# ELECTROCUTIONS ASSOCIATED WITH CONSUMER PRODUCTS: 2009*

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* This analysis was prepared by the CPSC staff and has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

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## Executive Summary

This report provides: (1) information about the estimated number of unintentional, non-work-related electrocutions associated with the use of consumer products in 2009; (2) updates to the 2007 and 2008 estimates; and (3) companion statistics since 2002. This report was prepared by U.S. Consumer Product Safety Commission (CPSC) staff.

It is important to note that the electrocution incidents covered in this report were associated with a consumer product but were not necessarily caused by the product.[1]

Some of the key findings in this report:

- There was an estimated average of 70 electrocution fatalities associated with consumer products per year over the 3-year period from 2007 through 2009, with an estimated 60 consumer product-related electrocutions in 2007, 50 in 2008, and 100 in 2009. [2]

- The standardized age-adjusted death rate for electrocutions associated with consumer product use was 0.199 per million population for 2007, 0.177 in 2008, and 0.308 in 2009. The 3-year average from 2007 through 2009 is 0.228. Tests indicate that there is no statistical evidence of a trend in the electrocution death rate from 2002 to 2009.

- Victim age appears to be a factor in electrocution incidents. During the period covered by this report (2002 to 2009), there were more than twice as many electrocutions to victims 40 through 59 years old than there were to victims 19 years of age and younger, even though the U.S. population in these age groups is roughly equal.

- In 2009, there were an estimated 51 electrocutions to individuals in the 40- to 59-year old range. This number is higher than estimates for 2008 (17) and 2007 (21).

- In 2009, there were records of two multiple fatality incidents, but there were no multiple electrocution incidents in 2008 or 2007.

- There were more than seven times as many estimated consumer product-related electrocutions to males than to females over the years 2002 through 2009.

- The three most common product categories associated with electrocutions over the 3-year period 2007–2009 were: “Small Appliance” (22 electrocutions), “Large Appliance” (19 electrocutions), and “Power Tool” (10 electrocutions).

[1] Not all of these fatalities are addressable by an action the CPSC could take; however, it was not the purpose of this report to evaluate the addressability of the incidents, but rather, to update the estimates of the number of consumer product-associated electrocutions.

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

- Also, in 2009, a larger percentage of the electrocutions occurred during repair work by consumers at residential locations than in the prior 2 years.

## Introduction

This report was prepared by U.S. Consumer Product Safety Commission (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 2002 through 2009. 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 was not work-related. For the period studied, CPSC records contain the majority of death certificates identified as electrocutions. The National Center for Health Statistics (NCHS) has records of every known electrocution that occurred in the United States. NCHS records, however, lack product information. National estimates 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 2002 through 2009. 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 and gender, 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.*, "Small 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 reported to 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 2002 through 2009.

**Table 1: National Estimates of Electrocutions Associated with Consumer Products, 2002–2009**

| 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 |
|---|---|---|---|---|---|
| 2002 | 432 | 397 | 51 | 60 | 13% |
| 2003 | 377 | 344 | 56 | 60 | 16% |
| 2004 | 387 | 358 | 56 | 60 | 16% |
| 2005 | 394 | 350 | 83 | 90 | 24% |
| 2006 | 390 | 348 | 41 | 50 | 12% |
| 2007 | 370 | 321 | 50 | 60 | 16% |
| 2008 | 306 | 263 | 43 | 50 | 16% |
| 2009 | 305 | 232 | 73 | 100 | 32% |
| Total 2002-2009 | 2961 | 2613 | 453 | 530 | 18% |
| Average 2007-2009 | 327 | 272 | 55 | 70 | 21% |

* 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 for 2009 were higher than estimates for the previous 3 years. There is insufficient information available to CPSC staff to determine what caused the apparently higher number of electrocutions in 2009. With the exception of 2005, when the CPSC estimated that there were 90 consumer product-related electrocutions, the estimates for all other years were 50 or 60 (rounded to the nearest ten).

**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 2000 U.S. population. The Year 2000 U.S. population standard has been adopted for age-adjusting death rates in the United States by the NCHS, the Centers for Disease Control and Prevention (CDC), and the U.S. Department of Health and Human Services (HHS), as well as many state vital statistics programs. 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, 2002–2009**

| Age of Victim | Total 2002-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average 2007-2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| < 1–19 | 88 | 14 | 15 | 6 | 16 | 5 | 11 | 10 | 12 | 11 |
| 20–39 | 144 | 15 | 11 | 15 | 28 | 16 | 22 | 13 | 22 | 19 |
| 40–59 | 197 | 15 | 15 | 29 | 35 | 15 | 21 | 17 | 51 | 29 |
| 60 and over | 99 | 12 | 20 | 11 | 14 | 10 | 6 | 15 | 12 | 11 |
| All | 528 | 56 | 61 | 61 | 93 | 46 | 60 | 55 | 96 | 70 |

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, 2002–2009**

| Age of Victim | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average Rate 2007-2009[#] |
|---|---|---|---|---|---|---|---|---|---|
| < 1–19 | 0.166 | 0.184 | 0.068 | 0.198 | 0.061 | 0.135 | 0.119 | 0.142 | 0.132 |
| 20–39 | 0.184 | 0.138 | 0.187 | 0.348 | 0.198 | 0.271 | 0.159 | 0.263 | 0.231 |
| 40–59 | 0.193 | 0.189 | 0.360 | 0.426 | 0.180 | 0.245 | 0.196 | 0.599 | 0.347 |
| 60 and over | 0.255 | 0.417 | 0.227 | 0.272 | 0.198 | 0.107 | 0.276 | 0.214 | 0.199 |
| Electrocution Rate, All Ages | 0.193 | 0.211 | 0.208 | 0.315 | 0.155 | 0.198 | 0.179 | 0.314 | 0.230 |
| Standardized Age-Adjusted Rate, All Ages* | 0.193 | 0.210 | 0.205 | 0.313 | 0.154 | 0.199 | 0.177 | 0.308 | 0.228 |

# Average Rate is the average of the annual fatality rates within the specified age group for the years 2007 through 2009.
* Standardized to Year 2000 Population, U.S. Census Bureau, Statistical Abstract of the United States: 2012

There were fewer electrocutions to young persons (19 years of age and younger) than might be expected, given the proportion of the U.S. population that is in that age range. For example, the 8-year average U.S. population of individuals younger than 20 years of age (82.308 million) is slightly higher than the average population size of individuals 40 to 59 years old (82.080

million), yet the estimated total number of electrocutions from 2002 through 2009 in the older age group was more than double that of the younger group (197 versus 88, a ratio of 2.24 to 1). The difference was even greater with more than half of the 2009 electrocutions occurring to individuals in the 40- to 59-year-old range. A Pearson's Chi-Square Test for Independence was performed on the 2002–2009, 8-year average electrocution estimates to determine whether there was statistically significant evidence that age was a factor in electrocution incidents.[3] The statistical test rejected independence, which would indicate that age is a factor in electrocution incidents.

In 2009, there were an estimated 51 electrocutions to individuals in the 40- to 59-year-old range. This number is greater than estimates for 2008 (17) and 2007 (21). A partial explanation of the increase in 2009 was an increase in the number of electrocutions to individuals while attempting repair work at residential locations. In 2009, an estimated 14 individuals in the 40- to 59-year-old range were electrocuted while attempting repair work. In 2008, there were an estimated five electrocutions while attempting repair work and only an estimated two in 2007. Additionally, there were an estimated six electrocutions to individuals in the 40- to 59-year-old range that occurred in multiple fatality scenarios. Multiple fatality scenarios are somewhat rare. One such event which occurred in 2009 resulted in the death of three individuals while attempting to erect a Hamm radio antenna which inadvertently touched a power line. There were no multiple electrocution incidents, to individuals of any age, in 2008 or 2007.

Figure 1 presents the estimated age-adjusted annual electrocution rates for the years 2002 through 2009. There does not appear 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 2002 through 2009. The results of the analysis indicate that there is insufficient evidence of a trend in the electrocution rates over this time period.[4] Details of the analysis are provided in Appendix C, with the Analysis of Variance table provided as Table C3.

[3] See Appendix C for details.
[4] No trend was declared unless the attained significance (p-value) of the statistic was $< 0.05$.

**Figure 1: Estimated Age-Adjusted Annual Electrocution Rates (per 1,000,000 population) Associated with Consumer Products, 2002–2009**

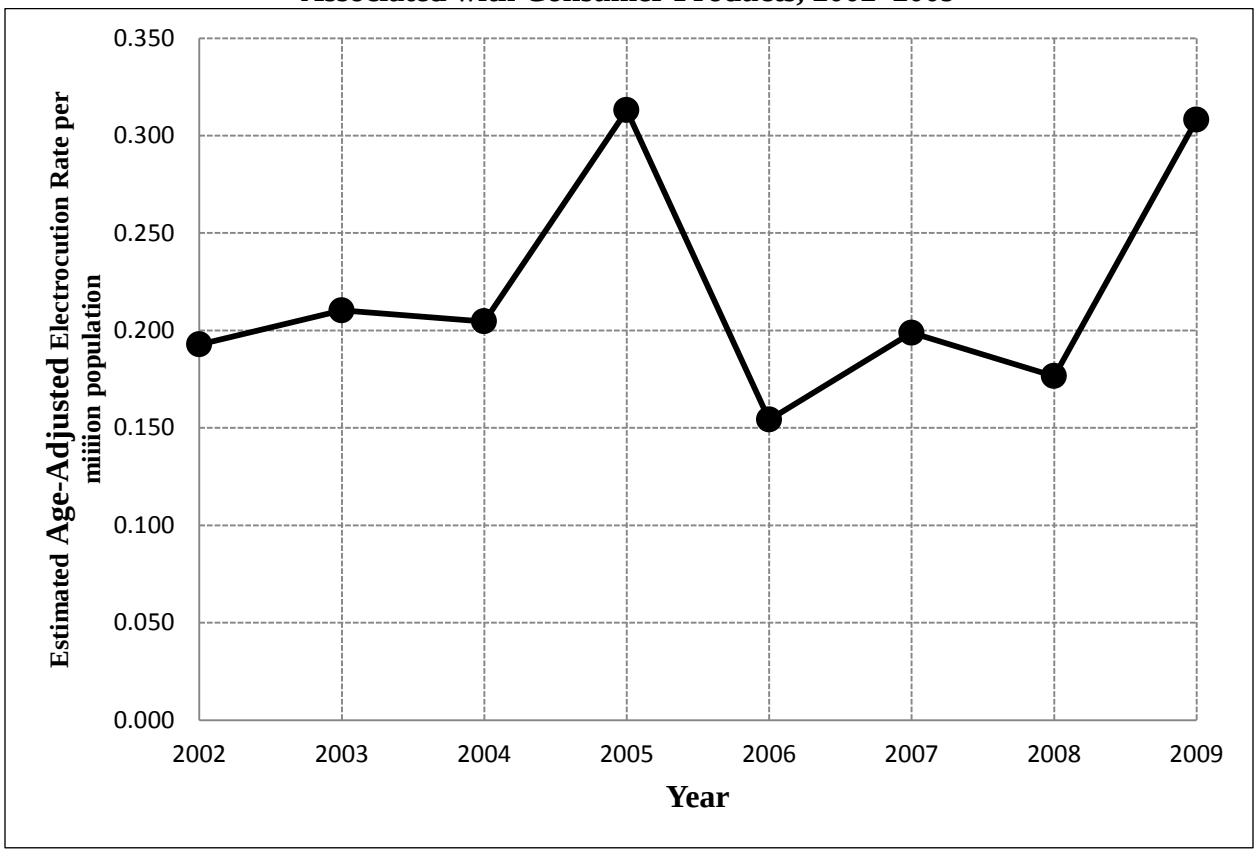


Table 4 presents the national estimates of electrocutions characterized by gender. Male victims comprise the large majority of electrocutions, accounting for 91 percent (192 of 211) of all consumer product-related electrocutions over the 3-year period 2007–2009.

**Table 4: National Estimates of Consumer Product-Associated Electrocutions Categorized by Gender of Victim, 2002–2009**

| Gender of Victim | Total 2002-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average 2007-2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Female | 65 | 15 | 6 | 12 | 7 | 5 | 6 | 5 | 8 | 6 |
| Male | 464 | 41 | 55 | 49 | 86 | 41 | 54 | 50 | 88 | 64 |
| All | 528 | 56 | 61 | 61 | 93 | 46 | 60 | 55 | 96 | 70 |

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 8-year average U.S. population of females for the years 2002–2009 is slightly higher than the average population of males (150.937 million

and 146.373 million, respectively), yet the estimated number of electrocutions to males is more than seven 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.[5]

**Number of Reported Electrocutions by Product Type**

There is a broad distribution of incidents over many products and product categories. The specific counts are small and would not show any 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 three most common product categories associated with electrocutions over the 3-year period 2007–2009 were "Small Appliance" (22 deaths, or 19% of reported consumer product-related electrocutions); "Large Appliance" (19, 16%); and "Power Tool" (10, 8%). The most common scenario for electrocutions involving small and large appliances was the consumer being electrocuted while attempting to repair the appliance. The most common scenario for electrocutions involving power tools was the equipment coming into contact with electrical wires while the consumer was using the power tool. Over the 8 years covered in this report, the four most common product categories associated with electrocutions were: "Large Appliance" (47 deaths, or 13% of reported consumer product-related electrocutions); "Small Appliance" (45, 13%); "Power Tool" (34, 10%); and "Lighting Equipment" (29, 8%).

[5] See Appendix C for details.

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

| Product Category | Total 2002–2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average 2007–2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Amusement Ride | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Antenna | 18 | 4 | 0 | 2 | 2 | 1 | 2 | 2 | 5 | 3 |
| Boat Lift | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Electric Fence | 11 | 1 | 3 | 1 | 1 | 3 | 0 | 2 | 0 | 1 |
| Extension Cord | 12 | 1 | 2 | 3 | 2 | 0 | 1 | 1 | 2 | 1 |
| Hand Tool | 8 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 3 | 3 |
| Holiday Lighting | 5 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Household Wiring | 15 | 2 | 1 | 5 | 1 | 2 | 0 | 1 | 3 | 1 |
| Ladder | 14 | 2 | 0 | 4 | 4 | 2 | 1 | 0 | 1 | 1 |
| Large Appliance | 47 | 4 | 7 | 8 | 4 | 5 | 3 | 3 | 13 | 6 |
| Lawn & Garden Equipment | 9 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | < 1 |
| Lighting Equipment | 29 | 4 | 5 | 4 | 6 | 2 | 4 | 0 | 4 | 3 |
| Miscellaneous Wiring | 9 | 0 | 3 | 0 | 1 | 1 | 2 | 2 | 0 | 1 |
| Other Household Appliance | 5 | 2 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | < 1 |
| Other Miscellaneous Product | 4 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 | 1 |
| Outdoor Wiring | 7 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Piping | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 1 |
| Pole | 22 | 5 | 2 | 2 | 6 | 0 | 1 | 3 | 3 | 2 |
| Pool/Whirlpool/Hot Tub | 14 | 1 | 1 | 3 | 3 | 1 | 1 | 2 | 2 | 2 |
| Power Tool | 34 | 0 | 8 | 3 | 11 | 2 | 2 | 3 | 5 | 3 |
| Recreational Equipment | 10 | 0 | 0 | 2 | 7 | 1 | 0 | 0 | 0 | 0 |
| Small Appliance | 45 | 1 | 4 | 1 | 7 | 10 | 6 | 7 | 9 | 7 |
| Unspecified Appliance | 11 | 1 | 1 | 1 | 5 | 1 | 0 | 2 | 0 | 1 |
| Unspecified Electrical Cord | 15 | 2 | 2 | 0 | 3 | 4 | 2 | 0 | 2 | 1 |
| Unspecified Tool | 5 | 0 | 0 | 1 | 3 | 0 | 1 | 0 | 0 | <1 |
| All Consumer Products | 354 | 37 | 49 | 44 | 69 | 37 | 31 | 30 | 57 | 39 |

## APPENDIX A: CPSC Scope Assessments

CPSC has jurisdiction over thousands of consumer products used in and around the home, in sports and recreation, and in schools. In the cases of electrocution, the following determinate factors were used to assess whether the case was in scope:

- All work-related incidents were determined to be out of scope.
- All incidents involving products outside CPSC jurisdiction were determined to be out of scope. Examples of these include, but are not limited to, incidents involving autos, 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.

When there was insufficient information to make a definitive determination of whether a case was in scope, or where apparent contradictions existed, the following assumption was used:

- Incidents involving an individual apparently functioning in his/her regular occupation in which the death certificate indicates that the fatality was not work-related are assumed to be in error. In these cases, the incident was assumed to be work related. For example, a tree-trimmer, by profession, was electrocuted while trimming trees at someone else's residence, yet the incident was classified as not work related on the death certificate. There are many reasons that could explain this discrepancy. First, the death certificate may simply have been miscoded, or the coder may have a different interpretation of the "work-related" question on the death certificate. On many death certificates, the work-related question field states something to the effect of: "Did the death occur at work?" Perhaps the coders interpreted "at work" as referring to an office or factory, and working in a yard of a residence does not fit this interpretation. Finally, it may be possible that the individual actually may not have been "working" and may have been helping out a friend or family member. Without evidence of this, however, it was assumed to be miscoded.

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),
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, 2002 and December 31, 2009, as of June 5, 2012.

*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. 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 CPSC scope. Tables B1(a), B1(b), and B1(c) provide a summary of the CPSC electrocution death certificates categorized by location and scope for 2007, 2008, and 2009, respectively.

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

| **2007** | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0 | 9 | 0 | 9 |
| Industrial | 0 | 82 | 0 | 82 |
| Public Land | 1 | 43 | 6 | 50 |
| Recreational | 2 | 5 | 1 | 8 |
| Residential | 27 | 34 | 35 | 96 |
| School | 0 | 3 | 0 | 3 |
| Street | 0 | 40 | 5 | 45 |
| Unknown | 1 | 16 | 11 | 28 |
| **Total** | 31 | 232 | 58 | 321 |

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**

| **2008** | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0 | 7 | 0 | 7 |
| Industrial | 0 | 54 | 2 | 56 |
| Public Land | 1 | 41 | 3 | 45 |
| Recreational | 0 | 0 | 1 | 1 |
| Residential | 29 | 31 | 21 | 81 |
| School | 0 | 6 | 1 | 7 |
| Street | 0 | 53 | 4 | 57 |
| Unknown | 0 | 3 | 6 | 9 |
| **Total** | 30 | 195 | 38 | 263 |

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**

| **2009** | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0 | 4 | 1 | 5 |
| Industrial | 0 | 40 | 2 | 42 |
| Public Land | 3 | 33 | 2 | 38 |
| Recreational | 0 | 1 | 1 | 2 |
| Residential | 53 | 30 | 22 | 105 |
| School | 0 | 2 | 0 | 2 |
| Street | 1 | 21 | 1 | 23 |
| Unknown | 0 | 10 | 5 | 15 |
| **Total** | 57 | 141 | 34 | 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.

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), and B2(c). 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): Allocation of "Unknown" Location Electrocutions to "Known" Location Categories**

| **2007** | **Scope** | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 9.67 | 0.00 | 9.67 |
| Industrial | 0.00 | 88.07 | 0.00 | 88.07 |
| Public Land | 1.03 | 46.19 | 7.40 | 54.62 |
| Recreational | 2.07 | 5.37 | 1.23 | 8.67 |
| Residential | 27.90 | 36.52 | 43.19 | 107.61 |
| School | 0.00 | 3.22 | 0.00 | 3.22 |
| Street | 0.00 | 42.96 | 6.17 | 49.13 |
| Unknown | | | | |
| **Total** | 31.00 | 232.00 | 58.00 | 321.00 |

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

**Table B2(b): Allocation of "Unknown" Location Electrocutions to "Known" Location Categories**

| 2008 | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 7.11 | 0.00 | 7.11 |
| Industrial | 0.00 | 54.84 | 2.38 | 57.22 |
| Public Land | 1.00 | 41.64 | 3.56 | 46.20 |
| Recreational | 0.00 | 0.00 | 1.19 | 1.19 |
| Residential | 29.00 | 31.48 | 24.94 | 85.42 |
| School | 0.00 | 6.09 | 1.19 | 7.28 |
| Street | 0.00 | 53.83 | 4.75 | 58.58 |
| Unknown | | | | |
| **Total** | 30.00 | 195.00 | 38.00 | 263.00 |

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

**Table B2(c): Allocation of "Unknown" Location Electrocutions to "Known" Location Categories**

| 2009 | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 4.31 | 1.17 | 5.48 |
| Industrial | 0.00 | 43.05 | 2.34 | 45.40 |
| Public Land | 3.00 | 35.52 | 2.34 | 40.86 |
| Recreational | 0.00 | 1.08 | 1.17 | 2.25 |
| Residential | 53.00 | 32.29 | 25.79 | 111.08 |
| School | 0.00 | 2.15 | 0.00 | 2.15 |
| Street | 1.00 | 22.60 | 1.17 | 24.78 |
| Unknown | | | | |
| **Total** | 57.00 | 141.00 | 34.00 | 232.00 |

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

*Step 3: Allocation of unknown scope cases to known scope categories within location categories*
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), and B3(c) 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): Allocation of "Unknown" Scope Electrocutions to "Known" Scope Categories**

| 2007 | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 9.67 | | 9.67 |
| Industrial | 0.00 | 88.07 | | 88.07 |
| Public Land | 1.20 | 53.43 | | 54.62 |
| Recreational | 2.41 | 6.26 | | 8.67 |
| Residential | 46.61 | 61.00 | | 107.61 |
| School | 0.00 | 3.22 | | 3.22 |
| Street | 0.00 | 49.13 | | 49.13 |
| Unknown | | | | |
| **Total** | 50.21 | 270.79 | | 321.00 |

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

**Table B3(b): Allocation of "Unknown" Scope Electrocutions to "Known" Scope Categories**

| 2008 | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 7.11 | | 7.11 |
| Industrial | 0.00 | 57.22 | | 57.22 |
| Public Land | 1.08 | 45.12 | | 46.20 |
| Recreational | 0.59 | 0.59 | | 1.19 |
| Residential | 40.96 | 44.47 | | 85.42 |
| School | 0.00 | 7.28 | | 7.28 |
| Street | 0.00 | 58.58 | | 58.58 |
| Unknown | | | | |
| **Total** | 42.63 | 220.37 | | 263.00 |

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

**Table B3(c): Allocation of "Unknown" Scope Electrocutions to "Known" Scope Categories**

| 2009 | Scope | | | |
|---|---|---|---|---|
| Location | In | Out | Unknown | Total |
| Farm | 0.00 | 5.48 | | 5.48 |
| Industrial | 0.00 | 45.40 | | 45.40 |
| Public Land | 3.18 | 37.68 | | 40.86 |
| Recreational | 0.00 | 2.25 | | 2.25 |
| Residential | 69.03 | 42.06 | | 111.08 |
| School | 0.00 | 2.15 | | 2.15 |
| Street | 1.05 | 23.73 | | 24.78 |
| Unknown | | | | |
| **Total** | 73.26 | 158.74 | | 232.00 |

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

*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 2007, 2008, and 2009 estimates of electrocutions associated with consumer products.

**Table B4: Derivation of Consumer Product-Associated Electrocution National Estimates**

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| $n_1$ | 50.21 | 42.63 | 73.26 |
| $n_2$ | 321 | 263 | 232 |
| $n_3$ | 370 | 306 | 305 |
| *Weighting Factor* ($n_3 / n_2$) | 1.1526 | 1.1635 | 1.3147 |
| N | 57.88 | 49.60 | 96.31 |

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, 2007–2009.

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

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**

| | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|
| Observed In-Scope Records | 37 | 49 | 44 | 69 | 37 | 31 | 30 | 57 |
| In-Scope Records After Allocation of "Unknowns" | 51.05 | 56.00 | 56.41 | 82.82 | 41.35 | 50.21 | 42.63 | 73.26 |
| "Unknowns" Allocation Weight | 1.3798 | 1.1429 | 1.2820 | 1.2003 | 1.1177 | 1.6197 | 1.4211 | 1.2853 |
| Weighting Factor | 1.0882 | 1.0959 | 1.0810 | 1.1257 | 1.1207 | 1.1526 | 1.1635 | 1.3147 |
| **Combined weight** | **1.5015** | **1.2526** | **1.3859** | **1.3512** | **1.2526** | **1.8670** | **1.6535** | **1.6897** |

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

| Age Group | Total 2002-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average 2007-2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| < 1–19 | 60 | 9 | 12 | 4 | 12 | 4 | 6 | 6 | 7 | 6 |
| 20–39 | 97 | 10 | 9 | 11 | 21 | 13 | 12 | 8 | 13 | 11 |
| 40–59 | 132 | 10 | 12 | 21 | 26 | 12 | 11 | 10 | 30 | 17 |
| 60 and over | 69 | 8 | 16 | 8 | 10 | 8 | 3 | 9 | 7 | 6 |
| ALL | 358 | 37 | 49 | 44 | 69 | 37 | 32 | 33 | 57 | 41 |

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 2002-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average 2007-2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| < 1–19 | 88.26 | 13.51 | 15.03 | 5.54 | 16.21 | 5.01 | 11.20 | 9.92 | 11.83 | 10.98 |
| 20–39 | 143.79 | 15.01 | 11.27 | 15.24 | 28.37 | 16.28 | 22.40 | 13.23 | 21.97 | 19.20 |
| 40–59 | 197.07 | 15.01 | 15.03 | 29.10 | 35.13 | 15.03 | 20.54 | 16.53 | 50.69 | 29.25 |
| 60 and over | 98.98 | 12.01 | 20.04 | 11.09 | 13.51 | 10.02 | 5.60 | 14.88 | 11.83 | 10.77 |
| ALL | 528.10 | 55.55 | 61.38 | 60.98 | 93.23 | 46.34 | 59.74 | 54.56 | 96.31 | 70.21 |

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."[6] 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 2000 U.S. population as the standard. In August 1998, the use of the Year 2000 standard population was established in a policy statement from the Secretary of the Department of Health and Human Services (DHHS). In the policy statement, all DHHS agencies, including NCHS and the Centers for Disease Control and Prevention (CDC), were directed to use this standard.

[6] 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.

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 2000). 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 2002 through 2009. Table B9 provides the standardized age group weights based on the Year 2000 U.S. Population. Table B10 provides a summary of the calculations to determine age-adjusted death rates for the years 2002 and 2009 standardized to the Year 2000 population.

It should be noted that the age-adjusted death rates for the years 2002 through 2006 presented in Table 3 of the main body of this report may have changed slightly from the previous electrocutions report,[7] due to changes in U.S. population estimates obtained from the U.S. Census Bureau's 2012 Statistical Abstract of the United States from the population estimates presented in the U.S. Census Bureau's 2011 Statistical Abstract, which was used in the previous report.

[7] Hnatov, M. V. *2008 Electrocutions Associated with Consumer Products.* U.S. Consumer Product Safety Commission. January 2012.

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

| Age Group | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Average Population |
|---|---|---|---|---|---|---|---|---|---|
| < 1–19 | 81.221 | 81.485 | 81.820 | 82.073 | 82.390 | 82.857 | 83.198 | 83.421 | 82.308 |
| 20–39 | 81.629 | 81.492 | 81.486 | 81.612 | 82.064 | 82.581 | 83.127 | 83.644 | 82.204 |
| 40–59 | 77.888 | 79.326 | 80.904 | 82.384 | 83.594 | 83.816 | 84.169 | 84.559 | 82.080 |
| 60 and over | 47.066 | 48.023 | 48.836 | 49.685 | 50.546 | 52.326 | 53.881 | 55.383 | 50.718 |
| ALL | 287.804 | 290.326 | 293.046 | 295.753 | 298.593 | 301.580 | 304.375 | 307.007 | 297.310 |

Source: U.S. Census Bureau, Statistical Abstract of the United States: 2012
NOTE: Rows and columns may not sum to "Totals" due to rounding.

## Table B9: Standardized Age Group Weights based on Year 2000 U.S. Population

| Age Group | Census Year 2000 Estimated Population (1,000,000's) | Std. Wt. (Year 2000) |
|---|---|---|
| < 1–19 | 80.473 | 0.28595 |
| 20–39 | 81.563 | 0.28982 |
| 40–59 | 73.590 | 0.26149 |
| 60 and over | 45.798 | 0.16274 |

Source: U.S. Census Bureau, Statistical Abstract of the United States: 2012

**Table B10: Age-Specific and Age-Adjusted Electrocution Rates Standardized to Year 2000 Population, 2002–2009**

| **Year 2002** Age Group | Estimated Number of Deaths | Population: 2002 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 13.51 | 81.221 | 0.1664 | 0.28595 | 0.0476 |
| 20–39 | 15.01 | 81.629 | 0.1839 | 0.28982 | 0.0533 |
| 40–59 | 15.01 | 77.888 | 0.1928 | 0.26149 | 0.0504 |
| 60 and over | 12.01 | 47.066 | 0.2552 | 0.16274 | 0.0415 |
| Total | 55.55 | 287.804 | 0.1930[a] | 1.00000 | 0.1928[b] |

| **Year 2003** Age Group | Estimated Number of Deaths | Population: 2003 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 15.03 | 81.485 | 0.1845 | 0.28595 | 0.0527 |
| 20–39 | 11.27 | 81.492 | 0.1383 | 0.28982 | 0.0401 |
| 40–59 | 15.03 | 79.326 | 0.1895 | 0.26149 | 0.0495 |
| 60 and over | 20.04 | 48.023 | 0.4173 | 0.16274 | 0.0679 |
| Total | 61.38 | 290.326 | 0.2114[a] | 1.00000 | 0.2103[b] |

| **Year 2004** Age Group | Estimated Number of Deaths | Population: 2004 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 5.54 | 81.820 | 0.0678 | 0.28595 | 0.0194 |
| 20–39 | 15.24 | 81.486 | 0.1871 | 0.28982 | 0.0542 |
| 40–59 | 29.10 | 80.904 | 0.3597 | 0.26149 | 0.0941 |
| 60 and over | 11.09 | 48.836 | 0.2270 | 0.16274 | 0.0369 |
| Total | 60.98 | 293.046 | 0.2081[a] | 1.00000 | 0.2046[b] |

| **Year 2005** Age Group | Estimated Number of Deaths | Population: 2005 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 16.21 | 82.073 | 0.1976 | 0.28595 | 0.0565 |
| 20–39 | 28.37 | 81.612 | 0.3477 | 0.28982 | 0.1008 |
| 40–59 | 35.13 | 82.384 | 0.4264 | 0.26149 | 0.1115 |
| 60 and over | 13.51 | 49.685 | 0.2719 | 0.16274 | 0.0443 |
| Total | 93.23 | 295.753 | 0.3152[a] | 1.00000 | 0.3130[b] |

| **Year 2006**<br><br>Age Group | Estimated Number of Deaths | Population: 2006 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 5.01 | 82.390 | 0.0608 | 0.28595 | 0.0174 |
| 20–39 | 16.28 | 82.064 | 0.1984 | 0.28982 | 0.0575 |
| 40–59 | 15.03 | 83.594 | 0.1798 | 0.26149 | 0.0470 |
| 60 and over | 10.02 | 50.546 | 0.1982 | 0.16274 | 0.0323 |
| Total | 46.34 | 298.593 | 0.1552[a] | 1.00000 | 0.1542[b] |

| **Year 2007**<br><br>Age Group | Estimated Number of Deaths | Population: 2007 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 11.20 | 82.857 | 0.1352 | 0.28595 | 0.0387 |
| 20–39 | 22.40 | 82.581 | 0.2713 | 0.28982 | 0.0786 |
| 40–59 | 20.54 | 83.816 | 0.2450 | 0.26149 | 0.0641 |
| 60 and over | 5.60 | 52.326 | 0.1070 | 0.16274 | 0.0174 |
| Total | 59.74 | 301.580 | 0.1981[a] | 1.00000 | 0.1988[b] |

| **Year 2008**<br><br>Age Group | Estimated Number of Deaths | Population: 2008 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 9.92 | 83.198 | 0.1192 | 0.28595 | 0.0341 |
| 20–39 | 13.23 | 83.127 | 0.1591 | 0.28982 | 0.0461 |
| 40–59 | 16.53 | 84.169 | 0.1964 | 0.26149 | 0.0514 |
| 60 and over | 14.88 | 53.881 | 0.2762 | 0.16274 | 0.0449 |
| Total | 54.56 | 304.375 | 0.1793[a] | 1.00000 | 0.1765[b] |

| **Year 2009**<br><br>Age Group | Estimated Number of Deaths | Population: 2009 | Age-Specific Rate* | Std. Wt. (Year 2000) | Product of Rate x Weight* |
|---|---|---|---|---|---|
| < 1–19 | 11.83 | 83.421 | 0.1418 | 0.28595 | 0.0405 |
| 20–39 | 21.97 | 83.644 | 0.2626 | 0.28982 | 0.0761 |
| 40–59 | 50.69 | 84.559 | 0.5995 | 0.26149 | 0.1568 |
| 60 and over | 11.83 | 55.383 | 0.2136 | 0.16274 | 0.0348 |
| Total | 96.31 | 307.007 | 0.3137[a] | 1.00000 | 0.3082[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 2002-2009 | Average 2007-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Female | 44 | 4 | 10 | 5 | 9 | 5 | 4 | 3 | 3 | 5 |
| Male | 314 | 37 | 27 | 44 | 35 | 64 | 33 | 29 | 30 | 52 |
| All | 358 | 41 | 37 | 49 | 44 | 69 | 37 | 32 | 33 | 57 |

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 2002-2009 | Average 2007-2009 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Female | 64.53 | 6.34 | 15.01 | 6.26 | 12.47 | 6.76 | 5.01 | 5.60 | 4.96 | 8.45 |
| Male | 463.58 | 63.87 | 40.54 | 55.11 | 48.51 | 86.47 | 41.33 | 54.14 | 49.60 | 87.86 |
| All | 528.10 | 70.21 | 55.55 | 61.38 | 60.98 | 93.23 | 46.34 | 59.74 | 54.56 | 96.31 |

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 (2002 through 2009), 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 $i^{th}$ age group, and
*population* $n_i$ is the average U.S. population (2002-2009) in the $i^{th}$ age group.

$$x^2 = \sum_{n=1}^{4} \frac{(O_i - E_i)^2}{E_i}$$

where,

$E_i$ is the expected number of electrocutions in the $i^{th}$ age group, and
$O_i$ is the observed (estimated) number of electrocutions in the $i^{th}$ 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 20 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) |
|---|---|---|---|---|---|
| < 1–19 | 82.308 | 146.20 | 88.26 | 22.96 | |
| 20–39 | 82.204 | 146.02 | 143.79 | 0.03 | |
| 40–59 | 82.080 | 145.80 | 197.07 | 18.03 | |
| 60 and over | 50.718 | 90.09 | 98.98 | 0.88 | |
| ALL | 297.310 | 528.10 | 528.10 | 41.91 | **0.000000** |

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) |
|---|---|---|---|---|---|
| Female | 150.937 | 268.10 | 64.53 | 154.58 | |
| Male | 146.373 | 260.00 | 463.58 | 159.40 | |
| ALL | 297.310 | 528.10 | 528.10 | 313.98 | **0.0000000** |

**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 | 0.00127 | 0.00127 | 0.33 | **0.5844** |
| Error | 6 | 0.02290 | 0.00382 | | |
| Corrected Total | 7 | 0.02417 | | | |

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 greater than 0.05, we conclude that there is insufficient evidence to reject the hypothesis that there is no trend. Therefore, we can conclude that there is insufficient evidence of a 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. Hnatov, Matthew V.: *2008 Electrocutions Associated With Consumer Products*, January 2012, Directorate for Epidemiology, Division of Hazard Analysis, U.S. Consumer Product Safety Commission.

3. 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.

4. *U.S. Census Bureau*, Statistical Abstract of the United States: 2012. http://www.census.gov/compendia/statab/