ORIGINAL ARTICLE

Police deaths in New York and London during the twentieth century

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Objectives: To describe the incidences and causes of occupational police deaths in New York City in the United States and Greater London in the United Kingdom during the twentieth century. To assess the relation between overall societal violence and violence directed toward police officers in these metropolitan areas.

Design and setting: Ecological study of New York and London from 1900 through 1999.

Main outcome measures: Intentional and unintentional occupational police mortality rates for New York and London were estimated for each decade. The general population homicide rates of both New York and London were assessed for their correlation with their respective intentional occupational police mortality rates.

Results: During the 20th century, 585 police officers in New York and 160 police officers in London died while participating in law enforcement activities. New York had markedly greater intentional police mortality rates compared to London throughout most of the 20th century, but these differences decreased significantly by the end of the century. Intentional gunshot wounds comprised 290 police deaths in New York, but only 14 police deaths in London. In New York, gun shot wounds (both intentional and unintentional) accounted for more occupational police deaths (51.6%) than did all other injury mechanisms combined. In London, motor vehicle collision was the most common cause (47.5%) of occupational police death. There were no apparent correlations between the general population homicide rates and intentional police mortality rates in either New York ($r^2 = 0.05$, 95% CI −0.77 to 0.81) or London ($r^2 = 0.34$, 95% CI −0.61 to 0.89).

Conclusions: During the 20th century, both intentional and unintentional occupational police mortality rates were significantly greater in New York compared to London. These differences are likely from several socioeconomic, cultural, and occupational factors. The declines in police deaths in New York during the latter part of the 20th century indicate that at least some measures taken by the New York Police Department have been successful at significantly reducing the incidence of both intentional and unintentional police deaths.

On 11 September 2001, 72 law enforcement officers were killed during the terrorist attacks on the World Trade Center in New York City.[1] This catastrophic loss exemplifies the extreme occupational mortality risk for police officers in the United States. Although police officers in many countries are frequently unintentionally killed from motor vehicle collisions, police officers in the US are often intentionally killed with firearms.[1 2] During the 10 year period of 1988 through 1997, 688 police officers were intentionally killed in the US and almost all of these (633, or 92%) victims died from gunshot injuries.[2] In contrast, the number of police officers intentionally killed from gunshot wounds in the United Kingdom is so low that officers do not typically carry firearms for their personal protection.[3–5] The reasons for these disparities between the US and the UK have not been previously studied from an occupational or public health perspective.

There are over 800 000 law enforcement officers currently employed in the United States.[1] Prior studies have found police to be at long term increased risk for various cancers, arteriosclerotic heart disease, and suicide.[6–8] However, only limited research has evaluated occupational risk factors for police deaths while performing law enforcement activities. For example, some ecological studies have found that intentional police mortality rates are correlated to general population homicide rates in the larger cities of the US, suggesting a relation to overall societal violence.[9 10] In addition, two recent studies have found that unbelted occupants of police cars were at two- to fourfold greater risk of fatal injury compared with belted occupants.[11 12] Unfortunately, there is little information in the occupational medicine literature regarding the effects of preventive strategies and interventions to reduce police mortality in the line of duty.[13 14]

We investigated the incidences and immediate causes of occupational police deaths in New York and London during the twentieth century. We also assessed the relation between overall societal violence and violence directed toward police in these two large metropolitan areas. Our objectives were to examine and contrast work related police deaths in two distinct geographic populations over an extended time period to generate hypotheses for future investigations of the important risk and protective factors for occupational police mortality.

METHODS

Study design and measures

We conducted an ecological trend study of the causes of occupational deaths among officers of the police services of New York City in the US and Greater London in the UK from 1900 through 1999.[15 16] These two metropolitan areas were selected for study because of their similar population and geographic dimensions. In addition, both metropolitan areas have dynamic populations that have become more demographically diverse during the 20th century. New York City covers 1214 km^2 and comprises five boroughs. Greater

London covers 1579 km^2 and comprises the City of London and 32 boroughs (including the City of Westminster). The City of London was excluded from this study because this small part of Greater London (that is, 2.9 km^2 with a residential population of 6500) has a historically autonomous police service.[3] We used general population homicides as a measure of overall societal violence and intentional police death rates as measures of violence directed toward police officers.

Sources of data

We obtained information concerning the number and causes of the occupational police deaths in New York and London for the study period from the official websites of their respective police departments.[17 18] We obtained information concerning the annual number of employed police officers from various official reference sources.[3 18–20] The annual general population homicides and census of New York and London were obtained from the Inter-university Consortium for Political and Social Research of the University of Michigan.[21]

Incidence rate estimations

Incidence rates of occupational police mortality were estimated for New York and London for each decade by dividing the total number of occupational police deaths for each decade by the estimated average number of employed police officers during the same decade. As the number of occupational police deaths fluctuates widely from year to year, we estimated average police mortality rates and general population homicide rates for 10 year periods.

Outcome classification

Causes of death were classified as intentional or unintentional based on the historical accounts reported in official documentation by the police services of New York and London. Causes of intentional deaths included shooting with various types of guns, physical assault without a weapon, stabbing with a knife or other sharp instrument, bomb explosion, and motor vehicle collision (that is, being intentionally struck with a car). Causes of unintentional deaths included motor vehicle collision (that is, as passenger, pedestrian, and motorcycle rider), physical collapse (that is, cardiopulmonary arrest while performing law enforcement activities), environmental injury (for example, exposure to fire, smoke, or electricity), drowning, unintentional shooting, fall from a building, and trampling or fall from a horse.

Statistical analyses

Temporal trends for occupational police mortality rates and proportional differences in the intentional and unintentional injury rates between New York and London were assessed using χ^2 tests. Crude rate ratios were used to compare the incidence rates of occupational police mortality for selected decades between New York and London.[22] The general population homicide rates of both New York and London were assessed for their correlations with their respective intentional police mortality rates using linear regression with coefficient of determination (r^2) estimations. General population homicide rates were calculated by decade to facilitate the statistical comparisons. We also assessed the relations between unintentional and intentional police deaths in both New York and London using linear regression with coefficient of determination estimations.

Table 2 Distribution of the immediate causes of occupational police deaths in New York and London during the 20th century

	New York	London
Occupational police deaths		
Intentional deaths		
Gun shot wound	290 (49.6%)	14 (8.8%)
Physical assault	24 (4.1%)	7 (4.4%)
Stabbing	11 (1.9%)	10 (6.3%)
Bomb explosion	6 (1.0%)	5 (3.1%)
Motor vehicle collision	0 (0.0%)	7 (4.4%)
Subtotal intentional	331 (56.6%)	43 (26.9%)
Unintentional deaths		
Motor vehicle collision	146 (25.0%)	69 (43.1%)
Physical collapse	41 (7.0%)	8 (5.0%)
Fire, smoke, or electrical injury	24 (4.1%)	5 (3.1%)
Drowning	14 (2.4%)	16 (10.0%)
Gunshot wound	12 (2.1%)	6 (3.8%)
Fall/building collapse	1 (0.2%)	8 (5.0%)
Trampling or fall from a horse	5 (0.9%)	3 (1.9%)
Subtotal unintentional	243 (41.5%)	115 (71.9%)
Unspecified deaths	11 (1.9%)	2 (1.3%)
Total	585	160

RESULTS

During the 20th century, 585 police officers in New York and 160 police officers in London died while performing law enforcement activities. The population, number of police officers, and number of occupational police deaths for New York and London are presented for each decade in table 1. From the 1900s through the 1990s, both the general population and number of employed police officers for New York had more than doubled. In London, however, the general population remained relatively constant and the number of employed police officers increased by approximately 60%.

Table 1 Population, police personnel, and total occupational police deaths in New York and London during the 20th century

Decade	Population of New York	New York Police Department officers	New York Police Department officer deaths	Population of London	London Metropolitan Police officers	London Metropolitan Police officer deaths
1900s	3,500,000	16,000	20	6,700,000	17,000	13
1910s	5,200,000	9000	29	7,200,000	19,000	22
1920s	6,000,000	15,000	96	7,700,000	19,000	10
1930s	7,000,000	18,500	113	8,300,000	19,000	15
1940s	7,500,000	17,000	59	8,400,000	15,000	13
1950s	7,900,000	22,000	34	8,100,000	16,000	10
1960s	7,800,000	27,000	69	7,700,000	20,000	21
1970s	7,700,000	31,000	79	7,100,000	22,000	17
1980s	7,100,000	35,000	54	6,700,000	25,000	21
1990s	7,300,000	39,000	32	6,900,000	27,000	18

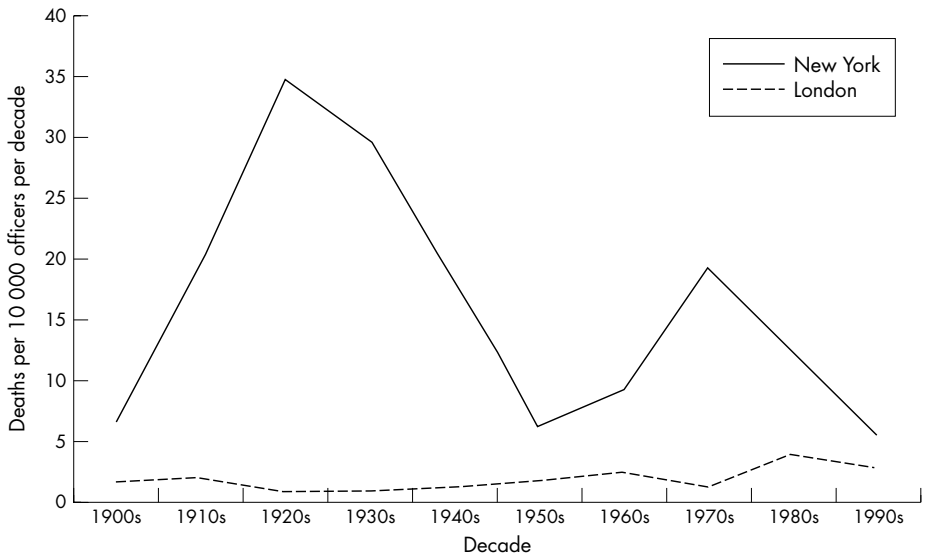

Figure 1 Comparison of intentional police mortality rates in New York and London during the 20th century.

The causes of occupational police deaths are presented in table 2. New York had a significantly greater overall proportion of intentional deaths compared with London (57% *v* 27%, $p<0.001$). The vast majority of intentional police deaths in New York (88%) were from gunshot wounds. In fact, intentional gunshot wounds caused 290 police deaths in New York, but only 14 police deaths in London during the entire 20th century. Motor vehicle collisions were the main cause of unintentional police mortality in both metropolitan areas followed by physical collapse (that is, cardiac arrest) in New York and drowning in London.

Intentional police mortality rates are presented in figure 1. The rates for New York were significantly greater during the first half compared with the second half of the century (χ^2 for trend = 25.63, $p<0.0001$). In contrast, intentional police mortality rates for London were stable (χ^2 for trend 3.22, $p = 0.068$) and markedly lower than New York throughout the 20th century. By the 1990s, the intentional police mortality rates for New York were still almost twice as great for London (rate ratio = 1.90, 95% CI 0.82 to 4.95), but not statistically different.

Unintentional police mortality rates are presented in figure 2. The rates for New York were also significantly greater during the first half compared with the second of the century (χ^2 for trend = 58.74, $p<0.0001$). Unintentional police deaths rates in London were relatively stable throughout the 20th century (χ^2 for trend 3.00, $p = 0.083$) and significantly lower than New York until the later part of the century. From the 1970s through the 1990s, unintentional occupational police mortality rates were higher in London than New York, but this difference was not significant (rate ratio = 1.27, 95% CI 0.78 to 2.06).

The general population homicide rates for New York and London during the 20th century are presented in figure 3. The incidence of homicide in the general population was significantly greater in New York compared with London throughout the entire 20th century and was markedly increased from the 1960s through the 1990s. There were no apparent correlations between the general population homicide rates and intentional police mortality rates in either New York ($r^2 = 0.05$, 95% CI −0.77 to 0.81) or London ($r^2 = 0.34$, 95% CI −0.61 to 0.89). However, it appeared that

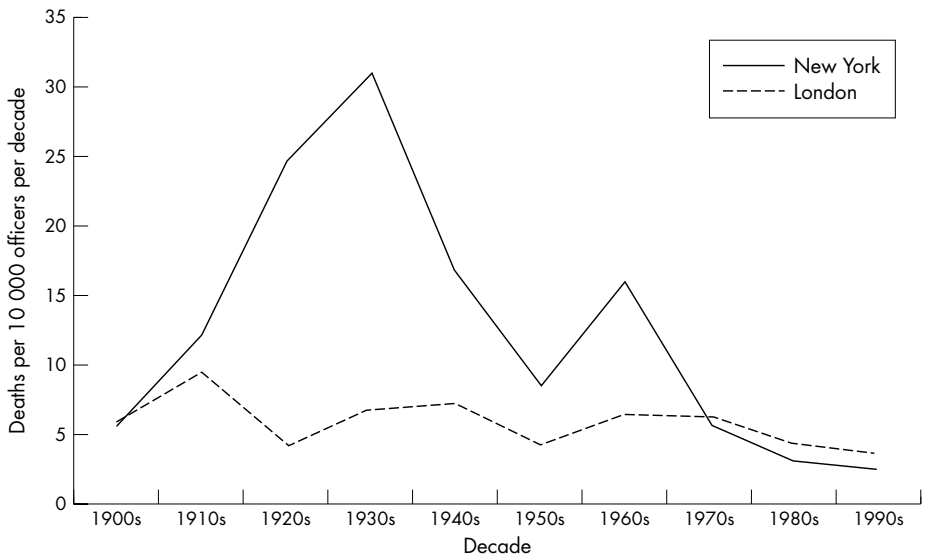

Figure 2 Comparison of unintentional police mortality rates in New York and London during the 20th century.

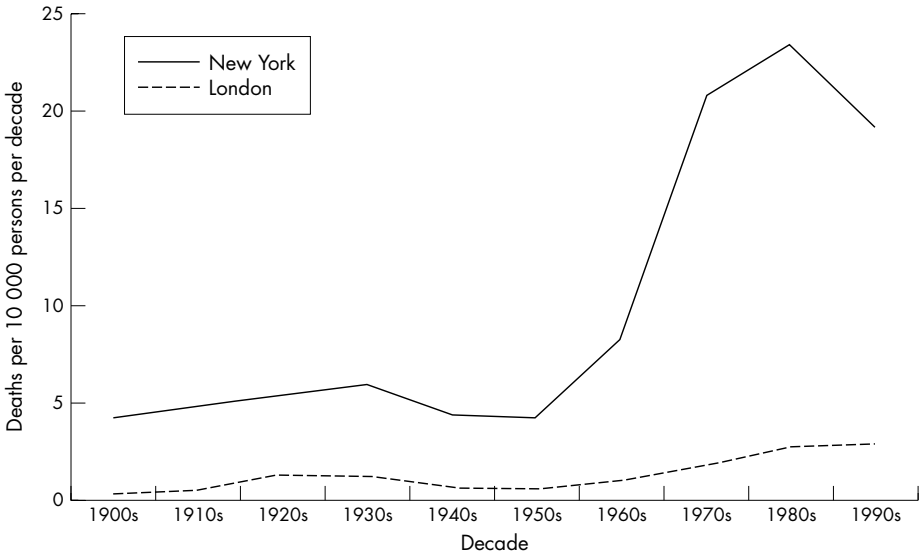

Figure 3 Comparison of general population homicide rates in New York and London during the 20th century.

unintentional and intentional police deaths were correlated in New York ($r^2 = 0.63$, 95% CI 0.00 to 0.90), but not in London ($r^2 = 0.11$, 95% CI −0.75 to 0.83).

DISCUSSION

We found that both intentional and unintentional police mortality rates were substantially higher in New York compared with London for most of the twentieth century, but the magnitudes of these rates decreased significantly by the 1980s and 1990s. We also found that most occupational police deaths in New York were intentional, while most in London were unintentional. In addition, gunshot wounds (both intentional and unintentional) accounted for more occupational police deaths (51.6%) in New York than all other mechanisms combined. Two questions arise from these findings: (1) why were there such remarkable disparities in the occupational police deaths rates between New York and London; and (2) what occurred in the latter part of the 20th century that reduced or resolved these disparities?

Several socioeconomic and occupational factors may have accounted for the differences in police deaths between New York and London. Specifically, the bimodal distributions of both intentional and unintentional occupational police mortality rates for New York (compared to relatively stable rates for London) may have resulted from sociodemographic changes occurring during the twentieth century. New York and London have similar population and geographic dimensions and similar histories of the development of their bureaucratic, uniformed police forces during the 1800s in response to concerns of popular disorder and crime.[23 24] However, New York underwent rapid population growth during the 20th century while the population change in London was significantly less remarkable. As previous research has indicated that overcrowding, socioeconomic status, and population changes are correlated significantly with the incidence of violent death, it is possible that these factors may have affected intentional police mortality in New York.[25] In addition, it is possible that these factors may have also affected unintentional police mortality as the bimodal distribution was seen in both intentional and unintentional police deaths in New York and appeared to be correlated during the 20th century.

In particular, the high incidence of intentional police deaths in New York may be related to the high level of general violence in this city. Our temporal trend analyses found no relations between intentional occupational police deaths and general population homicides in either New York or London. Furthermore, in New York the general population homicide rate increased while the intentional police mortality rate decreased during the second half of the 20th century. In contrast, a time series study of intentional police deaths in the entire US from 1961 to 1985 found the strongest correlate ($r^2 = 0.81$) to be the national general population homicide rate.[26] In addition, ecological research of cities in the US, comparing of multiple geographic sites at single points in time, has identified several socioeconomic factors correlated with intentional police deaths in the US, including overall crime rate and poverty level.[9 10 27] Not withstanding the differences in research methodology, these studies suggest that overall societal violence may play a role in intentional occupational police deaths. However, in New York it is likely that other socioeconomic and occupational factors influence the incidence of intentional occupational police deaths.

One of these factors may be the widespread availability and use of firearms in the US. This is exemplified by the 290 police officers killed by gunshot wounds in New York compared with only 14 police officers killed in London over the entire 100 year study period. A previous study of 21 large American cities found that intentional police deaths were strongly correlated with gun density (as measured by the incidence of suicides and homicides with guns).[28] In contrast, firearm assaults on police in London are so uncommon that officers rarely carry firearms for their protection and rely on armed back-up only when required.[4 5] For the past 150 years, only selected police officers on specialist duties have been issued firearms for their personal protection.[3 5] The decrease in availability and use of firearms in the UK is attributed to a culture in which the possession and use of firearms is strongly discouraged.[4 5 23] In addition, firearm related homicides and suicides in the UK are relatively rare and usually committed with shotguns or rifle, rather than handguns.[29 30 31] For example, in England and Wales firearms account for less than 10% of homicides and less than 5% of suicides.[32] Shotguns were the most frequent weapon used in both of these types of intentional fatal injuries.

In the US, however, firearm ownership is very common and is significantly associated with increased risks for both homicide and suicide.[33–36] Most of these firearm related homicides and suicides are committed with handguns, rather than shotguns or rifles.[34] Unfortunately, firearms are also

readily accessible to adolescents and young adults, increasing their risk for both intentional and unintentional injury and death.[37 38] Consequently, with the increased availability and use of firearms (particularly handguns) in the US, the lethality of interpersonal violent assaults is likely to be markedly greater in the US compared with the UK. From 1979 through 1992, for example, 22.6% of aggravated assaults were committed with a firearm in the US compared with 5.0% in England.[23] In addition, in 1992 the assault rate in England was 391.1 per 100 000 population compared to the US rate of 441.8 per 100 000 population, but the criminal homicide rate in England was 1.3 per 100 000 compared to the US rate of 9.3 per 100 000.[23]

If the large number of intentional police deaths in New York is related to firearm availability and use, then the marked reduction in intentional police deaths from the 1970s through 1990s may be related to the use of personal body armor designed to protect critical areas of the chest and trunk from gunshot wounds. The US Department of Justice estimates that 2700 law enforcement officers have benefited from the use of bullet resistant body armor since they became available for police officers in the 1970s.[39 40] Although specific statistics are not available for the use of body armor by the New York Police Department, the self-reported wear rates by frontline police officers in the US ranges from 52% in the Northeast to 83% in the West.[40] Improving compliance with the use of body armor would likely further reduce gunshot wound police fatalities. In addition, body armor may provide some protection against stab wounds,[39] but this effect may not be readily observed as stab wounds only accounted for 11 police deaths in New York and 10 police deaths in London for the entire 20th century.

Police training and policing strategies may also be related to intentional occupational police deaths. In England, several parliamentary acts were passed during the 19th century to develop a professional police force that emphasized restrained force and limited use of lethal weapons and tactics.[24] In addition, better pay, improved training, and enhanced discipline all resulted in reduced turnover rates of new recruits and young officers and consequently improved public perception of the police.[4 5] Improved training continued in the 20th century with the establishment of the Hendon Police College, and later the Peel Centre, that provided for advanced training in forensic science, detective work, information technology, and driving.[3] Furthermore, the number of police officers increased significantly compared to a relatively stable population census. The overall goal of these efforts have been to develop and maintain the Metropolitan Police Service's tradition of civility in fighting crime.[23]

New York City adopted police training and policing strategies in the 1980s, including community policing methods, which integrate officers with community resources and emphasize crime prevention and proactive problem solving.[41 42] Although these strategies have controversies, they are generally thought to reduce overall crime and violence against officers.[42–44] In addition, upgrades in police information systems have allowed police jurisdictions to more efficiently identify problem areas and proactively address these areas. Moreover, the implementation of the United States Occupational Health and Safety Act of 1974 included a General Duty Clause that required all employers to recognize and reduce workplace hazards. This may have led to wider recognition of occupational risks by the New York Police Department.

The decline in unintentional police deaths in New York during the latter part of the 20th century is from reductions in motor vehicle collision deaths. Unfortunately, specific information (for example, whether the police officer was a passenger versus a pedestrian) concerning the injury deaths from motor vehicle collisions was not typically available from the historic account of the individual police death. However, during this time period several improvements were instituted to improve overall motor vehicle safety, including the use of seat belts and the development of safer cars.[45 46] Two recent studies found that unbelted occupants of police cars were at much greater risk of fatal injury compared with belted occupants.[11 12] These studies also found that 75% to 80% of all occupants of police cars were belted.

Both intentional and unintentional police mortality rates were substantially higher in New York compared with London for most of the 20th century. Photo: Andrea Booher/FEMA News Photo.

It is also very likely that advances in prehospital and in-hospital medical and surgical care of severely injured patients have significantly reduced mortality from the intentional and unintentional occupational injuries sustained by police officers.[47] However, these advances are not likely to be the only factor as reductions in both injury morbidity and mortality rates have been found in many other occupations (especially in mining and construction) in the US during the 20th century.[48] These reductions can also be attributed to improved injury prevention research and development, but barriers to further progress in the reduction of occupational injuries and deaths still continue, including lack of formal scientific evaluation of the effectiveness of prevention strategies and technologies.[48 49]

Implications for prevention

While the differences in occupational police mortality between New York and London are likely from several factors, the significant declines in New York during the latter part of the 20th century indicate that at least some measures taken by the New York Police Department (specifically changes in policing methods, enhanced safety training, and the use of personal body armor) were successful at reducing the incidence of both intentional and unintentional police deaths. Limitations of ecological epidemiologic methods restrict us from directly attributing any single factor to causing or preventing police deaths in either metropolitan area.[50] In addition, we compared only two cities, further limiting our ability to infer relations. However, there have been very few randomized controlled trials regarding specific interventions aimed at reducing occupational injuries and, like our study, many occupational injury prevention studies are comparisons over time or across different populations. Despite inherent limitations, these studies still provide meaningful information concerning the effectiveness of interventions aimed at decreasing injury morbidity and mortality in selected occupations.[48] Our findings specify certain injury prevention interventions for police deaths that require further investigation.

Key points

- During the 20th century, 585 police officers in New York and 160 police officers in London died while participating in law enforcement activities.
- New York had markedly higher intentional police mortality rates compared to London throughout most of the 20th century.
- Intentional gunshot wounds comprised 290 police deaths in New York, but only 14 police deaths in London.
- In New York, gunshot wounds (intentional and unintentional) accounted for more occupational police deaths (51.6%) than did all other mechanisms combined.
- In London, motor vehicle collision was the most common cause (47.5%) of occupational police death.
- There were no correlations between the general population homicide rates and intentional police mortality rates in either New York or London.

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REFERENCES

1 **National Law Enforcement Officers Memorial Fund**. Available at http://www.nleomf.com/TheMemorialFacts/polfacts.htm
2 **United States Department of Justice**. *Law enforcement officers killed and assaulted: Uniform Crime Reports* 1997:1–70.
3 **Fido M**, Skinner K. *The official encyclopedia of Scotland Yard*. London: Virgin Publishing Ltd, 1999:86–89.
4 **Briggs J**, Harrison C, McInness A, *et al. Crime and punishment in England—an introductory history*. New York: St Martin's Press, 1996:88–105.
5 **Taylor D**. *Crime, policing and punishment in England, 1750–1914*. London: Macmillan Press Ltd, 1988:88–105.
6 **Violanti JM**, Vena JE, Petralia S. Mortality of a police cohort: 1950–1990. *Am J Ind Med* 1998;**33**:366–73.
7 **Violanti JM**, Vena JE, Marshall JR. Suicides, homicides, and accidental death: a comparative risk assessment of police officers and municipal workers. *Am J Ind Med* 1996;**30**:99–104.
8 **Vena JE**, Violanti JM, Marshall J, *et al*. Mortality of a municipal worker cohort. Police officers. *Am J Ind Med* 1986;**10**:383–97.
9 **Lester D**. The murder of police officers in American cities. *Crim Justice Behav* 1984;**11**:101–13.
10 **Lester D**. Predicting murder rates of police and civilians by each other. *Psych Rep* 2001;**89**:520.
11 **Von Kuenssberg Jehle D**, Wagner DG, Mayrose J, *et al*. Seat belt use by police: should they click it? *J Trauma* 2005;**58**:119–20.
12 **Becker LR**, Zaloshnja E, Levick N, *et al*. Relative risk of injury and death in ambulances and other emergency vehicles. *Accid Anal Prev* 2003;**35**:941–8.
13 **Rom, WN**. *Environmental and occupational medicine, 2nd ed*, Boston: Little, Brown and Company, 1992:1483.
14 **Levy BS**, Wegman, DH. *Occupational health, recognizing and preventing work-related disease, 3rd ed*, Boston: Little, Brown and Company, 1995:390.
15 **Morgenstern H**. Ecologic studies. In: Rothman KJ, Greenland S (eds). *Modern epidemiology*, 2nd ed. Philadelphia: Lippincott-Raven, 1998:459–80.
16 **Morgenstern H**. Ecologic studies in epidemiology: concepts, principles, and methods. *Ann Rev Pub Hlth* 1995;**16**:61–81.
17 **New York Police Department Memorial**. Available at http://www.nyc.gov/html/nypd/html/memorial.html (accessed May 2006).
18 **Metropolitan Police Service Memorial**. Available at: http://www.met.police.uk/history/remembrance.htm
19 **Police Department of the City of New York**. *Annual reports of the police department*, City of New York, New York.
20 **Dilnot G**. *The story of Scotland Yard*. New York: Houghton Mifflin Company, 1927:2–5.
21 **Inter-university Consortium for Political and Social Research, Homicide rates for New York City**. Available at http://www.icpsr.umich.edu (accessed May 2006).
22 **Checkoway H**, Pearce N, Crawford-Brown DJ. *Research methods in occupational epidemiology*. New York: Oxford University Press, 1989:99.
23 **Hirschel JD**, Wakefield W. *Criminal justice in England and the United States*. London: Praeger, 1995:49–64.
24 **Emsley C**. The thump of wood on a Swede turnip: police violence in the nineteenth-century England. In: Knafla LA (ed). *Crime, police and the courts in British history*. Meckler: London, 1990:193–217.
25 **Wallace D**, Wallace R. Scales of geography, time, and population: the study of violence as a public health problem. *Am J Public Health* 1998;**88**:1853–8.
26 **Lester D**. Predicting the rate with which law enforcement officers are murdered. *Psychol Rep* 1996;**78**:578.
27 **Lester, D**. Predicting murder rates of police officers in urban areas. *Police Law Quart* 1978;**7**:20–5.
28 **Lester D**. The police as victims: the role of guns in the murder of police. *Psychol Rep* 1987;**60**:366.
29 **Moug SJ**, Lyle JA, Black M. A review of gunshot deaths in Strathclyde—1989 to 1998. *Med Sci Law* 2001;**41**:260–5.
30 **Hawton K**, Fagg J, Simkin S, *et al*. Malmberg. Methods used for suicide by farmers in England and Wales. *Br J Psychiatry* 1998;**173**:320–4.
31 **Haw C**, Sutton L, Simkin S, *et al*. Suicide by gunshot in the United Kingdom: a review of the literature. *Med Sci Law* 2004;**44**:295–310.
32 **Chapman J**, Milroy CM. Firearm deaths in Yorkshire and Humberside. *Forensic Sci Int* 1992;**57**:181–91.
33 **Kellermann AL**, Rivara FP, Rushforth NB, *et al*. Gun ownership as a risk factor for homicide in the home. *N Engl J Med* 1993;**329**:1084–91.
34 **Wiebe DJ**. Homicide and suicide risks associated with firearms in the home: a national case-control study. *Ann Emerg Med* 2003;**41**:771–82.
35 **Miller M**, Azrael D, Hemenway D. Household firearm ownership and suicide rates in the United States. *Epidemiology* 2002;**13**:517–524.
36 **Wintemute GJ**, Parham CA, Beaumont JJ, *et al*. Mortality among recent purchasers of handguns. *N Engl J Med* 1999;**341**:1583–9.
37 **Miller M**, Azrael D, Hemenway D. Firearm availability and unintentional firearm deaths, suicide, and homicide among 5–14 year olds. *J Trauma* 2002;**52**:267–75.
38 **Wintemute GJ**. Where the guns come from: the gun industry and gun commerce. *Future Child* 2002;**12**:54–71.
39 **National Institute of Justice**. *Selection and application guide to personal body armor*, United States, Department of Justice. November, 2001.
40 **National Institute of Justice**. *Status report to the attorney general on body armor safety initiative testing and activities*, United States, Department of Justice. March 11, 2004.
41 **Pate AM**, Schtull P. Community policing grows in Brooklyn: an inside view of the New York City police departments model precinct. *Crime Delinquency* 1994;**40**:384–410.
42 **Sherman LW**, Gottfredson D, MacKenzie D, *et al*. *Preventing crime: what works, what doesn't, and what's promising? A report to the United States Congress*. Washington DC: National Institute of Justice, 1997.
43 **MacDonald JM**. The effectiveness of community policing in reducing urban violence. *Crime Delinquency* 2002;**48**:592–618.
44 **Greene JA**. Zero tolerance: A case study of police policies and practices in New York City. *Crime Delinquency* 1999;**45**:171–87.
45 **Evans, L**. The effectiveness of safety belts in preventing fatalities. *Accid Anal Prev* 1986;**18**:229–41.
46 **Cummings P**, Wells JD, Rivera FP. Estimating seat belt effectiveness using a match-pair cohort method. *Accid Anal Prev* 2003;**35**:143–9.
47 **Institute of Medicine**. *Injury in America—a continuing public health problem*. Washington, DC: National Academy Press, 1985:65–79.
48 **Stout NA**, Linn HI. Occupational injury prevention research: progress and priorities. *Inj Prev* 2002;**8**:9–14.
49 **Rivara FP**, Thompson DC. Systematic reviews of injury-prevention strategies for occupational injuries: an overview. *Am J Prev Med* 2000;**18**:1–3.
50 **Stevenson M**, McClure R. Use of ecological study designs for injury prevention. *Inj Prev* 2005;**11**:2–4.