

Article

# The Relationship between “Protection of” and “Violence Against” Infants and Young Children: The U.S. Experience, 1940–2005

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**Abstract:** Between 1940 and 2005, in the United States, the rate of unnatural death declined about 75 percent in infant and young child boys and girls; a remarkable indicator of successful child protection. During this same period, the rate of reported homicide in infant boys increased 64.0 percent, in infant girls increased 43.5 percent, in young child boys increased 333.3 percent, and in young child girls increased 300.0 percent, a dismal and disturbing indicator of failed child protection. Can these simultaneously encouraging and discouraging observations be reconciled? The four categories of unnatural death, homicide, suicide, motor vehicle accident (MVA), and non-MVA, are mutually exclusive classifications. Correlations between the four categories of unnatural death among U.S. men and woman in all age groups for the years 1940 through 2005 were calculated. A negative correlation between homicide and non-MVA death rates was shown for all age groups, encompassing the entire human lifespan, in both genders. This consistently observed negative correlation was only observed between homicide and non-MVA death rates, and was not demonstrated between other causes of unnatural deaths. Moreover, this negative correlation was strongest (less than  $-0.7$ ) in infants and young children. These observations are consistent with the suggestion that as the rate of unnatural death in infants and young children dramatically declined, society gave greater scrutiny to those fewer occurring unnatural deaths and demonstrated an increasing propensity to assign blame for those fewer deaths.

**Keywords:** child protection; child abuse; child homicide; infant protection; infant abuse; infant homicide; social surveillance; unnatural death

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## 1. Introduction

Over the past several decades, the problem of infant and child abuse, maltreatment, and neglect has received increased public notice and awareness [1–3]. The magnitude of fatal child abuse has likely been underestimated [4,5]. Infant and child homicide are most frequently the result of abuse by a parent or custodial adult with psychiatric dysfunction [6–8]. In the United States, infant and child homicide became the focus of increased attention in the 1960s [9,10]. Of note, identified risk factors in infant homicide and accidental death are similar [1,11,12]. Moreover, head injury is frequently observed in both intentional and accidental deaths in infants and young children [13,14].

Unnatural deaths may be classified into one of four mutually exclusive categories: homicide, suicide, motor vehicle accident (MVA), and non-MVA. Infants and young children (less than five years old) do not commit suicide. Consequently, there are only three broad classifications of unnatural death in infants and young children.

When classifying two mutually exclusive causes of unnatural death, their relative frequency may be important. For example, if A and B are two mutually exclusive causes of unnatural death and A is much more frequent than B, then those cases in which some ambiguity in the classification exists there may be a tendency to classify the unnatural death as A. However, if A becomes less frequent relative to B and the sensitivity to recognizing B increases, then there may be an increasing tendency to classify ambiguous unnatural deaths as B. Accordingly, when infant and young child reported non-MVA accident mortality rates were both absolutely and relatively high compared to infant and young child homicide rates, underascertainment of homicides was both understandable and predictable. However, as reported infant and young child and infant non-MVA mortality rates absolutely and relatively declined compared to infant and young child homicide rates and societal recognition and sensitivity to infant and young child abuse, maltreatment, and neglect increased, a propensity to assign a homicide classification over a non-MVA death classification as a cause of unnatural death also became conversely understandable and predictable [15–17].

In this analysis, the correlations between the four categories of unnatural death among U.S. men and women in each age group spanning all ages were examined in order to determine whether further credence and support for the hypothesis that changing propensities to classify infant and young child unnatural deaths as homicides or non-MVA deaths occurred.

## 2. Methods

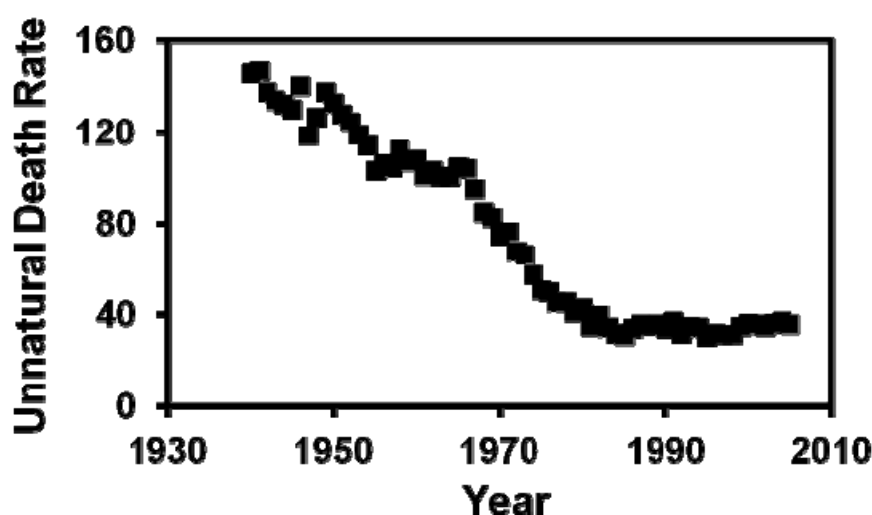
The data used in this study is publicly accessible from the National Center for Health Statistics [18]. Mortality rates (per 100,000) for unnatural deaths (including homicide, suicide, MVA, and non-MVA) and for all age groups (0 < 1 years, 1 < 5 years, 5 < 15 years, 15 < 25 years, 25 < 35 years, 35 < 45 years, 45 < 55 years, 55 < 65 years, 65 < 75 years, and 75+ years) in the United States for the years 1940 through 2005 in men and women were utilized.

Correlations between annual mortality rates for each of the four categories of unnatural death (homicide, suicide, MVA, and non-MVA) were calculated in each age group spanning all ages and by gender.

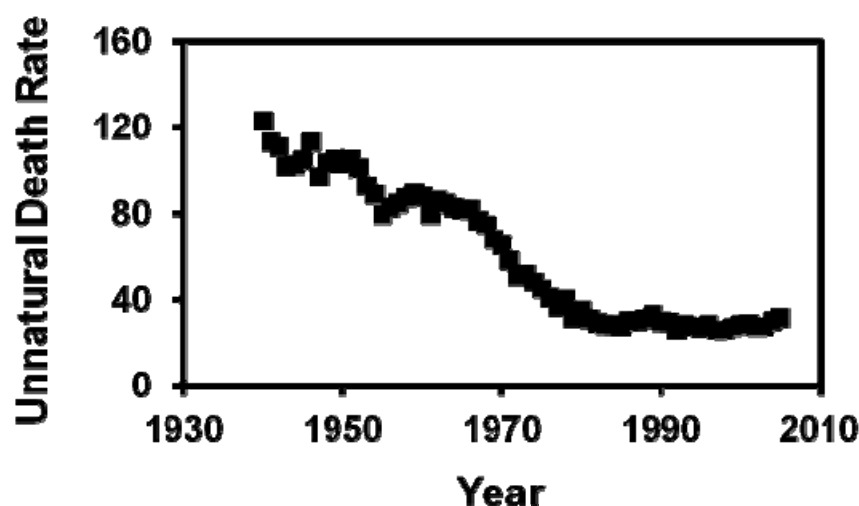
### 3. Results

Annual unnatural death rates (per 100,000) for U.S. infant boys and girls are shown in Figures 1 and 2 respectively. Infant boy annual unnatural death rates decreased from 145.9 in 1940 to 35.7 in 2005, a 75.5 percent decline. Infant girl annual unnatural death rates decreased from 122.9 in 1940 to 31.8 in 2005, a 74.1 percent decline. Annual homicide rates (per 100,000) for U.S. infant boys and girls are shown in Figures 3 and 4 respectively. Infant boy annual homicide rates increased from 5.0 in 1940 to 8.2 in 2005, a 64.0 percent increase. Infant girl annual homicide rates increased from 4.6 in 1940 to 6.6 in 2005, a 43.5 percent increase.

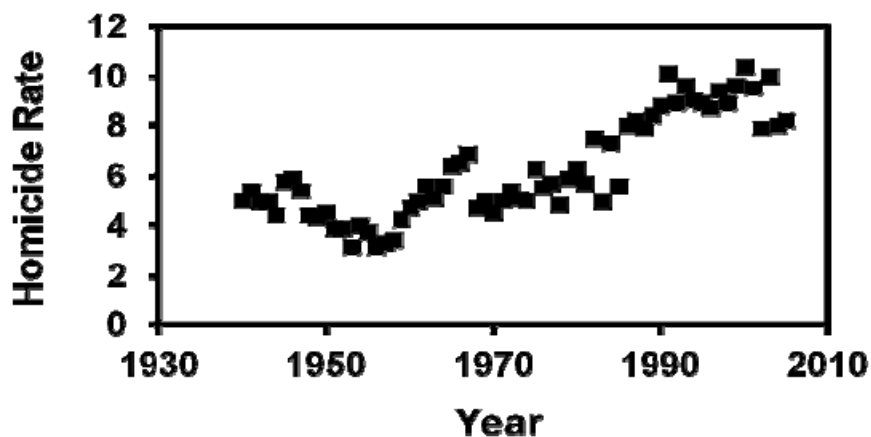
**Figure 1.** Annual unnatural death rates (per 100,000) in U.S. boys (infants, aged 0 to less than 1 year) for the years 1940 through 2005.



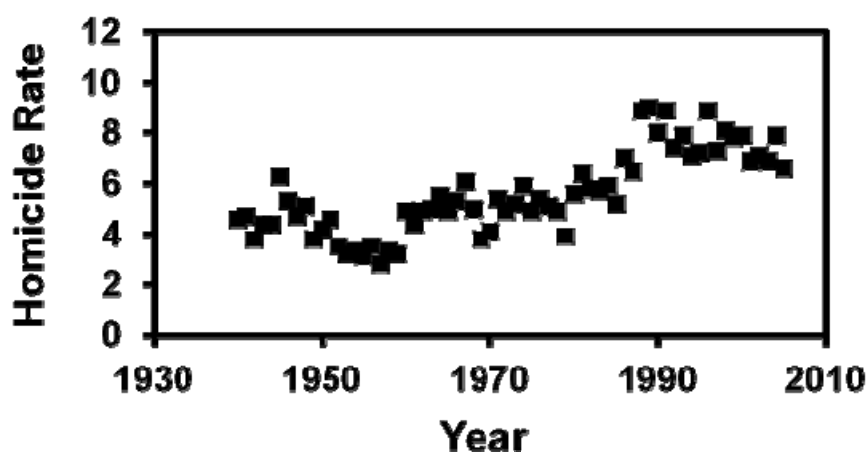
**Figure 2.** Annual unnatural death rates (per 100,000) in U.S. girls (infants, aged 0 to less than 1 year) for the years 1940 through 2005.



**Figure 3.** Annual homicide rates (per 100,000) in U.S. boys (infants, aged 0 to less than 1 year) for the years 1940 through 2005.



**Figure 4.** Annual homicide rates (per 100,000) in U.S. girls (infants, aged 0 to less than 1 year) for the years 1940 through 2005.



Annual unnatural death rates (per 100,000) for U.S. young child boys and girls are shown in Figures 5 and 6 respectively. Young child boy annual unnatural death rates decreased from 57.5 in 1940 to 15.0 in 2005, a 73.9 percent decline. Young child girl annual unnatural death rates decreased from 38.9 in 1940 to 10.2 in 2005, a 73.8 percent decline. Annual homicide rates (per 100,000) for U.S. young child boys and girls are shown in Figures 7 and 8 respectively. Young child boy annual homicide rates increased from 0.6 in 1940 to 2.6 in 2005, a 333.3 percent increase. Young child girl annual homicide rates increased from 0.5 in 1940 to 2.0 in 2005, a 300.0 percent increase.

The correlations between each of the four categories of unnatural death for every age group for the years 1940 through 2005 are shown in Table 1 for men and in Table 2 for women. The effect size of the 54 correlations listed in each table are large (absolute value greater than 0.5) [19] in 28 instances for men (Table 1) and in 29 instances for women (Table 2). Of the 28 large effect size correlations in men, 11 are negative (Table 1). Of the 29 large effect size correlations in women, 9 are negative (Table 2). Of unique note, the correlations between homicide rates and non-MVA death rates are negative for each and every age group for both genders (Tables 1 and 2).

**Table 1.** Correlations between homicide (Hom), non-motor vehicle accident (nMVA) mortality, motor vehicle accident (MVA) mortality, and suicide (Sui) rates in U.S. men within the indicated age groups for the years 1940 through 2005.

| Age Group          | 0 < 1   | 1 < 5   | 5 < 15  | 15 < 25 | 25 < 35 | 35 < 45 | 45 < 55 | 55 < 65 | 65 < 75 | 75 +    |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Correlation</b> |         |         |         |         |         |         |         |         |         |         |
| Hom-nMVA           | −0.7364 | −0.8035 | −0.6720 | −0.6020 | −0.3306 | −0.2043 | −0.1557 | −0.0196 | −0.0308 | −0.2939 |
| Hom-MVA            | −0.6712 | −0.7500 | −0.5545 | −0.3858 | 0.1726  | 0.2853  | 0.1109  | −0.0220 | −0.0656 | −0.2404 |
| MVA-nMVA           | 0.4554  | 0.8807  | 0.8792  | 0.1199  | 0.3132  | 0.4899  | 0.8117  | 0.9279  | 0.9381  | 0.9029  |
| Sui-nMVA           | -       | -       | −0.8119 | −0.6669 | −0.6248 | −0.2404 | 0.7640  | 0.8629  | 0.8500  | 0.6612  |
| Sui-Hom            | -       | -       | 0.8500  | 0.8936  | 0.7988  | 0.2045  | −0.1108 | −0.0596 | 0.0033  | −0.0793 |
| Sui-MVA            | -       | -       | −0.7819 | −0.2711 | −0.2443 | −0.3341 | 0.8153  | 0.9226  | 0.8819  | 0.6565  |

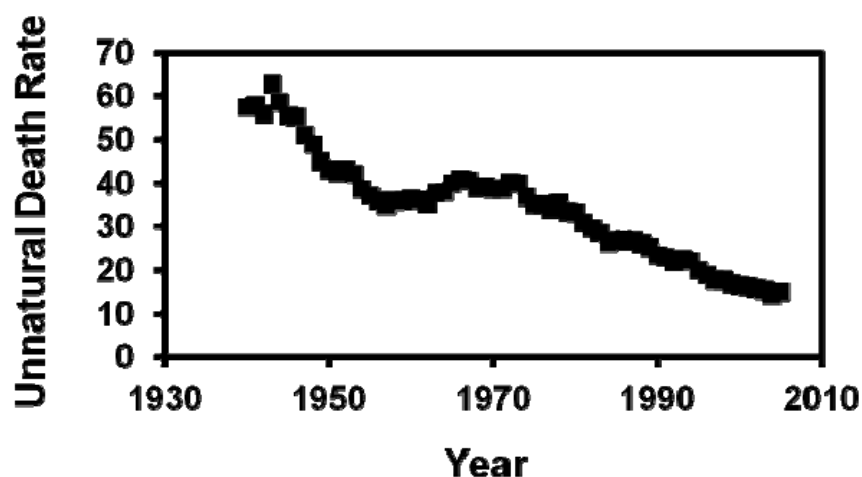
**Table 2.** Correlations between homicide (Hom), non-motor vehicle accident (nMVA) mortality, motor vehicle accident (MVA) mortality, and suicide (Sui) rates in U.S. women within the indicated age groups for the years 1940 through 2005.

| Age Group          | 0 < 1   | 1 < 5   | 5 < 15  | 15 < 25 | 25 < 35 | 35 < 45 | 45 < 55 | 55 < 65 | 65 < 75 | 75 +    |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Correlation</b> |         |         |         |         |         |         |         |         |         |         |
| Hom-nMVA           | −0.7155 | −0.8465 | −0.6638 | −0.3830 | −0.4288 | −0.3149 | −0.3059 | −0.4132 | −0.6477 | −0.6632 |
| Hom-MVA            | −0.5450 | −0.6666 | −0.2849 | 0.5647  | 0.6284  | 0.5232  | 0.1597  | −0.1896 | −0.4314 | −0.4836 |
| MVA-nMVA           | 0.3101  | 0.7699  | 0.6228  | −0.3936 | −0.3619 | −0.0400 | 0.3712  | 0.5615  | 0.3898  | 0.5516  |
| Sui-nMVA           | -       | -       | −0.7782 | −0.0806 | 0.3230  | 0.2068  | 0.6250  | 0.8009  | 0.6360  | 0.7586  |
| Sui-Hom            | -       | -       | 0.7696  | 0.8361  | 0.4510  | 0.5446  | 0.2787  | 0.0649  | −0.3107 | −0.3185 |
| Sui-MVA            | -       | -       | −0.6052 | 0.5977  | 0.5474  | 0.5515  | 0.5962  | 0.6961  | 0.7058  | 0.4358  |

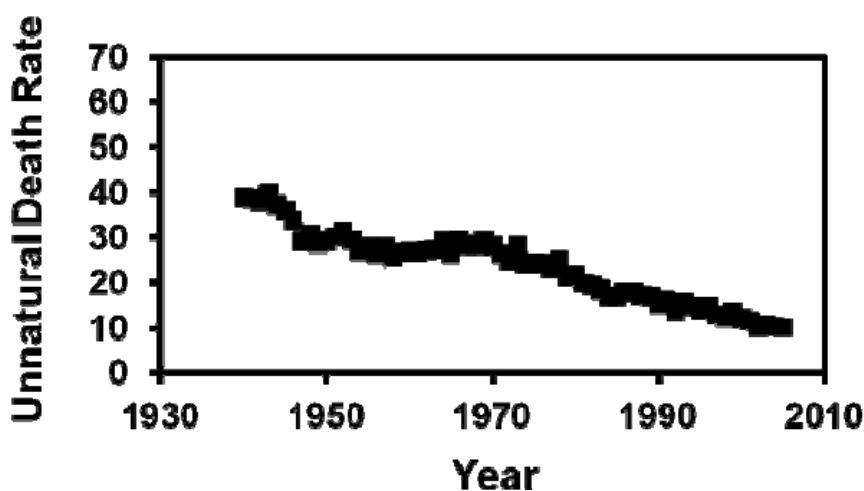
#### 4. Discussion and Conclusions

One measure of how well a society is protecting its youngest citizens is the rate of unnatural death in that group. As shown (Figures 1, 2, 5 and 6), unnatural death rates among U.S. infants and young children of both genders declined approximately 75 percent from 1940 through 2005. One could argue that this decline represents a remarkable achievement and demonstrates sustained commitment to protecting the lives of society's youngest and most innocent citizens through improved accident prevention and trauma management. On the other hand, rates of unnatural death attributed to homicide in infants and young children (Figures 3, 4, 7 and 8) increased dramatically over this same time period in the United States. One could conversely argue that these increases represent an increasing tendency in American society towards violence against our youngest and most innocent citizens. Are these two views of American society compatible? Are we simultaneously protecting and harming infants and young children? More importantly, are the data supporting both of these views interrelated?

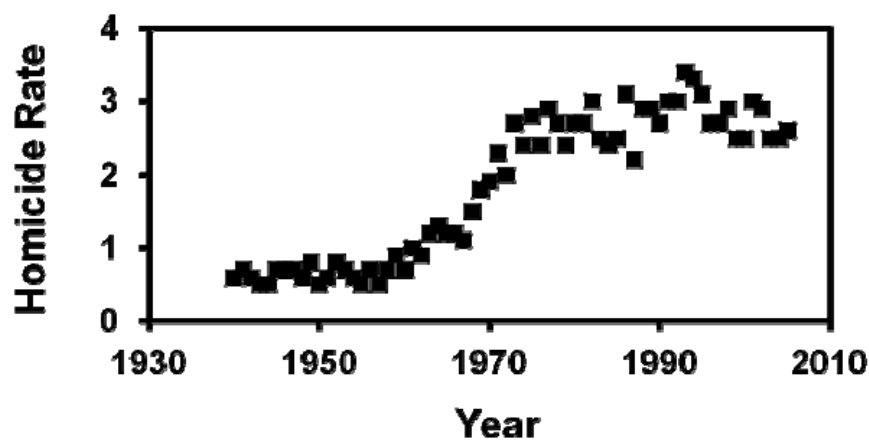
**Figure 5.** Annual unnatural death rates (per 100,000) in U.S. boys (young child, aged 1 to less than 5 years) for the years 1940 through 2005.



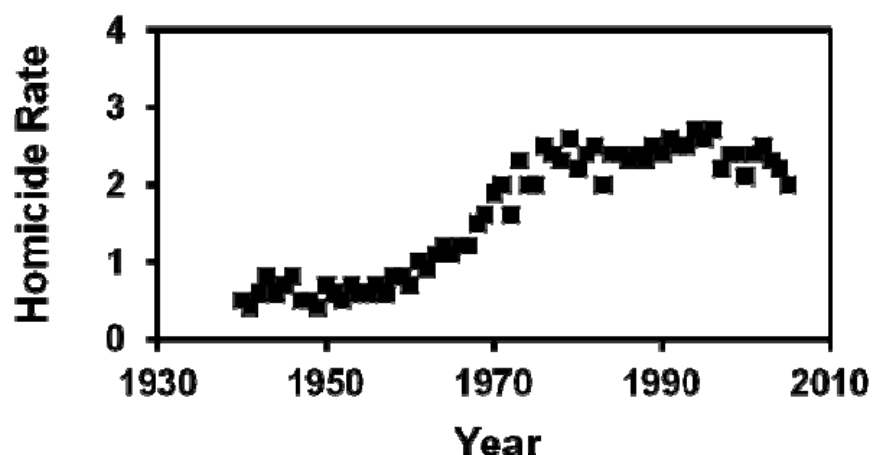
**Figure 6** Annual unnatural death rates (per 100,000) in U.S. girls (young child, aged 1 to less than 5 years) for the years 1940 through 2005.



**Figure 7.** Annual homicide rates (per 100,000) in U.S. boys (young child, aged 1 to less than 5 years) for the years 1940 through 2005.



**Figure 8.** Annual homicide rates (per 100,000) in U.S. girls (young child, aged 1 to less than 5 years) for the years 1940 through 2005.



There are four broad categories of unnatural death; homicide, suicide, MVA, and non-MVA. These four categories are mutually exclusive. Accordingly, an unnatural death can be classified into only one of these four categories. When classifying mutually exclusive events, their frequency may be important [15–17]. For example, if event A is much more frequent than event B, there may be a propensity to bias classification towards event A. However, if event A becomes less frequent and the sensitivity to recognizing event B increases, there may be a tendency to bias classification towards event B. While the classification of an individual mutually exclusive event is inherently competitive [20], there is no reason that the observed rates of such events should be necessarily negatively or positively correlated. However, if a consistently changing propensity to bias classification between two mutually exclusive events is occurring, one might expect to observe a negative correlation between the rates of those two events. Moreover, the larger the negative correlation, the greater the likelihood that such a change in propensity to classify mutually exclusive events one way or the other has occurred.

As shown in Tables 1 and 2, a negative correlation for every age group in both genders was shown to only exist between homicide and non-MVA death rates. Moreover, the effect size of this negative correlation was largest in the two youngest age groups, infants and young children.

Can there be some element of uncertainty when trying to classify the death of an infant or young child as a homicide or an accident death? The finding of the triad of subdural hematoma, retinal hemorrhage, and encephalopathy had gained acceptance as being “evidence” indicative of intentional infant injury; commonly referred to as the “shaken baby syndrome” [21]. However, the reliability and validity of using the clinical and pathological triad associated with the shaken baby syndrome to definitively indicate intentional injury has been challenged [22–26]. Consequently, pathological injuries sustained by an infant or young child should not be a sole and sufficient indicator of whether those injuries were intentionally inflicted.

When an infant or young child dies while under the care of an adult, intense scrutiny of the surrounding circumstances may ensue. How does society decide whether to hold a custodial adult criminally responsible for such a death? That dilemma received intense international media attention in the British *au pair* case. Louise Woodward, a 19 year old woman, was working as a nanny for an eight month old boy in February 1997 when the infant became unresponsive and died a few days later. When the infant was found to have injuries consistent with “shaken baby syndrome”, Woodward was charged and convicted of second-degree murder in a Massachusetts court. That conviction was ultimately reduced to involuntary manslaughter by the presiding trial judge [27]. The Woodward case was unusual in the extent of international media attention that it received and served to focus attention on the validity and reliability of “medical evidence” used to distinguish accidental from intentionally inflicted injury. Most such cases and the associated evidence do not receive such media attention [28,29].

When reported infant and young child non-MVA mortality rates were both absolutely and relatively high compared to reported young child and infant homicide rates, underascertainment of homicides was understandable and perhaps predictable. However, when reported infant and young child non-MVA mortality rates absolutely and relatively declined compared to reported infant and young child homicide rates, those changing frequencies, coupled with increased societal sensitivity to the problem of child abuse, understandably and perhaps predictably resulted in an increased propensity to assign a homicide classification over a non-MVA death classification as the cause of an unnatural death in an infant or young child [15–17].

There are many potential problems with utilizing centralized data sets over time. There is not uniformity or quality control of the data as it is collected. In fact, it is that very lack of uniformity and quality control that this manuscript suggests may have been responsible for an evolving pattern of misclassification of infant and young child homicide and non-MVA deaths over time. Moreover, when using macro data sets as was done in this study, the influence of such factors as ethnic origin, income, and urban/rural influences can be readily obscured. Nevertheless, patterns observed at the macro level can help focus attention on subsequent studies or analyses.

While this study focused on rates of unnatural deaths in infants and young children, the absolute numbers in each category can be readily estimated by multiplying the rates by the relevant U.S population for that particular age and gender.

Infant and young child abuse and homicide is a serious societal problem that cannot be tolerated. However, inaccurate classification of an infant or young child unnatural death as a homicide, rather than as an accident, also has unacceptable and intolerable consequences.

## Author Contributions

Jack E. Riggs and Gerald R. Hobbs designed the study. Gerald R. Hobbs was the statistician. Jack E. Riggs wrote the first draft. Jack E. Riggs and Gerald R. Hobbs edited and approved the final version.

## Conflicts of Interest

The authors declare no conflict of interest.

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