United States
Consumer Product Safety Commission

Electrocutions Associated With Consumer Products: 2011-2020

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*This report was prepared by the CPSC staff.
It has not been reviewed or approved by,
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the Commission.*

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Executive Summary

This report provides information about the estimated number of unintentional, non-work-related electrocutions associated with the use of consumer products from 2011 through 2020. This report was prepared by U.S. Consumer Product Safety Commission (CPSC) staff.

Some of the key findings in this report are:

There was an estimated average of 100 electrocution fatalities associated with consumer products per year over the 3-year period from 2018 through 2020, with an estimated 110 consumer product-related electrocutions in 2018, 100 in 2019, and 90 in 2020.[1]

The standardized age-adjusted death rate for electrocutions associated with consumer product use was 0.347 per million population for 2018, 0.305 in 2019, and 0.282 in 2020. The 3-year average from 2018 through 2020 is 0.311. For the period 2011 through 2020, there is statistical evidence of an increasing trend in the age-adjusted electrocution death rate.

Age appears to be a factor in electrocution incidents. During the period covered by this report (2011 to 2020), there were more electrocutions to victims 45 through 64 years old and fewer child victims than would be expected if the deaths were proportionate to population totals.

There were nearly nine times as many estimated consumer product-related electrocutions to males than to females over the years 2011 through 2020.

When race and ethnicity were known, a higher proportion of incidents involved non-Hispanic White victims than would be expected based upon the racial distribution of the U.S. (74.1% vs. 61.5%).

Fractal wood burning[2] emerged as a major source of electrocutions during this reporting period. It often involved tampering with microwaves and other devices to produce the electricity the practice requires. A third of the reports received from 2018-2020 mentioned wood burning explicitly, and other reports may indicate wood burning indirectly.

It is important to note that the electrocution incidents CPSC staff associated with a consumer product for purposes of this report were not necessarily caused by the product.

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[1] Annual electrocution estimates are rounded to the nearest 10.

[2] Also referred to as Lichtenberg, fractal wood burning is an embellishing technique that uses high voltage electric current to burn patterns on wood.

Introduction

This report was prepared by CPSC staff and contains estimates of the number of unintentional, non-work-related electrocutions involving consumer products and the corresponding age-adjusted death rates from 2011 through 2020. National estimates of consumer product-related electrocutions are derived from in-scope death certificate records contained in CPSC databases. An in-scope case is any unintentional electrocution in which a consumer product (*e.g.*, power drill or microwave oven) was involved, and that was not work-related. The National Center for Health Statistics (NCHS) has records of every known electrocution that occurred in the United States during the period studied. CPSC records contain the majority of death certificates identified as electrocutions, and often include details about product information and whether or not an incident was work-related. National estimates therefore are generated by scaling or projecting CPSC records using NCHS record totals (see appendix B for details).

This report contains annual estimates for consumer product-related electrocutions for 2011 through 2020. The 3-year average of the latter 3 years is also presented. In addition, this report presents a breakdown of consumer product-related electrocutions by victim age group, gender, and race, as well as age-adjusted mortality rates for direct comparison of year-to-year data. Finally, there is a breakdown by product category (*e.g.*, "Appliance" or "Power Tool").

National Estimates of the Number of Product-Related Electrocutions

The basis for national estimates of the number of product-related electrocutions per year is the number of in-scope fatalities identified by CPSC staff through death certificates. Appendix A presents the scope definition used for this report. The annual frequency of in-scope fatalities reported to CPSC staff is projected nationally using NCHS data. Specifics of the scaling procedure can be found in Appendix B. The NCHS database contains records of all death certificates filed in the United States. Table 1 provides a summary of the number of electrocution records in the NCHS and CPSC databases. Table 1 also provides CPSC staff's national estimates for consumer product-related electrocutions for the years 2011-2020.

Table 1: National Estimates of Electrocutions Associated with Consumer Products, 2011-2020

Year	NCHS Electrocution Records	CPSC Electrocution Records	*Estimated CPSC In-Scope Records	#CPSC Staff National Estimates	Percent of CPSC Electrocution Records that are In Scope
2011	310	283	55	60	19%
2012	279	248	54	50	22%
2013	257	235	67	70	29%
2014	260	214	56	60	26%
2015	226	200	57	60	29%
2016	261	232	56	60	24%
2017	256	234	64	60	27%
2018	322	276	114	110	41%
2019	297	283	100	100	35%
2020	281	256	93	90	36%
Total 2011-2020	2,749	2,461	716	720	29%
Average 2018-2020	300	272	102	100	38%

* Estimated CPSC In-Scope Records represents proportionately scaled counts after allocation of electrocution incidents with unknown location and/or scope (see Appendix B for details).
\# Estimates have been rounded to the nearest 10.

The national estimates of consumer product-related electrocutions from 2018 through 2020 were higher than estimates for the previous 7 years. Table 5 provides more detail on the

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products involved. The practice of fractal wood burning appears to be a major contributor to electrocutions in recent years.

National Estimates of Electrocution Rates

Table 2 provides national consumer product-related electrocution estimates categorized by age group of the victim. Table 3 gives the age-specific mortality rates and age-adjusted death rates per 1 million population of electrocutions, based on the standardized Year 2020 U.S. population. Using an age-adjusted death rate standardized to a specific year allows for direct comparison of death rates between years, compensating for the changes in population age distribution.

Table 2: National Estimates of Consumer Product-Associated Electrocutions Categorized by Age of Victim, 2011-2020

Age of Victim	Total 2011-2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average 2018-2020
< 18	75	8	9	8	9	6	5	5	16	5	4	8
18–44	277	29	19	21	19	24	16	18	57	50	24	44
45–64	262	13	15	29	22	15	23	31	30	35	49	38
65 and over	100	6	10	8	7	11	11	10	10	10	17	12
All	716	55	54	67	56	57	56	64	114	100	93	102

Note: Details may not sum to row and column totals due to rounding.

Table 3: Estimated Age-Specific and Age-Adjusted Electrocution Rates (per 1,000,000 population) Associated with Consumer Products, 2011-2020

Age of Victim	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average Rate 2018-2020[#]
< 18	0.104	0.121	0.111	0.116	0.088	0.073	0.067	0.221	0.069	0.050	0.113
18-44	0.253	0.170	0.185	0.163	0.211	0.139	0.155	0.485	0.425	0.205	0.372
45–64	0.162	0.180	0.353	0.266	0.174	0.277	0.371	0.363	0.421	0.577	0.454
65 and over	0.139	0.242	0.183	0.148	0.238	0.219	0.194	0.194	0.185	0.309	0.229
Electrocution Rate, All Ages	0.178	0.171	0.212	0.177	0.177	0.172	0.197	0.348	0.305	0.282	0.312
Standardized Age-Adjusted Rate, All Ages*	0.178	0.173	0.211	0.176	0.179	0.172	0.197	0.347	0.305	0.282	0.311

Average Rate is the average of the annual fatality rates within the specified age group for the years 2018 through 2020.
* Standardized to Year 2020 Population, U.S. Census Bureau, Population Division.

There were fewer electrocutions to children under the age of 18 than might be expected, given the proportion of the U.S. population that is in that age range. Adults aged 45-64 had a rate of electrocution per million population that was 4 times higher than that seen for children between 2018 and 2020. Adults aged 18-44 also had a rate more than 3 times higher than that seen for children. Seniors (adults aged 65 and over) had more than twice the electrocution rate per million population than children but was smaller than the overall average. A Pearson's Chi-square Test for Independence confirms that age is associated with the likelihood of electrocution (see Appendix C).

Figure 1 presents the estimated age-adjusted annual electrocution rates for the years 2011 through 2020. There appears to be a trend in electrocution rates. To test this hypothesis, a regression analysis was performed to determine if there is sufficient evidence to conclude that there is a trend in the estimated age-adjusted electrocution rate over the period from 2011 through 2020. The results of the analysis indicate that there is evidence of a trend in the electrocution rates over this time period. Details of the analysis are provided in Appendix C, with the Analysis of Variance table provided as Table C3.

Figure 1: Estimated Age-Adjusted Annual Electrocution Rates (per 1,000,000 population) Associated with Consumer Products, 2011–2020
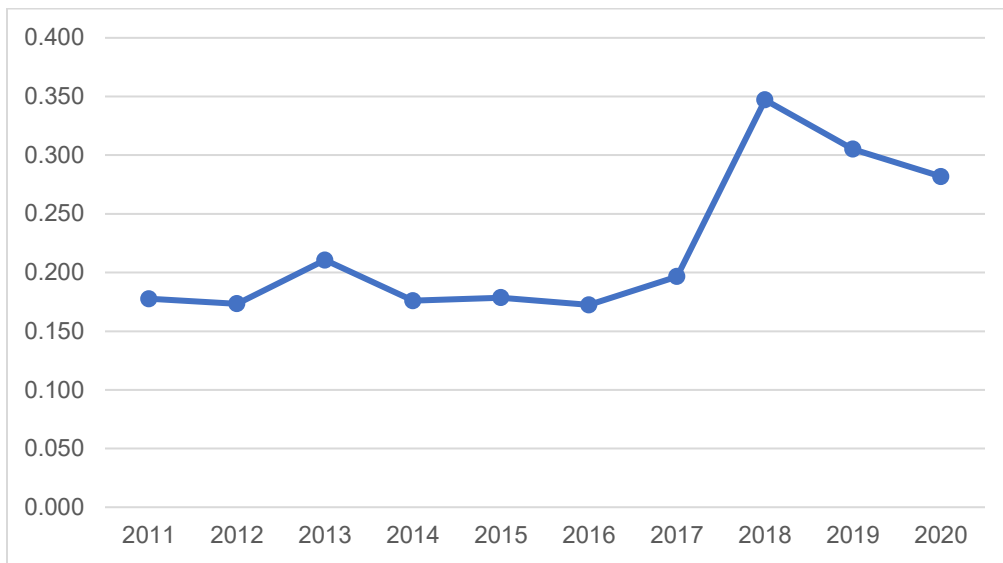

Table 4 presents the national estimates of electrocutions characterized by gender. Male victims compose the large majority of electrocutions, accounting for 89 percent (273 of 307) of all consumer product-related electrocutions over the 3-year period 2018–2020.

Table 4: National Estimates of Consumer Product-Associated Electrocutions Categorized by Gender of Victim, 2011-2020

Gender of Victim	Total 2011-2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average 2018-2020
Male	638	50	48	59	49	50	52	57	101	84	88	91
Female	79	6	6	8	7	6	4	7	12	17	6	12
All	716	55	54	67	56	57	56	64	114	100	93	102

Note: Details may not sum to row and column totals due to rounding.

There are far fewer electrocutions to female consumers than might be expected, given the proportion of the U.S. population that is female. The 10-year average U.S. population of females for the years 2011–2020 is slightly higher than the average population of males (163.128 million and 158.339 million, respectively), yet the estimated number of electrocutions to males is more than eight times greater than to females. A Pearson's Chi-Square Test for Independence rejected independence, which would indicate that gender is a factor in electrocution incidents (see Appendix C).

Number of Reported Electrocutions by Product Type

There is a broad distribution of incidents over many products and product categories. The specific counts in most cases are small and would show little change when applying scaling factors. Therefore, product and product category summaries in Table 5 are presented as actual observed frequencies in the CPSC death certificate databases and are not national estimates. The practice of fractal wood burning did not appear until the latter half of the time period covered in this report and became the most frequent product involved with electrocutions in 2018, 2019, and 2020. The practice has included using components of microwaves, jumper cables, and other electrodes to produce the desired burning effect. It's possible, if not likely, that some of the incidents classified under other categories did involve fractal wood burning (e.g., appliances, jumper cables, homemade electronic devices, welding) but the reports did not mention wood burning explicitly.

Table 5: Number of Electrocutions Reported to CPSC by Consumer Product Category and Year

Product Category	Total 2011–2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average 2018-2020
Antenna	8	0	1	2	0	1	2	1	1	0	0	<1
Appliance	66	3	7	6	7	11	3	1	16	6	6	9
Electrical Box/ Outlet	16	0	0	3	2	0	0	2	1	3	5	3
Electric Cord	9	0	0	2	0	0	1	1	1	1	3	2
Electric Fence	10	0	2	2	1	0	2	0	1	0	2	1
Extension Cord	11	0	3	1	0	0	0	3	1	3	0	1
Fractal Wood Burning	65	0	0	0	0	0	2	9	16	25	13	18
Hand/Cutting Tool	8	1	0	4	0	0	0	0	0	1	2	1
Homemade Elect. Device	12	0	0	0	0	1	1	3	5	1	1	2
Jumper Cables	6	0	0	0	0	3	0	0	0	3	0	1
Ladder	22	3	0	3	2	1	2	4	1	2	4	2
Lawn & Garden Equip.	13	4	5	1	2	0	0	1	0	0	0	0
Lighting Equipment	5	0	0	1	0	1	2	1	0	0	0	0
Other Miscellaneous Product	40	3	5	5	6	3	3	4	2	4	5	4
Piping	3	1	0	0	0	0	1	0	1	0	0	<1
Pole	31	2	6	4	3	5	2	2	3	3	1	2
Pool/Whirlpool/ Hot Tub	19	0	2	2	1	1	4	1	3	3	2	3
Pump/Sump	8	3	0	0	1	2	0	2	0	0	0	0
Power Tool	9	0	0	1	2	3	0	1	0	0	2	1
Welding Equip.	16	2	1	1	1	1	4	0	2	1	3	2
Wiring	33	7	4	3	5	2	2	3	2	4	1	2
All Consumer Products	410	29	36	41	33	35	31	39	56	60	50	55

Number of Reported Electrocutions by Race and Ethnicity

A number of death certificates obtained by the Consumer Product Safety Commission lack race and/or ethnicity information. Of the 410 in-scope records for the period from 2011-2020, 88 records lacked information on ethnicity (i.e., Hispanic Origin). Thirteen of those records indicated the race was "white"; the remainder did not indicate a race. Among the records where ethnicity was known, 55 indicated the victim was Hispanic and 267 indicated the victim was non-Hispanic. One of the non-Hispanic victims had no information regarding their race. Table 6 shows race and ethnicity jointly with the unknown records excluded. It includes average race and ethnicity distribution for the midpoint years of 2015 and 2016 from the Census Bureau for comparison. A disproportionately high proportion of victims were non-Hispanic and white.

Table 6: Number of Electrocutions by Race/Ethnicity, 2011-2020

Known Race/ Ethnicity	In-scope Records	In-scope Percentage	2015-2016 Average in U.S. Population
Hispanic	55	17.1%	17.7%
Non-Hispanic White	238	74.1%	61.5%
Non-Hispanic Black	21	6.5%	12.5%
Non-Hispanic Asian	2	0.6%	5.5%
Non-Hispanic Pacific Islander	1	0.3%	0.2%
Non-Hispanic American Indian	3	0.9%	0.7%
Non-Hispanic More than one race	1	0.3%	2.1%

Note: Excludes record missing ethnicity or missing race where ethnicity is unknown.

Appendix A: CPSC Scope Assessments

The following factors were used to assess whether the case was in scope for this report:

All work-related incidents were determined to be out of scope for purposes of this report but could be within the agency's jurisdiction.

All incidents involving products that are generally outside CPSC jurisdiction were determined to be out of scope for this report. Examples of these include, but are not limited to, incidents involving automobiles, boats, direct contact with power lines, direct contact with installed wiring (excluding outlets, light switches, electrical boxes, etc.) with no other consumer product involvement, and industrial equipment.

Incidents involving a product under CPSC jurisdiction that comes into contact with an electrical source, such as power lines or household current (e.g., a drill or power saw cutting into an electrical wire) were considered in scope.

It should be noted that the prior report[3] used decision rules for 2011-2013 to treat death certificates lacking explicit mentions of consumer products as out of scope. These cases were re-evaluated for the current period, and many placed in an "unknown" scope status. This had the effect of increasing the estimated electrocutions from 40 per year into the range of 50 to 70. However, it also seemed most consistent with prior reports in its treatment of records lacking in complete details about whether a consumer product was involved and whether or not an incident was work-related[4] (e.g., Hnatov, 2012). The re-evaluation also resulted in some reconsideration of the coded location and identified death certificates with the wrong ICD-10 (International Classification of Disease) code. These death certificates are omitted from the CPSC counts of death certificates, but the NCHS death certificates were assumed to have correct ICD-10 codes.

There are also many cases where one or more key piece(s) of information are missing, and a determination cannot be made from the known information. An imputation method (simple proportional adjustment) was applied to adjust the overall and categorical counts, if possible. The key factors to determining scope are:

1. work-related status,
2. location of injury,
3. profession of victim,
4. age of victim (to assist in work-related status determination when this information is not provided),

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[3] Hanway and Siddiqui, *Electrocutions Associated With Consumer Products*: *2004-2013,* CPSC May 2017
[4] Hnatov, *Electrocutions Associated With Consumer Products*: *2009,* CPSC May 2017

5. product involved, and
6. activity engaged in when the incident occurred.

Even though there may be some key data missing, a determination often can be made with limited information. For example, all work-related incidents can be eliminated, regardless of what other information is missing. As another example, if a child is injured, it would be assumed not to be a work-related injury, even if work status were missing. In this latter case, the incident would be considered in scope, unless some other factor would eliminate it, such as the product involved.

Appendix B: Derivation of National Estimates and Age Standardized Electrocution Rate Calculations

This appendix describes the data sources and methodology used to compute the national estimates of electrocutions associated with the use of consumer products.

All death certificates filed in the United States are compiled into a multiple cause of mortality data file by the National Center for Health Statistics (NCHS). The NCHS Mortality File contains demographic and geographic information, as well as the International Statistical Classification of Diseases and Related Health Problems codes for the underlying cause of death. Data are compiled in accordance with World Health Organization instructions, which request that member nations classify causes of death by the current Manual of the International Statistical Classification of Diseases and Related Health Problems. The International Classification of Diseases, Tenth Revision (ICD-10) was implemented in 1999. Although the NCHS data contain cause of death codes that are helpful in identifying deaths due to electrocution, the data do not contain any narrative information that might indicate the involvement of a consumer product.

To complement the NCHS mortality data, CPSC staff purchases death certificates from the 50 states, the District of Columbia, and New York City. Specifically, CPSC staff purchases death certificates with cause of death codes for which there is a high probability that consumer products are involved. In addition to the cause of death codes and demographic and geographic information, death certificates contain information about the incident location and a brief narrative describing the incident. Any references to consumer products are usually found in these narratives. CPSC staff conducts follow-up in-depth investigations on selected deaths to confirm and expand upon the involvement of consumer products, as resources allow. The in-depth investigation reports, or IDIs, are contained within the CPSC In-depth Investigation (INDP) File. Additionally, information that may help the analyst in the determination of product involvement sometimes can be ascertained from the Injury or Potential Injury Incident (IPII) File, which may contain news articles and medical examiner reports associated with the incident.

Searches were conducted on both of the CPSC death certificate databases, Death Certificate (DTHS) File and Abbreviated Death Certificate (ABDT) File, and the NCHS database to retrieve all electrocution cases available within the timeframe of concern. The search criteria limited the death certificate records to those classified by ICD-10 codes as electrocution. These death certificates have one of the following ICD-10 cause of death codes:
- W85 - Accident caused by electric current: Electric transmission lines
- W86 - Accident caused by electric current: Other specified electric current
- W87 - Accident caused by electric current: Unspecified electric current

The search criteria also constrained the CPSC records to fatalities that occurred between January 1, 2011, and December 31, 2020, as of April 4, 2023.

Step 1: Review of CPSC records for scope determination
The first step in computing the annual estimates of electrocutions associated with consumer products is to compile an electrocution dataset of all electrocution death certificates available to CPSC staff. The CPSC's DTHS File and the CPSC's ABDT File both were searched for cases associated with ICD-10 codes W85 through W87.

Each death found in the DTHS database coded as an electrocution was reviewed by an analyst and categorized as in scope, out of scope, or of unknown scope. In-scope cases are unintentional electrocutions associated with a consumer product under the jurisdiction of the CPSC. Out-of-scope cases are cases that involve products that are not under the jurisdiction of the CPSC, work-related incidents, or intentional electrocutions. The scope of a case was classified as unknown in incidents where a consumer product was possibly associated with the incident but could not be expressly identified. An example of this scenario might be a consumer who was electrocuted in his home in an incident that was determined not to be work related, but a product was not identified.

Most deaths found in the ABDT database were categorized as out-of-scope cases. Most of the ABDT File contains death certificates for electrocutions that involve non-consumer situations, such as a lineman being electrocuted while working on power lines, or non-consumer products, such as motor vehicles and industrial equipment. Occasionally, an analyst's review of an ABDT case resulted in the case being reassessed as "in CPSC jurisdiction" or "possibly in CPSC jurisdiction." The former cases were included as in-scope deaths, and the latter cases were identified as "unknown scope" and used in the allocation of unknown scope phase (Step 3) of staff's analysis.

Step 2: Allocation of unknown location cases to known location categories
After review of the death certificate records in the two CPSC databases (DTHS and ABDT) for scope determination, electrocution cases from the two databases were combined. The location of the incident is an important factor in assessing whether an incident is in scope. For example, based on CPSC records, a significant proportion of residential electrocutions were determined to be in scope (consumer product- and non-work-related), while virtually no industrial incidents were determined to be within the scope of this report. Tables B1(a), B1(b), B1(c), B1(d), B1(e), B1(f), B1(g), B1(h), B1(i), and B1(j) provide a summary of the CPSC electrocution death certificates categorized by location and scope for 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, and 2020, respectively.

Table B1(a): Scope Characterization by Location of Death in the CPSC Database Records

2011	Scope			
Location	In	Out	Unknown	Total
Farm	0	13	0	13
Industrial	0	44	13	57
Public Land	2	30	9	41
Recreational	0	2	3	5
Residential	20	33	45	98
School	0	2	0	2
Street	3	28	11	42
Unknown	4	12	9	25
Total	29	164	90	283

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(b): Scope Characterization by Location of Death in the CPSC Database Records

2012	Scope			
Location	In	Out	Unknown	Total
Farm	2	6	1	9
Industrial	0	38	9	47
Public Land	0	22	7	29
Recreational	1	4	5	10
Residential	31	46	21	98
School	0	2	1	3
Street	0	22	6	28
Unknown	2	11	11	24
Total	36	151	61	248

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(c): Scope Characterization by Location of Death in the CPSC Database Records

2013	Scope			
Location	In	Out	Unknown	Total
Farm	0	4	0	4
Industrial	1	39	8	48
Public Land	2	18	8	28
Recreational	1	3	5	9
Residential	33	33	32	98
School	0	5	1	6
Street	0	10	6	16
Unknown	4	15	7	26
Total	41	127	67	235

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(d): Scope Characterization by Location of Death in the CPSC Database Records

2014	Scope			
Location	In	Out	Unknown	Total
Farm	0	7	0	7
Industrial	1	38	5	44
Public Land	0	16	4	20
Recreational	1	10	0	11
Residential	30	31	23	84
School	0	2	0	2
Street	0	11	3	14
Unknown	1	22	9	32
Total	33	137	44	214

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(e): Scope Characterization by Location of Death in the CPSC Database Records

2015	Scope			
Location	In	Out	Unknown	Total
Farm	0	6	1	7
Industrial	0	47	3	50
Public Land	1	15	2	18
Recreational	0	9	1	10
Residential	31	28	24	83
School	0	2	0	2
Street	0	19	0	19
Unknown	3	3	5	11
Total	35	129	36	200

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(f): Scope Characterization by Location of Death in the CPSC Database Records

2016	Scope			
Location	In	Out	Unknown	Total
Farm	1	4	0	5
Industrial	0	33	0	33
Public Land	1	36	4	41
Recreational	2	6	0	8
Residential	23	40	46	109
School	0	5	0	5
Street	1	14	1	16
Unknown	3	9	3	15
Total	31	147	54	232

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(g): Scope Characterization by Location of Death in the CPSC Database Records

2017	Scope			
Location	In	Out	Unknown	Total
Farm	2	3	0	5
Industrial	1	36	1	38
Public Land	1	20	3	24
Recreational	0	7	4	11
Residential	32	37	39	108
School	0	3	0	3
Street	0	17	3	20
Unknown	3	17	5	25
Total	39	140	55	234

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(h): Scope Characterization by Location of Death in the CPSC Database Records

2018	Scope			
Location	In	Out	Unknown	Total
Farm	2	7	1	10
Industrial	0	33	3	36
Public Land	2	27	9	38
Recreational	0	0	0	0
Residential	50	30	59	139
School	0	2	1	3
Street	0	20	4	24
Unknown	2	14	10	26
Total	56	133	87	276

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(i): Scope Characterization by Location of Death in the CPSC Database Records

2019	Scope			
Location	In	Out	Unknown	Total
Farm	0	6	4	10
Industrial	0	47	6	53
Public Land	2	33	2	37
Recreational	1	0	2	3
Residential	54	30	48	132
School	0	5	1	6
Street	0	17	4	21
Unknown	3	12	6	21
Total	60	150	73	283

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B1(j): Scope Characterization by Location of Death in the CPSC Database Records

2020	Scope			
Location	In	Out	Unknown	Total
Farm	1	6	1	8
Industrial	1	38	7	46
Public Land	2	24	4	30
Recreational	0	0	1	1
Residential	46	29	47	122
School	0	2	0	2
Street	0	22	2	24
Unknown	0	10	13	23
Total	50	131	75	256

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

The totals for death certificates, where a location of the death could not be identified, were then allocated proportionately among the known location categories, based on the observed frequency of occurrence by location. The results of the proportional allocation are given in Tables B2(a), B2(b), B2(c), B2(d), B2(e), B2(f), B2(g), B2(h), B2(i), and B2(j). It should be noted that, in order to minimize rounding error, the individual cell counts were kept as fractional numbers until the last stage of the estimation process and are presented to two decimal places in the tables.

Table B2(a): Scope Characterization by Location of Death in the CPSC Database Records

2011	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	14.03	0.00	14.03
Industrial	0.00	47.47	14.44	61.92
Public Land	2.32	32.37	10.00	44.69
Recreational	0.00	2.16	3.33	5.49
Residential	23.20	35.61	50.00	108.81
School	0.00	2.16	0.00	2.16
Street	3.48	30.21	12.22	45.91
Unknown				
Total	29.00	164.00	90.00	283.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(b): Scope Characterization by Location of Death in the CPSC Database Records

2012	Scope			
Location	In	Out	Unknown	Total
Farm	2.12	6.47	1.22	9.81
Industrial	0.00	40.99	10.98	51.97
Public Land	0.00	23.73	8.54	32.27
Recreational	1.06	4.31	6.10	11.47
Residential	32.82	49.61	25.62	108.06
School	0.00	2.16	1.22	3.38
Street	0.00	23.73	7.32	31.05
Unknown				
Total	36.00	151.00	61.00	248.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(c): Scope Characterization by Location of Death in the CPSC Database Records

2013	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	4.54	0.00	4.54
Industrial	1.11	44.22	8.93	54.26
Public Land	2.22	20.41	8.93	31.56
Recreational	1.11	3.40	5.58	10.09
Residential	36.57	37.42	35.73	109.72
School	0.00	5.67	1.12	6.79
Street	0.00	11.34	6.70	18.04
Unknown				
Total	41.00	127.00	67.00	235.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(d): Scope Characterization by Location of Death in the CPSC Database Records

2014	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	8.34	0.00	8.34
Industrial	1.03	45.27	6.29	52.59
Public Land	0.00	19.06	5.03	24.09
Recreational	1.03	11.91	0.00	12.94
Residential	30.94	36.93	28.91	96.78
School	0.00	2.38	0.00	2.38
Street	0.00	13.10	3.77	16.88
Unknown				
Total	33.00	137.00	44.00	214.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(e): Scope Characterization by Location of Death in the CPSC Database Records

2015	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	6.14	1.16	7.30
Industrial	0.00	48.12	3.48	51.60
Public Land	1.09	15.36	2.32	18.77
Recreational	0.00	9.21	1.16	10.38
Residential	33.91	28.67	27.87	90.44
School	0.00	2.05	0.00	2.05
Street	0.00	19.45	0.00	19.45
Unknown				
Total	35.00	129.00	36.00	200.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(f): Scope Characterization by Location of Death in the CPSC Database Records

2016	Scope			
Location	In	Out	Unknown	Total
Farm	1.11	4.26	0.00	5.37
Industrial	0.00	35.15	0.00	35.15
Public Land	1.11	38.35	4.24	43.69
Recreational	2.21	6.39	0.00	8.61
Residential	25.46	42.61	48.71	116.82
School	0.00	5.33	0.00	5.33
Street	1.11	14.91	1.06	17.08
Unknown				
Total	31.00	147.00	54.00	232.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(g): Scope Characterization by Location of Death in the CPSC Database Records

2017	Scope			
Location	In	Out	Unknown	Total
Farm	2.17	3.41	0.00	5.58
Industrial	1.08	40.98	1.10	43.16
Public Land	1.08	22.76	3.30	27.15
Recreational	0.00	7.97	4.40	12.37
Residential	34.67	42.11	42.90	119.68
School	0.00	3.41	0.00	3.41
Street	0.00	19.35	3.30	22.65
Unknown				
Total	39.00	140.00	55.00	234.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(h): Scope Characterization by Location of Death in the CPSC Database Records

2018	Scope			
Location	In	Out	Unknown	Total
Farm	2.07	7.82	1.13	11.03
Industrial	0.00	36.88	3.39	40.27
Public Land	2.07	30.18	10.17	42.42
Recreational	0.00	0.00	0.00	0.00
Residential	51.85	33.53	66.66	152.04
School	0.00	2.24	1.13	3.37
Street	0.00	22.35	4.52	26.87
Unknown				
Total	56.00	133.00	87.00	276.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B2(i): Scope Characterization by Location of Death in the CPSC Database Records

2019	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	6.52	4.36	10.88
Industrial	0.00	51.09	6.54	57.62
Public Land	2.11	35.87	2.18	40.15
Recreational	1.05	0.00	2.18	3.23
Residential	56.84	32.61	52.30	141.75
School	0.00	5.43	1.09	6.52
Street	0.00	18.48	4.36	22.84
Unknown				
Total	60.00	150.00	73.00	283.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table 2(j): Scope Characterization by Location of Death in the CPSC Database Records

2020	Scope			
Location	In	Out	Unknown	Total
Farm	1.00	6.50	1.21	8.71
Industrial	1.00	41.14	8.47	50.61
Public Land	2.00	25.98	4.84	32.82
Recreational	0.00	0.00	1.21	1.21
Residential	46.00	31.40	56.85	134.25
School	0.00	2.17	0.00	2.17
Street	0.00	23.82	2.42	26.24
Unknown				
Total	50.00	131.00	75.00	256.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

In this step, the "unknown scope" summary counts are allocated to the known scope categories. This is performed using the observed in-scope and out-of-scope ratios within location categories because of the rationale previously stated regarding the probability that an in-scope case is dependent upon the location of the incident. Tables B3(a), B3(b), B3(c), B3(d), B3(e), B3(f), B3(g), B3(h), B3(i), and B3(j) present the number of death certificates summarized from the two CPSC databases by scope determination (after allocation of unknowns) and the total number of electrocution records in the NCHS database.

Table B3(a): Scope Characterization by Location of Death in the CPSC Database Records

2011	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	14.03		14.03
Industrial	0.00	61.92		61.92
Public Land	2.99	41.70		44.69
Recreational	0.00	5.49		5.49
Residential	42.93	65.88		108.81
School	0.00	2.16		2.16
Street	4.74	41.17		45.91
Unknown				
Total	50.66	232.34		283.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(b): Scope Characterization by Location of Death in the CPSC Database Records

2012	Scope			
Location	In	Out	Unknown	Total
Farm	2.42	7.39		9.81
Industrial	0.00	51.97		51.97
Public Land	0.00	32.27		32.27
Recreational	2.26	9.21		11.47
Residential	43.02	65.03		108.06
School	0.00	3.38		3.38
Street	0.00	31.05		31.05
Unknown				
Total	47.70	200.30		248.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(c): Scope Characterization by Location of Death in the CPSC Database Records

2013	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	4.54		4.54
Industrial	1.33	52.94		54.26
Public Land	3.09	28.47		31.56
Recreational	2.48	7.61		10.09
Residential	54.23	55.49		109.72
School	0.00	6.79		6.79
Street	0.00	18.04		18.04
Unknown				
Total	61.13	173.87		235.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(d): Scope Characterization by Location of Death in the CPSC Database Records

2014	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	8.34		8.34
Industrial	1.17	51.42		52.59
Public Land	0.00	24.09		24.09
Recreational	1.03	11.91		12.94
Residential	44.12	52.66		96.78
School	0.00	2.38		2.38
Street	0.00	16.88		16.88
Unknown				
Total	46.32	167.68		214.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(e): Scope Characterization by Location of Death in the CPSC Database Records

2015	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	7.30		7.30
Industrial	0.00	51.60		51.60
Public Land	1.25	17.53		18.77
Recreational	0.00	10.38		10.38
Residential	49.01	41.44		90.44
School	0.00	2.05		2.05
Street	0.00	19.45		19.45
Unknown				
Total	50.26	149.74		200.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(f): Scope Characterization by Location of Death in the CPSC Database Records

2016	Scope			
Location	In	Out	Unknown	Total
Farm	1.11	4.26		5.37
Industrial	0.00	35.15		35.15
Public Land	1.23	42.46		43.69
Recreational	2.21	6.39		8.61
Residential	43.68	73.10		116.78
School	0.00	5.33		5.33
Street	1.18	15.90		17.08
Unknown				
Total	49.41	182.59		232.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(g): Scope Characterization by Location of Death in the CPSC Database Records

2017	Scope			
Location	In	Out	Unknown	Total
Farm	2.17	3.41		5.58
Industrial	1.11	42.05		43.16
Public Land	1.23	25.91		27.15
Recreational	0.00	12.37		12.37
Residential	54.04	65.64		119.68
School	0.00	3.41		3.41
Street	0.00	22.65		22.65
Unknown				
Total	58.55	175.45		234.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(h): Scope Characterization by Location of Death in the CPSC Database Records

2018	Scope			
Location	In	Out	Unknown	Total
Farm	2.31	8.72		11.03
Industrial	0.00	40.27		40.27
Public Land	2.73	39.69		42.42
Recreational	0.00	0.00		0.00
Residential	92.34	59.71		152.04
School	0.00	3.37		3.37
Street	0.00	26.87		26.87
Unknown				
Total	97.37	178.63		276.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(i): Scope Characterization by Location of Death in the CPSC Database Records

2019	Scope			
Location	In	Out	Unknown	Total
Farm	0.00	10.88		10.88
Industrial	0.00	57.62		57.62
Public Land	2.23	37.93		40.15
Recreational	3.23	0.00		3.23
Residential	90.08	51.67		141.75
School	0.00	6.52		6.52
Street	0.00	22.84		22.84
Unknown				
Total	95.53	187.47		283.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B3(j): Scope Characterization by Location of Death in the CPSC Database Records

2020	Scope			
Location	In	Out	Unknown	Total
Farm	1.16	7.54		8.71
Industrial	1.20	49.41		50.61
Public Land	2.35	30.48		32.82
Recreational	0.61	0.61		1.21
Residential	79.79	54.46		134.25
School	0.00	2.17		2.17
Street	0.00	26.24		26.24
Unknown				
Total	85.11	170.90		256.00

Source: U.S. Consumer Product Safety Commission/EPHA. CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Step 4: Generating national estimates of consumer product-related electrocutions
The proportion of death certificates found in the CPSC databases associated with both electrocutions and consumer products was applied to the NCHS totals to calculate the total estimated number of electrocutions associated with consumer products. In theory, the NCHS totals comprise all death certificates in the United States, and the same proportion of in-scope cases should exist in the death certificates that are missing from the combined CPSC Death Certificate and Abbreviated Death Certificate files. Therefore, applying the proportion of in-scope cases to the NCHS database totals should provide an estimate of in-scope cases nationwide. This was done for each year separately in the following way:

1.   The number of in-scope deaths in the CPSC's Death Certificate File coded as W85, W86, or W87 that were associated with an unintentional, non-work-related electrocution and a consumer product were identified after adjusting for *unknown location cases* (n_1).

2.   The total number of deaths in the CPSC's Death Certificate File and the Abbreviated

Death Certificate File coded as W85 through W87 were summed separately for each year (n_2).

3.   The total number of deaths in the NCHS data coded as W85 through W87 was counted (n_3).

4.   The national estimate of the number of unintentional, non-work-related electrocutions associated with consumer products in codes W85 through W87 was calculated separately for each year using the formula:

$$N = (n_1 / n_2) * n_3$$

The proportion (n_1 / n_2) represents the number of in-scope cases found in the CPSC's files divided by the total of in-scope and out-of-scope cases in the CPSC data files.

The ratio (n_3 / n_2) represents the weighting factor used to calculate the annual national estimates. The CPSC's Death Certificate File does not contain death certificates for all deaths listed in the NCHS file; therefore, a weighting factor was calculated to account for death certificates that are missing. The weighting factor is used to scale-up the CPSC counts to compensate for the records missing in the CPSC databases. Under the assumption that the characteristics of the deaths not contained in the CPSC database follow the same proportions as those in which the CPSC has records, this weighting factor allows for the computation of national estimates of electrocutions by consumer products and by other characteristics collected by the CPSC about each death by scaling up the data observed in the CPSC subset.

The following table contains the values for the variables used in the calculation, as well as the final computed 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, and 2020 estimates of electrocutions associated with consumer products.

Table B4: Derivations of Consumer Product-Associated Electrocution National Estimates

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
n_1	50.66	47.70	61.13	46.32	50.26	49.41	58.55	97.37	95.53	85.11
n_2	283	248	235	214	200	232	234	276	283	256
n_3	310	279	257	260	226	261	256	322	297	281
Wt Fctr (n_3/n_2)	1.0954	1.1250	1.0936	1.2150	1.1300	1.1250	1.0940	1.1667	1.0495	1.0977
N	55.49	53.67	66.85	56.28	56.79	55.59	64.05	113.60	100.26	93.42

Source: U.S. Consumer Product Safety Commission/EPHA.
CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File, National Center for Health Statistics Mortality File, 2011–2020.

<u>Step 5: Generating national estimates of consumer product-related electrocutions by age group and calculating age-adjusted death rates</u>

The weighting factors derived above for adjusting the counts for the number of missing records in the CPSC databases were also applied to the age and gender categorizations to develop national estimates by these characterizations. A second weighting factor is also needed to make the age and gender category estimates consistent with the national estimates generated previously. The second weighting factor is a weight to accommodate the scaling up procedure for the "unknowns" outlined in Steps 2 and 3 above. This weight is simply the ratio of the number of in-scope CPSC records after allocation of "unknowns" for a given year to the number of CPSC records where scope and location are known for the same year. The two weights are both multipliers so they can be combined into one factor by multiplying one by the other. Table B5 shows the calculation of the weighting factor. Table B6 shows the number of in-scope records in the CPSC's databases characterized by age group. Table B7 shows the national estimates after the combined weighting factor was applied.

Table B5: Consumer Product-Associated Electrocution Death Certificates in the NCHS Database and the Combined CPSC Databases After Allocation of Unknowns

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Observed In-Scope Records	29	36	41	33	35	31	39	56	60	50
In-Scope Records After Allocation of "Unknowns"	50.66	47.70	61.13	46.32	50.26	49.41	58.55	97.37	95.53	85.11
"Unknowns" Allocation Weight	1.7468	1.3251	1.4909	1.4037	1.4359	1.5939	1.5012	1.7388	1.5922	1.7021
Weighting Factor	1.0954	1.1250	1.0936	1.2150	1.1300	1.1250	1.0940	1.1667	1.0495	1.0977
Combined weight	**1.9135**	**1.4907**	**1.6305**	**1.7054**	**1.6226**	**1.7932**	**1.6424**	**2.0286**	**1.6710**	**1.8683**

Table B6: Consumer Product-Associated Electrocution Death Certificates in the CPSC Database Characterized by Age Group

Age Group	0 – 17	18 - 44	45 - 64	65 and over	ALL
Total 2011 - 2020	43	158	151	58	410
2011	4	15	7	3	29
2012	6	13	10	7	36
2013	5	13	18	5	41
2014	5	11	13	4	33
2015	4	15	9	7	35
2016	3	9	13	6	31
2017	3	11	19	6	39
2018	8	28	15	5	56
2019	3	30	21	6	60
2020	2	13	26	9	50
Average 2018-2020	4.33	23.67	20.67	6.67	55.33

Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, In-Depth Investigation File, Injury or Potential Injury Incident File, Abbreviated Death Certificate File.

Table B7: National Estimates of Unintentional Consumer Product-Associated Electrocutions Characterized by Age Group After Weights Were Applied Prior to Rounding to Nearest Whole Number

Age Group	Total 2011-2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average 2018-2020
< 18	75.05	7.65	8.94	8.15	8.53	6.49	5.38	4.93	16.23	5.01	3.74	8.33
18-44	277.80	28.70	19.38	21.20	18.76	24.34	16.14	18.07	56.80	50.13	24.29	43.74
45–64	263.04	13.39	14.91	29.35	22.17	14.60	23.31	31.20	30.43	35.09	48.58	38.03
65 and over	100.10	5.74	10.44	8.15	6.82	11.36	10.76	9.85	10.14	10.03	16.82	12.33
ALL	715.99	55.49	53.67	66.85	56.28	56.79	55.59	64.05	113.60	100.26	93.42	102.43

The "crude death rate" is typically defined as the number of deaths in a given population during a given time period, divided by the total population, and multiplied by one thousand (or some other population scalar). Crude death rates are a widely used measure of mortality that can be used to compare subpopulations within the greater population of incidents. However, crude death rates are not the best measure when comparing year-to-year death rates. In a National Vital Statistics Report titled, "Age Standardization of Death Rates: Implementation of the Year 2000 Standard," a rationale for age-adjusting death rates is stated: ". . . crude death rates are influenced by age composition of the population. As such, comparisons of crude death rates over time or between groups may be misleading if the populations being compared differ in age composition. This is relevant, for example, in trend comparisons of U.S. mortality given

the aging of the U.S. population."[5] For this report, the electrocution incidents were characterized into subpopulations by year of death and age group and by year of death and gender. The death rates by year/age are presented as standardized death rates using the 2020 U.S. population as the standard.

The crude death rate is determined by dividing the total number of deaths for a specific characterization by the mid-year population for the same characterization. The standardized age-adjusted death rate is calculated by multiplying each age-specific category rate by a standardized weight, which represents the proportion of the population in the specific subpopulation for the given standard year (Year 2020). The products of the age-specific rates and the weights are then summed over age group to produce the age-adjusted rate. Table B8 presents the U.S. population subdivided by age group for the years 2011 through 2020. Table B9 provides the standardized age group weights based on the Year 2020 U.S. Population. Table B10 provides a summary of the calculations to determine age-adjusted death rates for the years 2011 and 2020 standardized to the Year 2020 population.

Table B8: U.S. Population (1,000,000s)

Age Group	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average Population
< 18	73.907	73.697	73.569	73.564	73.618	73.649	73.585	73.319	73.039	74.222	73.617
18–44	113.506	114.173	114.768	115.266	115.607	115.993	116.540	117.197	117.819	118.665	115.953
45–64	82.793	82.831	83.028	83.314	83.760	84.097	84.107	83.802	83.323	84.176	83.523
65 and over	41.350	43.130	44.629	46.157	47.651	49.202	50.753	52.369	54.058	54.438	48.374
ALL	311.557	313.831	315.994	318.301	320.635	322.941	324.986	326.688	328.240	331.501	321.467

Source: U.S. Census Bureau, https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html and https://www.census.gov/data/tables/time-series/demo/popest/2020s-national-detail.html
Note: Rows and columns may not sum to "Totals" due to rounding.

Table B9: Standardized Age Group Weights based on Year 2020 U.S. Population

Age Group	Census Year 2020 Estimated Population (1,000,000's)	Std. Wt. (Year 2020)
< 18	74.222	0.22390
18–44	118.665	0.35796
45–64	84.176	0.25393
65 and over	54.438	0.16422

Source: U.S. Census Bureau, https://www.census.gov/data/tables/time-series/demo/popest/2020s-national-detail.html

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[5] Anderson R. N., Rosenberg H. M. Age standardization of death rates: Implementation of the Year 2000 standard. National Vital Statistics Report; vol 47 no 3. Hyattsville, MD: National Center for Health Statistics. 1998.

Table B10: Age-Specific and Age-Adjusted Electrocution Rates Standardized to Year 2020 Population, 2011-2020

Year 2011 Age Group	Estimated Number of Deaths	Population: 2011	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	7.65	73.908	0.1036	0.22390	0.0232
18–44	28.70	113.506	0.2529	0.35796	0.0905
45–64	13.39	82.793	0.1618	0.25393	0.0411
65 and over	5.74	41.350	0.1388	0.16422	0.0228
Total	55.49	311.557	0.1781[a]	1.00000	0.1776[b]

Year 2012 Age Group	Estimated Number of Deaths	Population: 2012	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	8.94	73.697	0.1214	0.22390	0.0272
18–44	19.38	114.173	0.1697	0.35796	0.0608
45–64	14.91	82.831	0.1800	0.25393	0.0457
65 and over	10.44	43.130	0.2419	0.16422	0.0397
Total	53.67	313.831	0.1710[a]	1.00000	0.1734[b]

Year 2013 Age Group	Estimated Number of Deaths	Population: 2013	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	8.15	73.569	0.1108	0.22390	0.0248
18–44	21.20	114.768	0.1847	0.35796	0.0661
45–64	29.35	83.028	0.3535	0.25393	0.0898
65 and over	8.15	44.629	0.1827	0.16422	0.0300
Total	66.85	315.994	0.2116[a]	1.00000	0.2107[b]

Year 2014 Age Group	Estimated Number of Deaths	Population: 2014	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	8.53	73.564	0.1159	0.22390	0.0260
18–44	18.76	115.266	0.1627	0.35796	0.0583
45–64	22.17	83.314	0.2661	0.25393	0.0676
65 and over	6.82	46.157	0.1478	0.16422	0.0243
Total	56.28	318.301	0.1768[a]	1.00000	0.1760[b]

Year 2015 Age Group	Estimated Number of Deaths	Population: 2015	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	6.49	73.618	0.0882	0.22390	0.0197
18–44	24.34	115.607	0.2105	0.35796	0.0754
45–64	14.60	83.760	0.1743	0.25393	0.0443
65 and over	11.36	47.651	0.2384	0.16422	0.0391
Total	56.79	320.635	0.1771^a	1.00000	0.1785^b

Year 2016 Age Group	Estimated Number of Deaths	Population: 2016	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	5.38	73.649	0.0730	0.22390	0.0164
18–44	16.14	115.993	0.1391	0.35796	0.0498
45–64	23.31	84.097	0.2772	0.25393	0.0704
65 and over	10.76	49.202	0.2187	0.16422	0.0359
Total	55.59	322.941	0.1721^a	1.00000	0.1725^b

Year 2017 Age Group	Estimated Number of Deaths	Population: 2017	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	4.93	73.585	0.0670	0.22390	0.0150
18–44	18.07	116.540	0.1550	0.35796	0.0555
45–64	31.20	84.107	0.3710	0.25393	0.0942
65 and over	9.85	50.753	0.1942	0.16422	0.0319
Total	64.05	324.986	0.1971^a	1.00000	0.1966^b

Year 2018 Age Group	Estimated Number of Deaths	Population: 2018	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	16.23	73.319	0.2213	0.22390	0.0496
18–44	56.80	117.197	0.4847	0.35796	0.1735
45–64	30.43	83.802	0.3631	0.25393	0.0922
65 and over	10.14	52.369	0.1937	0.16422	0.0318
Total	113.60	326.688	0.3477^a	1.00000	0.3471^b

Year 2019 Age Group	Estimated Number of Deaths	Population: 2019	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	5.01	73.039	0.0686	0.22390	0.0154
18–44	50.13	117.819	0.4255	0.35796	0.1523
45–64	35.09	83.323	0.4211	0.25393	0.1069
65 and over	10.03	54.058	0.1855	0.16422	0.0305
Total	100.26	328.240	0.3054[a]	1.00000	0.3051[b]

Year 2020 Age Group	Estimated Number of Deaths	Population: 2020	Age-Specific Rate*	Std. Wt. (Year 2020)	Product of Rate x Weight*
< 18	3.74	74.222	0.0503	0.22390	0.0113
18–44	24.29	118.665	0.2047	0.35796	0.0733
45–64	48.58	84.176	0.5771	0.25393	0.1465
65 and over	16.82	54.438	0.3089	0.16422	0.0507
Total	93.42	331.501	0.2818[a]	1.00000	0.2818[b]

* Death rate is presented on a *per million population* basis.
Note: Rows and columns may not sum to "Totals" due to rounding.
a Crude rate
b Age-adjusted rate

Table B11 provides a summary of the consumer product-related electrocutions characterized by gender of victim. Table B12 provides the national estimates categorized by gender after application of the combined weight calculated above (derivation shown in Table B5 above).

Table B11: Electrocution Death Certificates Associated with Consumer Products in the CPSC Databases Characterized by Gender of Victim

Gender of Victim	Total 2011-2020	Average 2018-2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Male	365	49	26	32	36	29	31	29	35	50	50	47
Female	45	6	3	4	5	4	4	2	4	6	10	3
All	410	55	29	36	41	33	35	31	39	56	60	50

Source: U.S. Consumer Product Safety Commission / EPHA.
CPSC Death Certificate File, In-Depth Investigation File, Abbreviated Death Certificate File.

Table B12: National Estimates of Electrocutions Associated with Consumer Products Categorized by Gender of Victim Prior to Rounding to Nearest Whole Number

Gender of Victim	Total 2011-2020	Average 2018-2020	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Male	638.18	90.93	49.75	47.70	58.70	49.46	50.30	52.00	57.48	101.43	83.55	87.81
Female	77.81	11.50	5.74	5.96	8.15	6.82	6.49	3.59	6.57	12.17	16.71	5.61
All	715.99	102.43	55.49	53.67	66.85	56.28	56.79	55.59	64.05	113.60	100.26	93.42

Note: Rows and columns may not sum to "Totals" due to rounding.

Appendix C: Statistical Test Results

Chi-Square Statistic - Calculations

Pearson's Chi-Square Test for Independence was used to determine if the observed distribution on consumer product-related electrocutions was independent of the age of the victim. If electrocutions were independent of age, we would expect the observed proportions of electrocutions in each age group to be similar to the proportions of the U.S. population within the same age group categories. To test this assertion, the observed data, *i.e.,* the national estimates total over the eight years of this report (2011 through 2020), were compared to the expected number of electrocutions in each age group, given the estimated total number of electrocutions observed. The expected number of electrocutions for a specific age group is calculated using the formula:

$$E_i = \left(\frac{population\ n_i}{total\ population} \right) \times (total\ estimated\ electrocutions),$$

where,

E_i is the expected number of electrocutions in the ith age group, and
population n_i is the average U.S. population (2004-2013) in the ith age group.

where,

$$x^2 = \sum_{n=1} \frac{(O_i - E_i)^2}{E_i}$$

E_i is the expected number of electrocutions in the ith age group, and
O_i is the observed (estimated) number of electrocutions in the ith age group.

All calculations were performed on the non-rounded estimates.

Table C1 presents the results of the statistical test. The p-value of the test indicates that there is significant evidence to conclude that the observed proportions of electrocutions are not independent and are, in fact, dependent on age. Therefore, we can conclude that age is a factor in electrocution incidents. As can be seen in Table C1, there were many fewer electrocutions in the younger than 18 years old age range than would be expected based on the proportion of the U.S. population in that age range.

Table C1: Chi-Square Test for Independence Table to Determine if Age is a Significant Factor in Electrocution Incidents

Age of Victim	Average Population (millions)	Electrocutions, Expected	Electrocutions, Observed (Estimated)	Chi-Square Statistic	p-Value (3 degrees of freedom)
< 18	73.617	163.96	75.05	48.21	
18–44	115.953	258.26	277.80	1.48	
45–64	83.523	186.03	263.04	31.88	
65 and over	48.374	107.74	100.10	0.54	
ALL	321.467	715.99	715.99	82.11	**0.000**

Table C2 presents the results of the Pearson's Chi-Square statistic testing the assertion that electrocutions are independent of gender. The p-value of the test indicates again that there is significant evidence to conclude that the observed proportions of electrocutions are not independent and, in fact, are dependent on gender. Therefore, we can conclude that gender is a factor in electrocution incidents. As can be seen in Table C2, there were far fewer electrocutions to females than would be expected considering the proportion of the U.S. population that is female.

Table C2: Chi-Square Test for Independence Table to Determine if Gender is a Significant Factor in Electrocution Incidents

Gender of Victim	Average Population (millions)	Electrocutions, Expected	Electrocutions, Observed (Estimated)	Chi-Square Statistic	p-Value (1 degree of freedom)
Male	158.339	352.66	638.18	231.17	
Female	163.128	363.33	77.81	224.37	
ALL	321.467	715.99	715.99	455.54	**0.000**

Regression Analysis of Annual Age-Adjusted Death Rates

A regression analysis was performed in order to determine if there was sufficient evidence to conclude that there was a trend over time in the age adjusted fatality rates. For this analysis, the dependent variable was the estimated age-adjusted death rate, and the independent variable was the year. The analysis of variance (ANOVA) table for the regression is given in Table C3.

Table C3: ANOVA Table of Regression Model Testing for Trend in Age-Adjusted Death Rates Due to Electrocutions Associated with Consumer Products

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value	Prob. > F
Year	1	0.02042	0.02042	9.48	**0.0152**
Error	8	0.01724	0.00216		
Corrected Total	9	0.03766			

The probability value given in the table is the probability that the regression slope is equal to zero (*i.e.*, that there is no trend). Because the resultant probability value is less than 0.05, we conclude that there is sufficient evidence to reject the hypothesis that there is no trend. Therefore, we can conclude that there is an upward trend in the age-adjusted electrocution rates.

References

1. Anderson, R.N., Ph.D. and Rosenberg, H.M., Ph.D.: Age Standardization of Death Rates: Implementation of the Year 2000 Standard, Centers for Disease Control and Prevention and the National Center for Health Statistics, Volume 47, Number 3, October 1998.

2. Hanway, Stephen and Siddiqui, Saad, *Electrocutions Associated With Consumer Products: 2004-2013*, May 2017, Directorate for Epidemiology, Division of Hazard Analysis, U.S. Consumer Product Safety Commission.

3. Hnatov, Matthew V.: *Electrocutions Associated With Consumer Products: 2009*, November 2012, Directorate for Epidemiology, Division of Hazard Analysis, U.S. Consumer Product Safety Commission.

4. Klein, Richard J., M.P.H. and Schoenborn, Charlotte A., M.P.H.: Age Adjusting Using the 2000 Projected U.S. Population, Centers for Disease Control and Prevention and the National Center for Health Statistics, Statistical Notes, Volume 20, January 2001.