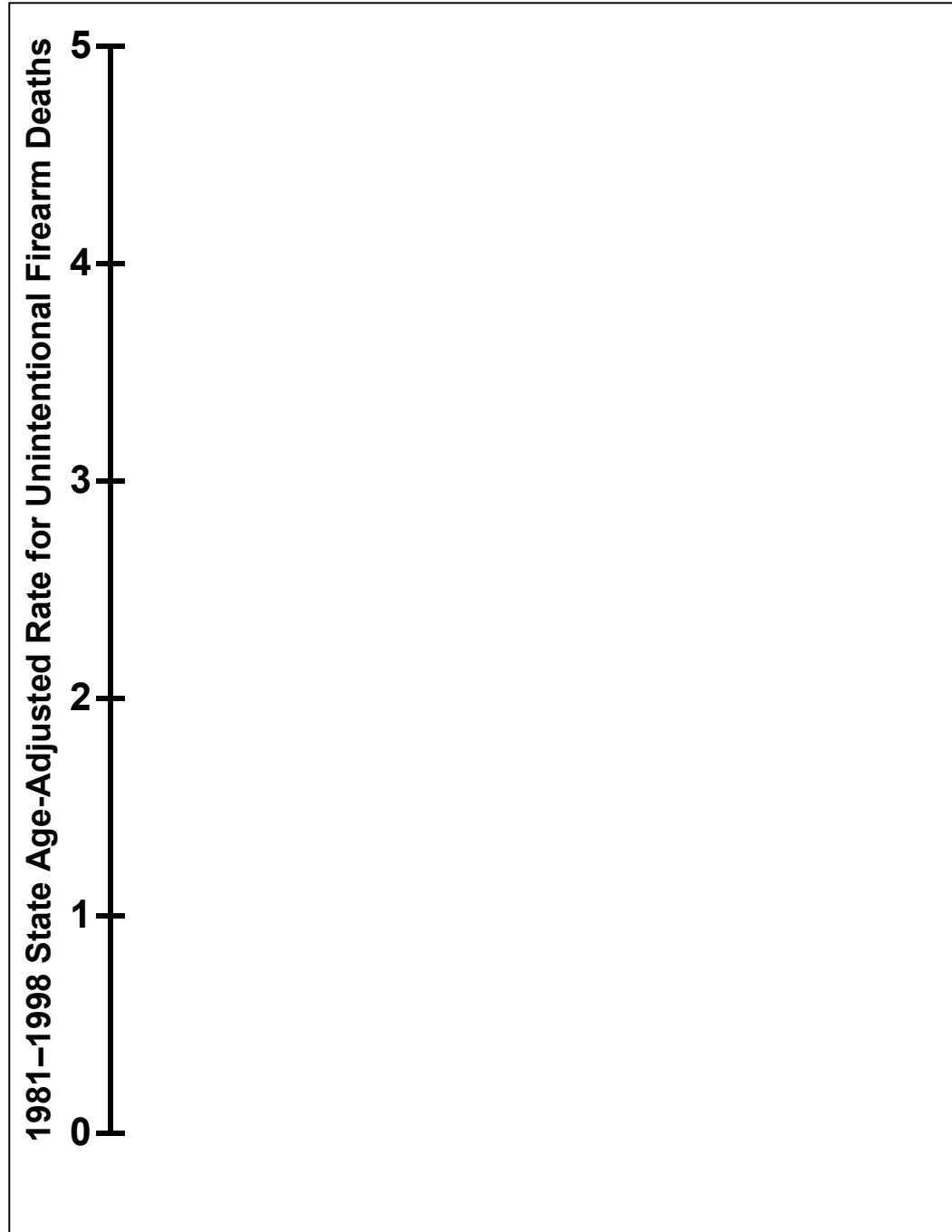
<i>0.76</i>	+	<i>67.5%</i>
		<u><i>75.1%</i></u>
		<i>142.6 / 2 = 71.3</i>

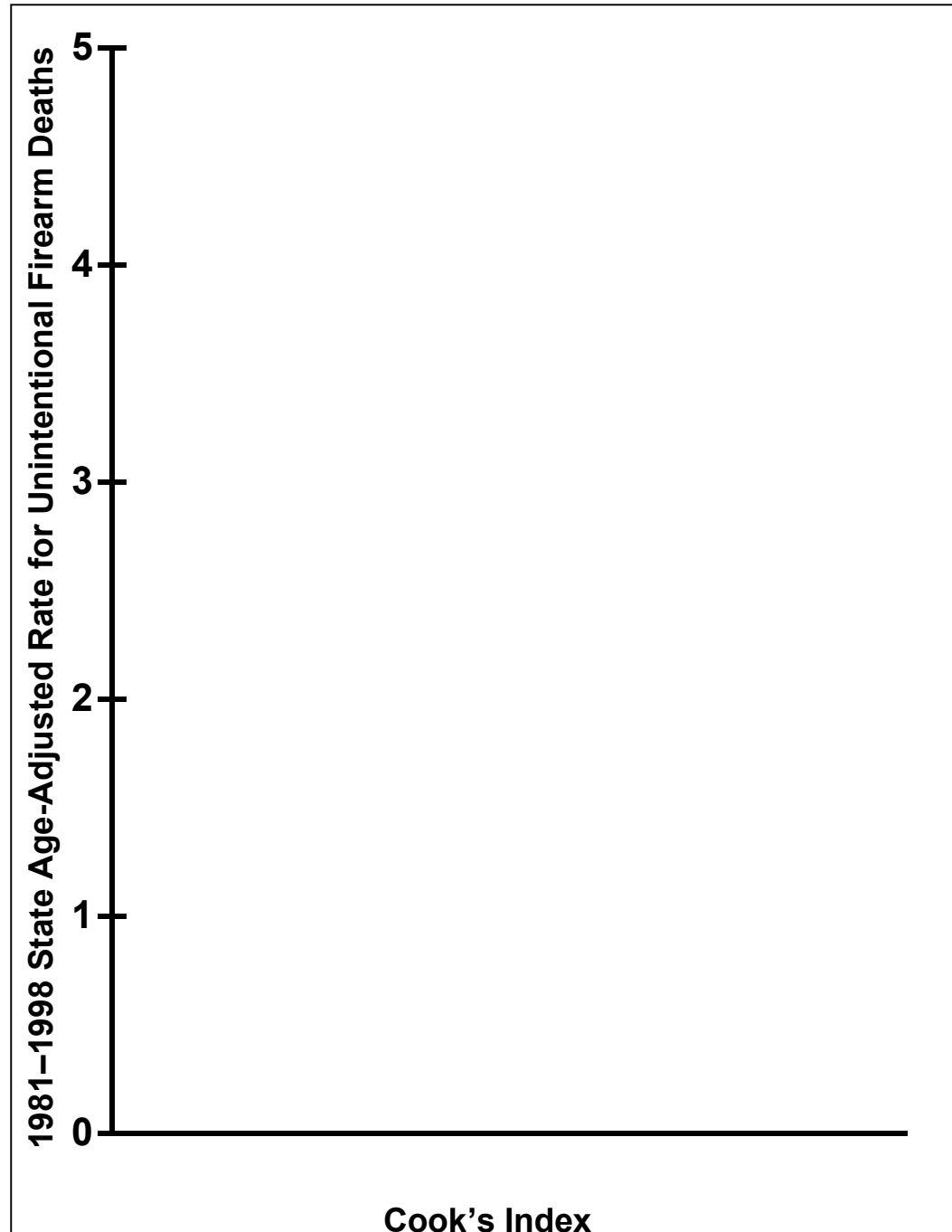
(1981–1998
State Age-Adjusted Rate
for Unintentional Firearm Deaths)

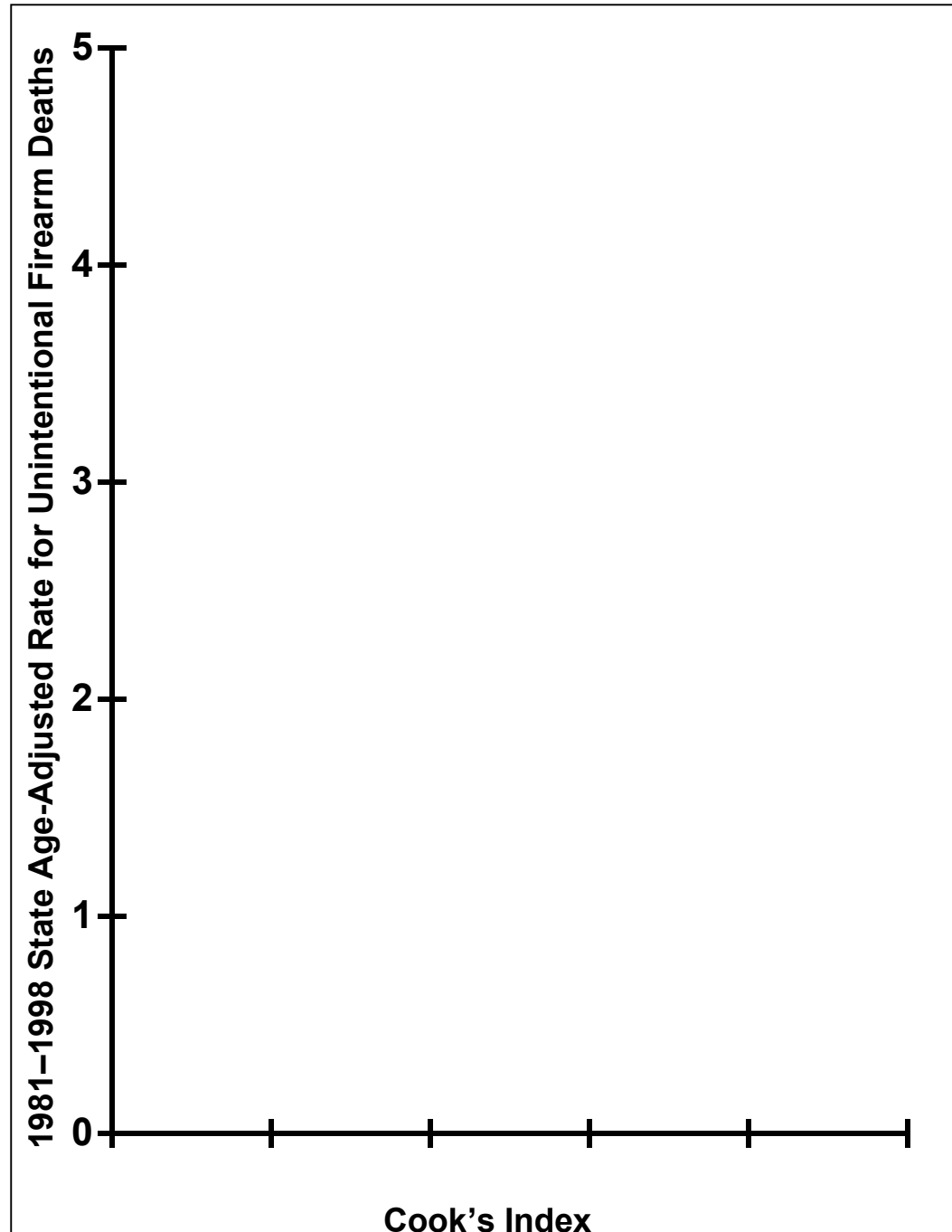
(Cook's Index)

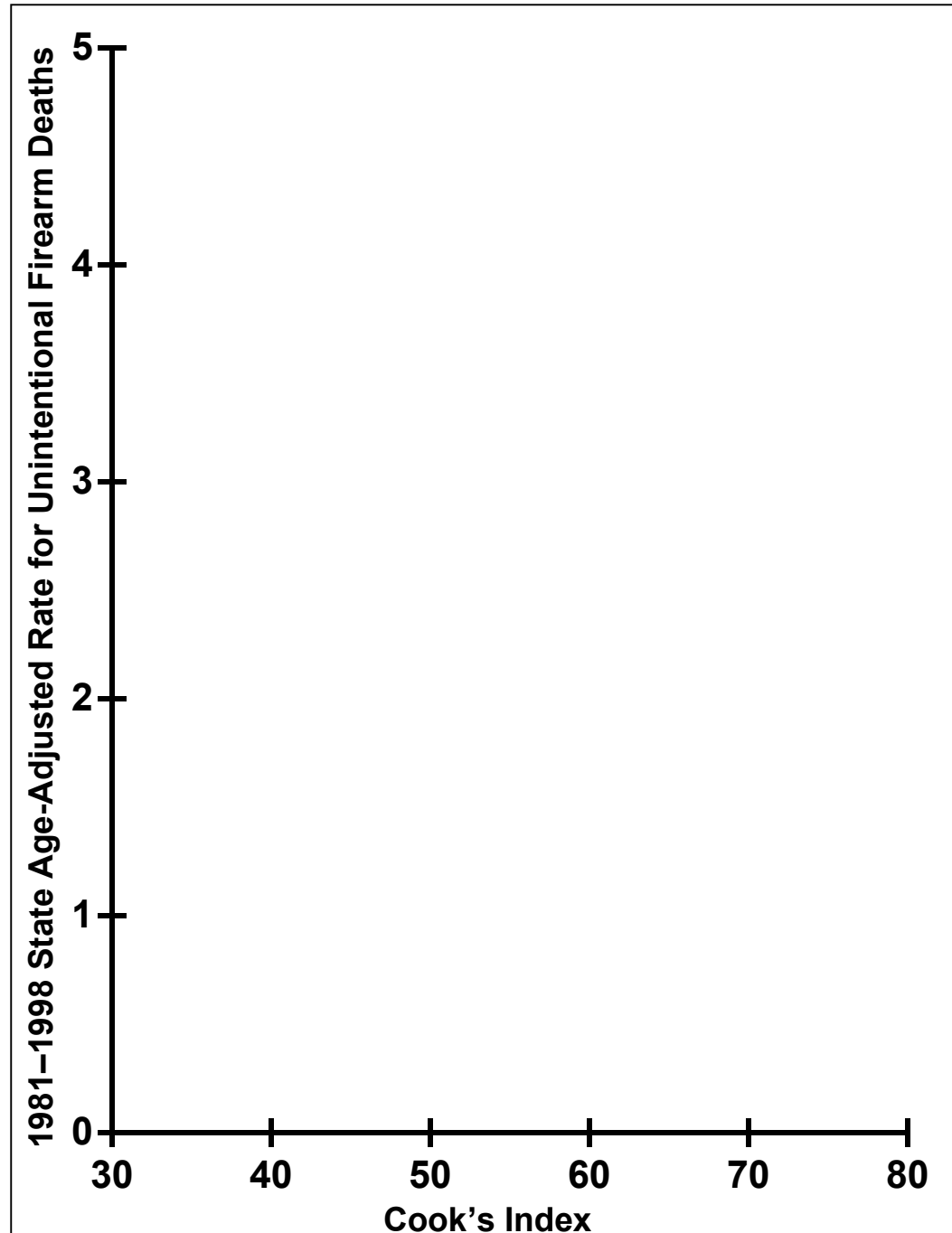
Teacher's Cook's Index Sheet (Alphabetical Order)

State	A	B	C
	"% of All <u>Suicides</u> Committed with a Firearm"	"% of All <u>Homicides</u> Committed with a Firearm"	Cook's Index (Column A + Column B) / 2
Alabama	78.0%	70.4%	74.2
Alaska	70.5%	61.3%	65.9
Arizona	67.3%	62.9%	65.1
Arkansas	76.4%	69.2%	72.8
California	52.6%	66.8%	59.7
Colorado	57.2%	56.4%	56.8
Connecticut	43.1%	63.7%	53.4
Delaware	48.4%	47.9%	48.2
D.C.	34.5%	72.4%	53.5
Florida	60.6%	66.0%	63.3
Georgia	75.1%	67.5%	71.3
Hawaii	29.3%	40.3%	34.8
Idaho	69.6%	59.8%	64.7
Illinois	45.6%	64.1%	54.9
Indiana	61.7%	68.3%	65.0
Iowa	54.5%	52.5%	53.5
Kansas	64.3%	64.8%	65.0
Kentucky	74.6%	69.9%	72.3
Louisiana	76.6%	74.5%	75.6
Maine	59.0%	52.4%	55.7
Maryland	55.1%	68.6%	61.9
Massachusetts	30.5%	46.8%	38.7
Michigan	55.8%	67.4%	61.6
Minnesota	49.9%	49.7%	49.8
Mississippi	34.7%	68.3%	51.5
Missouri	63.6%	68.4%	66.0
Montana	66.9%	58.4%	62.7
Nebraska	58.2%	59.0%	58.6
Nevada	67.3%	60.5%	63.9
New Hampshire	55.9%	48.5%	52.2
New Jersey	35.1%	48.6%	41.9
New Mexico	64.3%	54.6%	59.5
New York	37.5%	64.8%	51.2
North Carolina	71.4%	67.0%	69.2
North Dakota	58.4%	51.9%	55.2
Ohio	58.1%	63.0%	61.0
Oklahoma	69.9%	60.6%	65.3
Oregon	61.8%	55.0%	58.4
Pennsylvania	54.4%	60.7%	57.6
Rhode Island	32.4%	47.9%	40.2
South Carolina	72.5%	65.3%	68.9
South Dakota	60.6%	35.4%	48.0
Tennessee	74.0%	69.8%	71.9
Texas	69.3%	68.6%	69.0
Utah	61.0%	51.7%	56.4
Vermont	65.7%	59.6%	62.7
Virginia	66.8%	68.4%	67.6
Washington	56.1%	55.8%	56.0
West Virginia	74.9%	68.8%	71.9
Wisconsin	52.7%	59.3%	56.0
Wyoming	74.1%	55.6%	64.9





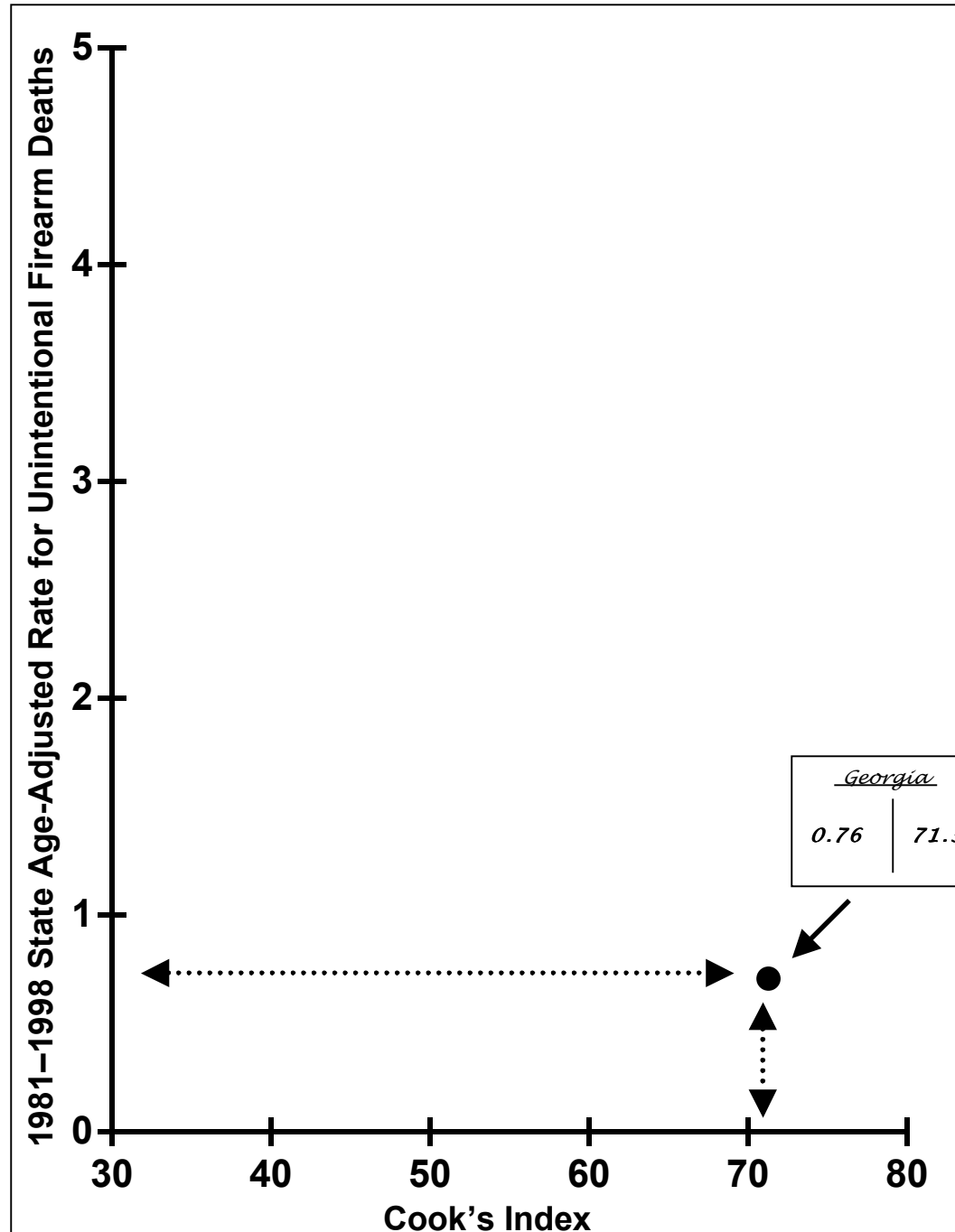


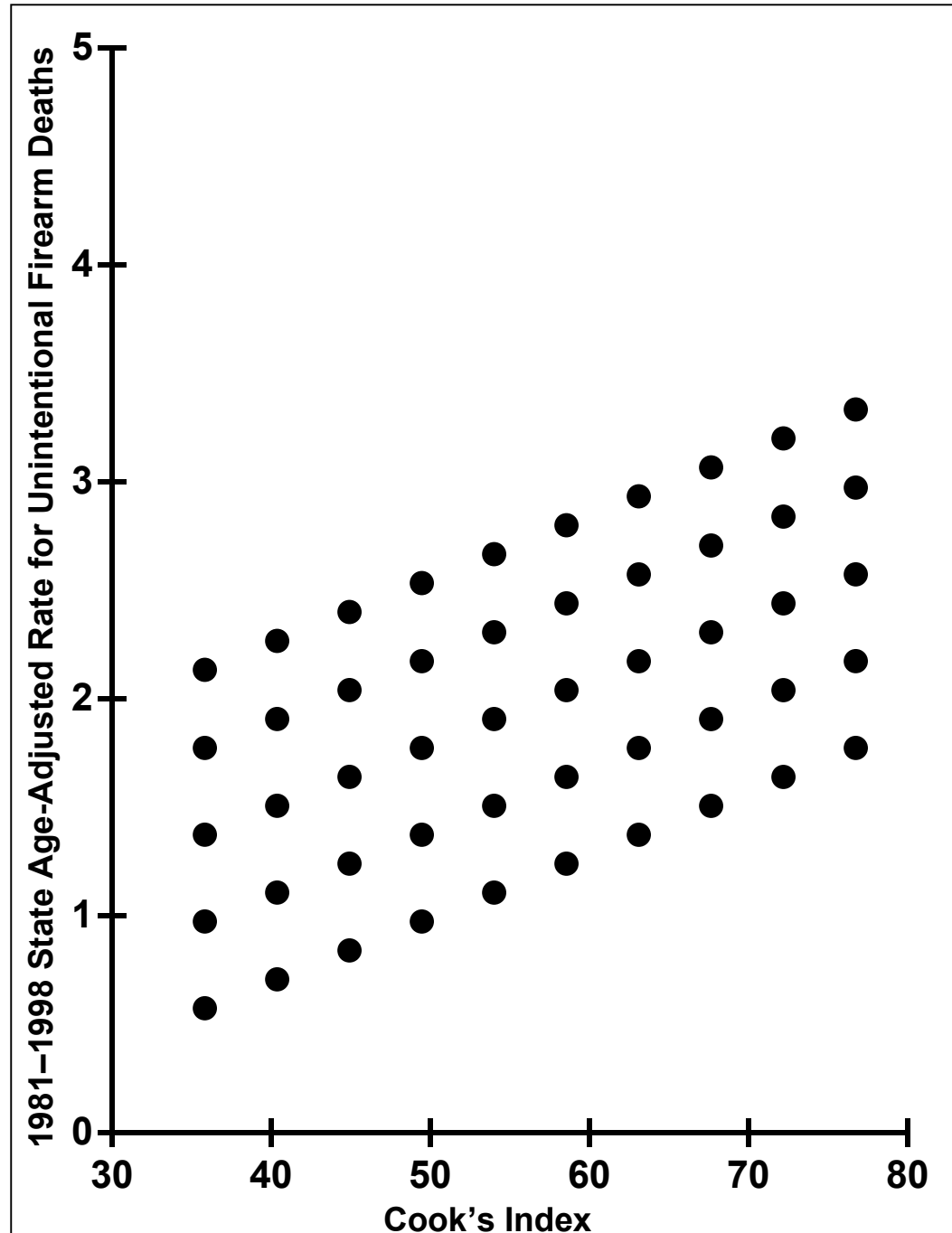


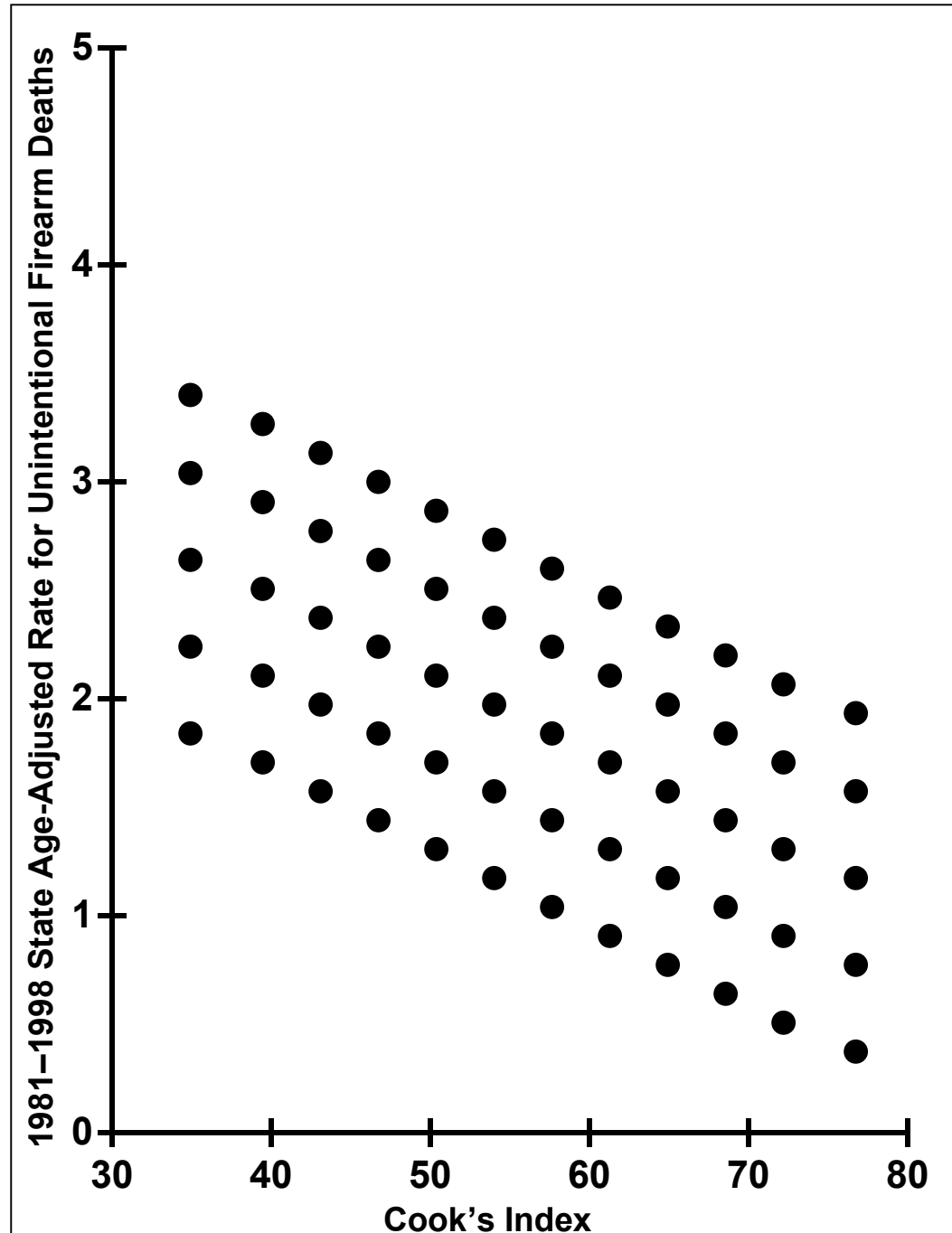
Harvard Injury Control Research Center

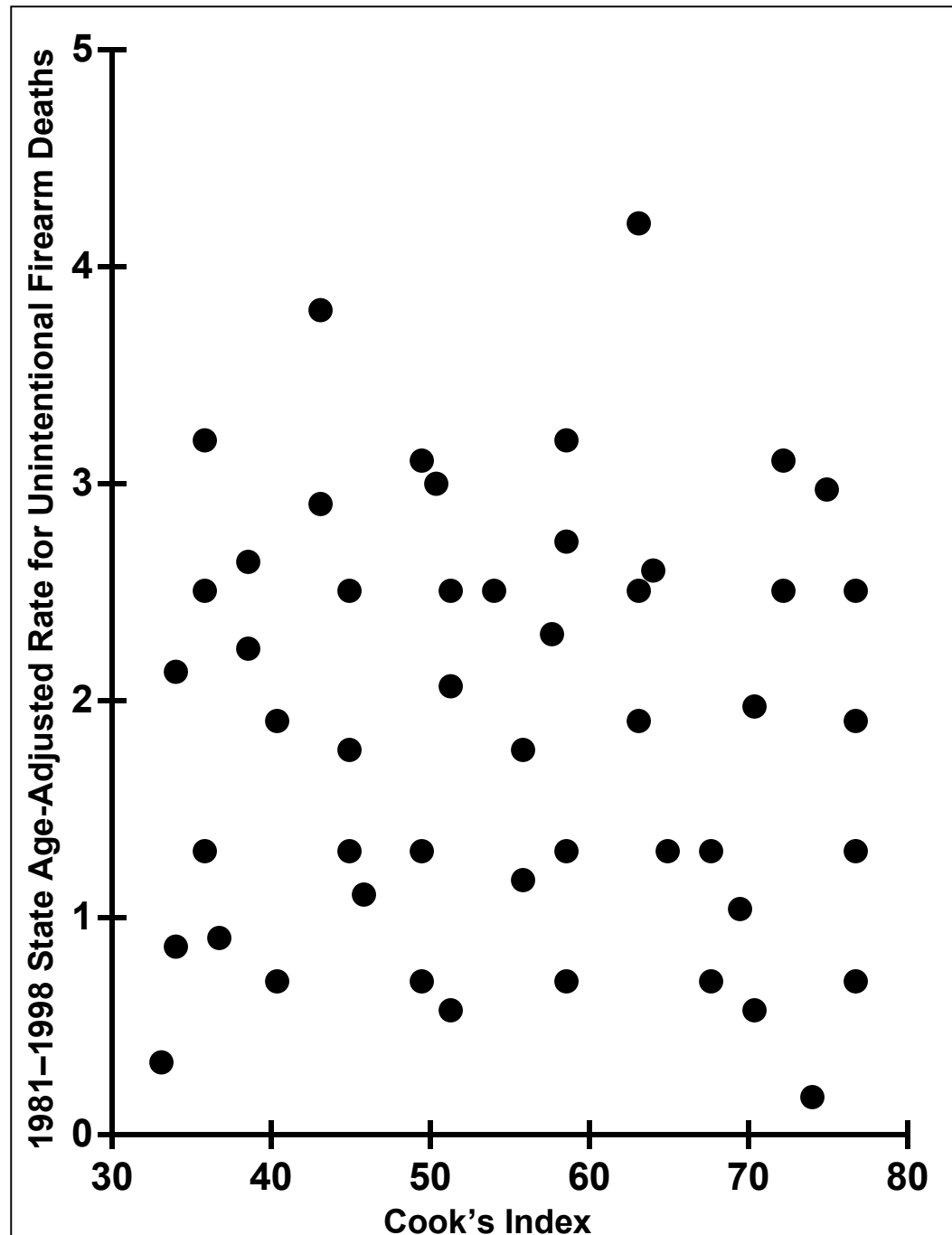


The rates of unintentional firearm deaths would be highest in places where firearms were most available and lowest in places where firearms were least available.









Scatterplot Diagram

A graphic method of displaying the distribution of two variables in relationship to each other, with the values of one variable measured on the vertical axis and the values of the other on the horizontal axis.

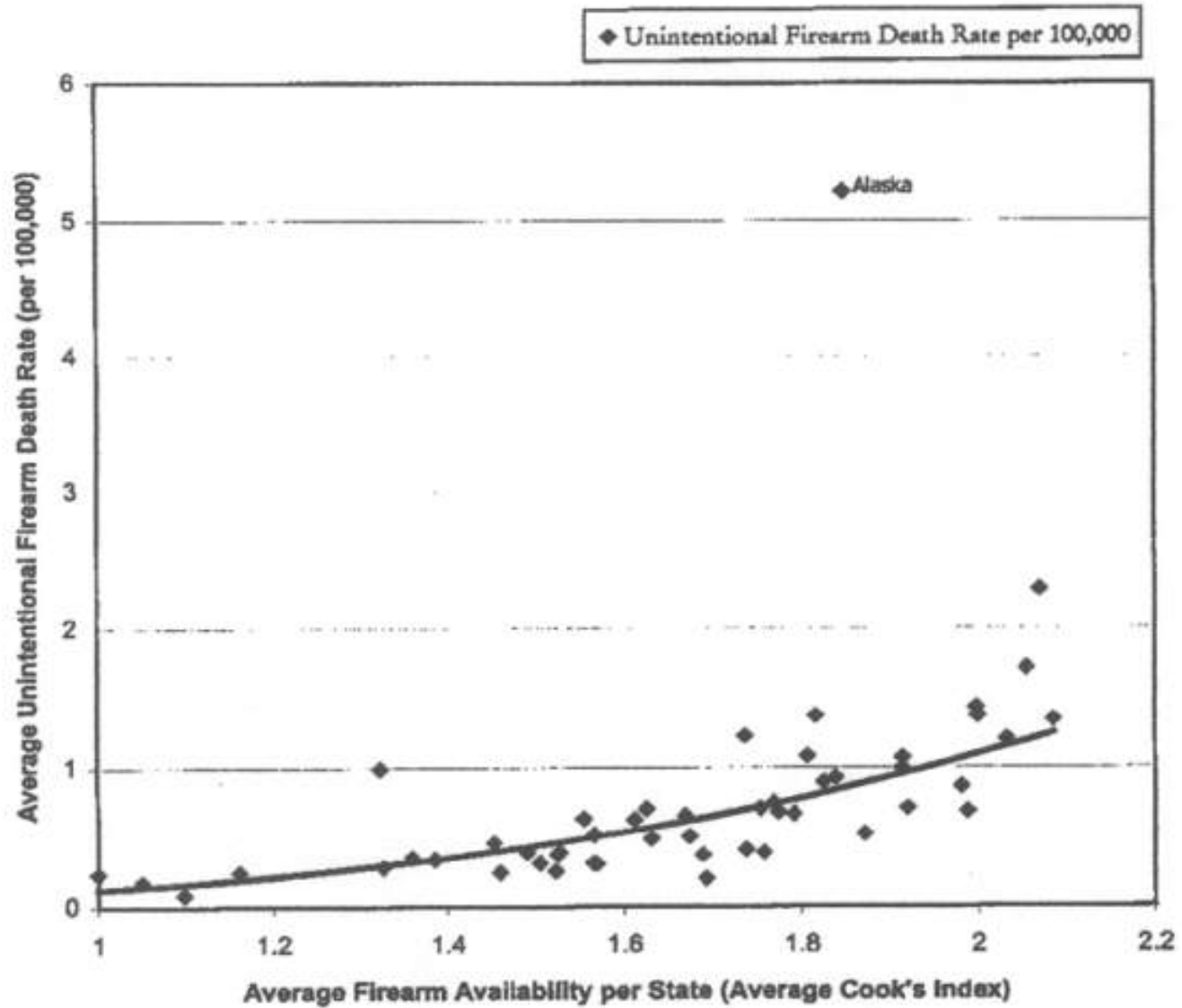


Fig. 1. Average state level unintentional firearm death rate by average state level firearm availability, all ages (1979-1997).

Ecologic Study

A study in which the units of analysis are populations or groups of people, not individuals.

2 x 2 Table

2 x 2 Table

	Unintentional Firearm Death	Not an Unintentional Death by Firearm	
High Firearm Availability			
Low Firearm Availability			

Ecologic Fallacy

“ . . . an error in inference due to a failure to distinguish between units of analysis. An association between variables at the group unit of analysis may not exist at the individual unit of analysis.”



PERGAMON

Accident Analysis and Prevention 33 (2001) 477–484

ACCIDENT
ANALYSIS
&
PREVENTION

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Firearm availability and unintentional firearm deaths

Mathew Miller ^{*}, Deborah Azrael, David Hemenway

Department of Health Policy and Management, 677 Huntington Avenue, Boston, MA 02115, USA

Received 15 March 2000; received in revised form 5 July 2000; accepted 4 July 2000

Abstract

Background: Between 1979 and 1997, almost 30000 Americans died from unintentional firearm injuries, half of whom were under 25 years of age and 4600 of whom were less than 15 years old. **Purpose:** To explore the association between state firearm levels and rates of unintentional firearm deaths by age group, accounting for several potential confounders. **Methods:** The study used a proxy for firearm availability and pooled cross-sectional time-series data on unintentional firearm deaths for the 50 United States from 1979 to 1997. Negative binomial models were used to estimate the association between firearm availability and unintentional firearm deaths. **Results:** A statistically significant and robust association exists between gun availability and unintentional firearm deaths for the US as a whole and within each age group. Multivariate analysis found that, compared to states with the lowest gun levels, states with the highest gun levels had, on average, 9 times the rate of unintentional firearm deaths. These results hold among men and women, for Whites and African Americans. **Conclusion:** Of the almost 30000 people who died in unintentional firearm deaths over the 19-year study period, a disproportionately high number died in states where guns are more prevalent. The results suggest that the increased risk of unintentional violent death among all age groups is not entirely explained by a state's level of poverty, urbanization, or regional location. © 2001 Elsevier Science Ltd. All rights reserved.

Keywords: Firearms; Guns; Children; Unintentional death; Accidents; Violence

1. Introduction

Between 1979 and 1997, almost 30000 Americans died from unintentional firearm injuries, 87% of whom were male, half of whom were under 25 years of age and 4600 of whom were less than 15 years old (NCHS, 1998). Among children in the US 14 years old or younger, only motor vehicle accidents and cancer claim more lives than do firearms; fully one third of these gun deaths are unintentional (NCHS, 1998).

By contrast, few children in other industrialized nations are dying from guns. Before a child in the US becomes a teenager, compared to children in other industrialized nations, he or she is 9 times as likely to die from an unintentional firearm injury (CDC, 1997). Adults in the US are also at increased risk of unintentional firearm death, compared to adults in other industrialized nations (Krug et al., 1998). Among adults,

however, intentional gun deaths constitute over 95% of all firearm mortality.

Unintentional firearm deaths are only the tip of the iceberg. It has been estimated that for every person who dies from an unintentional gunshot injury each year, 13 others are treated in hospital emergency departments for unintentional, non-fatal gunshot wounds (Annett et al., 1995). Many of those who survive unintentional gunshot injury are subject to long-term physical impairment and permanent disability (Kennedy et al., 1993), often at great cost (Miller and Cohen, 1997). While many studies of firearm fatalities in the US have been conducted, only a moderate number have focused on unintentional firearm deaths. Those that have (Rushforth et al., 1974; Morrow and Hudson, 1986; Cole and Patetta, 1988; Wintermute et al., 1988, 1987, 1989; Carter, 1989; Waller et al., 1989; Lee et al., 1991; Martin et al., 1991; Dowd et al., 1994; Annett et al., 1995; Sinauer et al., 1996), report valuable but limited descriptive information about the context in which the unintentional shootings, fatal and non-fatal, take place, and usually provide only correlates of injuries at one locality rather than statistical analyses of national data.

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