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Fatal Occupational Accidents—The Five-Year Metro Dade County Experience, 1979–1983

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ABSTRACT: A study of fatal occupational accidents in Metropolitan Dade County between the years 1979 and 1983 was performed from the case files of the office of the medical examiner. A total of 147 cases were collected and were subdivided into 25 traffic-related and 122 nontraffic-related cases. Cases were then analyzed as to age, race, sex, cause of death, alcohol, toxicology, scene circumstances, and who was at fault in the accidental fatality. Traffic-related fatalities, comprising 17% of the cases, were young white males, commonly less than 45 years of age, who died of multiple injuries in the majority of instances while working as drivers on tractor trailers, migrant farms, or fruit produce trucks. The most common scenario was a vehicle-vehicle collision in which seat belts were not used and the decedent or the decedent's driver was at fault. Nontraffic-related fatalities, comprising 83% of the cases, were likewise white males, commonly less than 45 years of age, who died of multiple injuries in the majority of instances as construction workers or as loading/forklift operators. The most common scenario was one in which alcohol or drugs were *not* involved. While the "fault" was unassignable in the majority of cases, in those in which it could be, the deceased was at fault approximately half the time with the company or others at fault the other half.

KEYWORDS: pathology and biology, accidents, death

Death at the job site is an occurrence that is not only tragic but frequently litigious. Forensic pathologists are commonly called upon to testify in cases in which there has been an accidental fatality at work. While the situational dynamics of such accidents is more in the area of expertise of forensic engineers, it behooves the forensic pathologist to understand the overall type of population involved in such cases rather than relying on an occasional anecdotal case report. With an overall pattern available, the pathologist can use this in a specific case for comparison and investigation purposes. Furthermore, risk factors must be understood by all who investigate these cases so that one may intelligently advise governmental agencies, legislatures responsible for regulations affecting safety, and the public in general. Statistical tabulations of such work accidents occurs with regularity [*1*]; however, in-depth analyses including risk factors are rare in recent times [*2*]. This latter study presents data on all occupational deaths during a one-year time span in a statewide medical examiner system. To compare systems and to offer greater analyses of death at the work site, this study was performed to see what information could be obtained during a five-year study in a county-wide regional medical examiner system concerning occupational fatalities.

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Materials and Methods

Metro Dade County is a community of 5180 km^2 (2000 $miles^2$) and a 1980 population of 1.6 million people. It is a traditional resort and retirement area, although it is also a center of industry and construction. Dade County's major employers include Dade County Public Schools, Metropolitan Dade County, U. S. agencies, Eastern Airlines, Inc., Southern Bell Telephone, and the state of Florida [*3*]. The number of nongovernmental employees in 1981 was 674 945 with the following leading industries: contract construction, manufacturing, transportation, wholesale trade, retail trade, services, finance, and health services [*4*].

The office of the medical examiner is empowered by statute to investigate all deaths that occur in Dade County of a violent, unnatural, or unexpected means, performing some 3500 examinations per year, of which 2800 are autopsied. For this study, all occupational, accidental fatalities were collected between the years 1979 and 1983. By the use of the term "occupational, accidental fatality," this writer refers to those deaths that occur at the job site (that is, "at work") of any gainful employment or the "terminal incident" (for example, trauma) started at the job site and in which the manner of death is certified as accidental. A total of 147 cases were in this category out of 3773 accidental deaths that occurred in Dade County during those years. Of these occupational accidental fatalities 25 were traffic related and 122 were nontraffic related (respectively 1.2% of all traffic-related fatalities and 6.9% of all nontraffic-related fatalities during the time period).

Cases were then analyzed as to age, race, sex, cause of death, alcohol, and toxicology of the victim. The term toxicology refers to the standard "screening" technique used in the Dade County office which is a urine EMIT® screen except where noted. While it is realized that this screen is by no means all-encompassing, it does screen for such common drugs of abuse as, for example, opiates, amphetamines, and barbiturates. Furthermore, the scene, circumstances, and who was at "fault," were also noted after the complete investigation by Occupational Safety and Health Administration (OSHA), police, and medical examiner office where indicated.

Results

Table 1 gives the age distribution for traffic-related fatalities. Approximately two thirds are age 50 or less. Table 2 gives the race and sex distribution of this category showing a white male predominance. Table 3 gives the cause of death with multiple injuries predominating. The alcohol data in Table 4 reveal that the majority of instances have a negative result. The toxicology results are noted in Table 5, with most cases having no results ascertained. These "screens" commonly are by urine EMIT but not limited to it. (Colorimetric and gas chromatography are also used.)

The scene circumstances are given in Tables 6 and 7 with the role of the deceased, industry, event, seat belt usage, and fault noted. Obviously, truck drivers are seen in the majority of instances of vehicle-vehicle collisions without seat belts and roughly at fault half the time (when fault could be ascertained). Data on nontraffic-related fatalities start with Table 8 giving the age distribution. Again, two thirds of the victims are below the age of 50. Table 9 gives the racial and sexual distribution of this category, again with a white male majority. The causes of death are given in Table 10, with multiple injuries, craniocerebral trauma, electrocution, and drowning being the most frequent. The alcohol data in Table 11 again show a negative result the majority of times. Toxicology (or urine drug screen) is presented in Table 12, with a large negative group and again a large not-ascertained category. The occupation or industry is noted in Table 13, with construction, loading/forklift, painting, electrical, and military leading the list. Table 14 delineates the "fault" with a sizeable number of not-ascertained cases. However, for those cases in which fault could be ascertained, it was equally divided between the deceased and the company or other factors.

TABLE 1—*Occupational traffic-related fatalities: age distribution.*

Age	Number	Percent
0–20	0	0
21–25	2	8.0
26–30	7	28.0
31–35	1	4.0
36–40	5	20.0
41–45	1	4.0
46–50	1	4.0
51–55	2	8.0
56–60	1	4.0
61–65	3	12.0
66–70	1	4.0
Greater than 70	1	4.0
Total	25	100

TABLE 2—*Occupational traffic-related fatalities: race and sex distribution.*

	Number	Percent
	RACE	
Black	7	28
White	18	72
	SEX	
Male	23	92
Female	2	8
Total	25	100

TABLE 3—*Occupational traffic-related fatalities: cause of death.*

Cause of Death	Number	Percent
Multiple injuries	10	40.0
Craniocerebral trauma	10	40.0
Chest trauma	1	4.0
Smoke inhalation	1	4.0
Drowning	1	4.0
Traumatic asphyxia	2	8.0
Total	25	100

TABLE 4—*Occupational traffic-related fatalities: blood alcohol content.*

Blood Alcohol Content at Postmortem	Number	Percent
Not ascertained	7	28.0
Negative	13	52.0
0% up to 0.1%	4	16.0
0.1% or greater	1	4.0
Total	25	100

TABLE 5—*Occupational traffic-related fatalities: toxicology (urine EMIT method).*

Drugs Detected	Number	Percent
Not ascertained	16	64.0
Negative	9	36.0
Positive	0	0.0
Total	25	100

TABLE 6—*Occupational traffic-related fatalities: occupant characteristics.*

	Number	Percent
ROLE		
Driver	16	64.0
Passenger	8	32.0
Pedestrian	0	0
Not specified	1	4.0
Total	25	100
VEHICLE-INDUSTRY		
Tractor-trailer	4	16.0
Migrant farm truck	3	12.0
Fruit truck	3	12.0
Refuse/dump truck	2	8.0
Delivery (for example, UPS) truck	2	8.0
Cement/concrete truck	2	8.0
Paint van	2	8.0
Truck, not specified	2	8.0
Executive zoo vehicle	1	4.0
Salvation Army truck	1	4.0
Municipal truck	1	4.0
Exterminator truck	1	4.0
Gas company truck	1	4.0
Total	25	100

Discussion

Between 1912 and 1982, accidental work deaths per 100 000 population in the United States were reduced 76% from 21 to 5, with agriculture, mining, construction, and transportation leading the list of death rates per 100 000 workers [*1*]. Axiomatically, legislation and technological advancement have led to safety improvement and hence reduced fatalities. However, with such improvements and an organization such as OSHA, the role for forensic pathologists is far from being diminished; rather, it is increased because of litigation and agencies requiring "the autopsy report." However, given this role of adviser, most forensic pathologists, unless having an ancillary background in engineering, would be ill-equipped to opine on the situational dynamics of such deaths. For example, in those jurisdictions in which deaths at the job site are infrequent, the pathologist may not be able to advise investigators on how common such a death is or what risk factors one should study in depth. This report seeks to offer some enlightenment on the subject beyond "cold statistics" and to identify risk factors which other reports did not [*2*].

First, this report has a sufficient volume of cases to offer the reader some meaning more than the forensic scientists who write on one or two cases in the pervasive case report and then seek to apply such a small sample size to the entire population. The results indicate that traffic-related deaths are *not* the most common, in contradiction to other studies [*2*]. The reason for

TABLE 7—*Occupational traffic-related fatalities: scene circumstances.*

	Number	Percent
EVENT		
Collision		
Vehicle left roadway	1	4.0
Vehicle/vehicle	13	52.0
Vehicle fixed object	3	12.0
Vehicle into water	1	4.0
Noncollision		
Fell out/off vehicle	3	12.0
Fell inside vehicle	1	4.0
Not ascertained	3	12.0
Total	25	100
SEAT BELT USAGE		
Not ascertained	3	12.0
Yes	0	0
No	22	88.0
Total	25	100
FAULT RISK		
Deceased or deceased's driver (32%)		
Speeding	1	4.0
Medical condition	1	4.0
Careless driving	2	8.0
Fail to yield	3	12.0
Alcohol	1	4.0
Other driver (20%)		
Fail to yield	2	8.0
Careless driver	3	12.0
Improper location of passenger	3	12.0
Not ascertained	9	36.0
Total	25	100

TABLE 8—*Nontraffic occupation-related fatalities: age distribution.*

Age	Number	Percent
0-20	10	8.2
21-25	13	10.6
26-30	15	12.3
31-35	12	9.8
36-40	14	11.5
41-45	12	9.8
46-50	12	9.8
51-55	12	9.8
56-60	8	6.6
61-65	4	3.3
66-70	5	4.1
Greater than 70	5	4.1
Total	122	100

this disparity is probably due to the fact that one deals in this study with a five-year county-wide system, while the former study dealt with a one-year statewide system. Now different catchment areas exist in many studies. The point to be made is that the reader or editors should not conclude that one study alone gives all the answers to the situational dynamics or occupational, accidental deaths [5]—hence the need for this report and others in many parts of the country.

TABLE 9—*Nontraffic occupational accidental fatalities: race and sex distribution.*

	Number	Percent
	RACE	
Black	27	22.1
White	95	77.9
	SEX	
Male	118	96.7
Female	4	3.3
Total	122	100

TABLE 10—*Nontraffic occupational accidental fatalities: cause of death.*

Cause of Death	Number	Percent
Multiple injuries	43	35.2
Craniocerebral trauma	27	22.1
Chest injury	1	0.8
Hand injury	1	0.8
Abdominal injury	1	0.8
Pulmonary embolism caused by hip fracture	2	1.6
Electrocution	15	12.3
Drowning	10	8.2
Heatstroke	3	2.5
Thermal burns	5	4.1
Chemical burns	1	0.8
Gunshot wound	1	0.8
Asphyxia by gas	4	3.3
Asphyxia by crush	7	5.7
Drug overdose	1	0.8
Total	122	100

TABLE 11—*Blood alcohol content of nontraffic occupational accidental fatalities.*

Blood Alcohol Content	Number	Percent
Not ascertained	30	24.6
Negative	83	68.0
0% up to 0.1%	7	5.7
0.1% or greater	2	1.6
Total	122	100

Traffic-related deaths are categorized in the several tables of results. First, as noted in Tables 1, 2, and 3, one deals with a young white male population who die from multiple injuries or craniocerebral trauma or both. Such results correlate well with national statistics on traffic fatalities [*1*]. The alcohol results in Table 4 are similar to other studies [*2*]. With alcohol detected in at least 20% of the traffic-related fatalities, some form of alcohol testing at autopsy is fundamental. To this writer such results are not all that alien to other traffic-related fatalities not in a work scenario. In fact, other studies indicate a 50% occurrence of alcohol in overall traffic fatalities nationwide [*1*].

The toxicology results in Table 5 have too many not ascertained results for this writer to give

TABLE 12—*Nontraffic occupational accidental fatalities: common toxicology (urine EMIT method except where noted).*

Drugs Detected	Number	Percent
Not ascertained	57	46.7
Negative	54	44.3
Positive	11	9.0
Total	122	100
	Number	
Benzodiazepine	1	
Acetaminophen	1	
Caffeine like	1	(UV absorbance method)
Lidocaine	1	
Salicylate	1	(colorimetric)
Methaqualone	1	
Benzoylecgonine	3	
Phencyclidine	1	
Multiple (narcotic)	1	(gas chromatographic method)

a statistical incidence of the presence of drugs or to predict drug usage among the fatalities studied. Suffice it to say the reader should include some form of drug screen in analyzing occupational, accidental deaths. Occupant characteristics and scene circumstances are noted in Tables 6 and 7. Predominantly, one deals with truck drivers involved in vehicle-vehicle collisions without seat belts in use despite availability. Such results correlate with statistics of other traffic fatalities [*1*] and have not been mentioned in other studies [*2*]. The "fault" in Table 7 refers to who caused the accident. Commonly in these cases, police agencies give an opinion on this, if possible, based on the results of their investigation along with the medical examiner's report. As noted in Table 7, the "fault" is roughly divided between the decedent and others, although 36% of the time no fault could be ascertained either from police agencies or other investigators. What is interesting is that the "faults" are most commonly carelessness, speeding, failure to yield, and alcohol. In only one case was a past medical history a precipitating factor for the accident and death caused by multiple injuries. Again, such results are similar to national statistics [*1*].

Several points emerge from this information. First, traffic-related occupational deaths are similar to nonoccupational traffic deaths from the standpoint of the people involved and the risk factors—human error in driving and lack of seat belt usage. Accordingly, a forensic science investigation should center on those points for determining the etiology of the fatality. Also, advice to lawmakers should be for more stringent driving laws rather than separate legislation for traffic occupational deaths, as some have advocated [*5*]. Such "safe driving laws" could include tougher driving-while-intoxicated penalties, along with penalties for not wearing seat belts.

Secondly, traffic-related deaths are not the most frequent in this study. Previous reports [*2*] advocating this fact should realize their results are regional and not necessarily reflective of the national situation of occupational deaths.

Turning to nontraffic-related accidental occupational fatalities, a similar age, race, and sex distribution compared to traffic-related cases is noted in Tables 8 and 9. While Table 10 also lists multiple injuries and craniocerebral trauma as frequent, electrocution and drowning are also common. Compared to Baker et al [*2*], this study reveals a higher percentage of electrical deaths. This may reflect regional differences in industries; however, it is hoped that *all* forensic scientists remember to investigate the possibility of an electrical death when dealing with an industrial fatality. The other causes of death are self-explanatory in Table 10. As an aside, the one drug overdose included is that of a masseuse who was a chronic drug user and used

TABLE 13—*Nontraffic occupational accidental fatalities: occupation/industry.*

Occupation. Industry	Number	Percent
Construction laborer	23	18.9
Loading/forklift	11	8.9
Painting	8	6.6
Electrical	6	4.9
Military		
Helicopter	5	4.0
Painting maintenance	1	0.8
Airport (civilian)		
Mechanic	3	2.4
Moving industry	1	0.8
Farming field work	3	2.4
Carpenter	2	1.6
Welding	1	0.8
Tree yard work	1	0.8
Roofing	5	4.0
Machinery iron	1	0.8
Trash/refuse	2	1.6
Knitting/garment	1	0.8
Cleaning building	2	1.6
Maintenance, not otherwise specified	1	0.8
Well driller	1	0.8
Pipe worker	1	0.8
Mechanic	2	1.6
Iron worker	2	1.6
Boxer (sports)	1	0.8
Metal worker	1	0.8
Race track	2	1.6
Managerial	3	2.4
Gardening mowing/grinding	3	2.4
Sewage	2	1.6
Oil industry	1	0.8
Refrigeration, installation	1	0.8
Plant—not otherwise specified	1	0.8
Domestic worker	2	1.6
Glass installation	3	3.2
Elevator	3	2.4
Hotel	1	0.8
Food/kitchen/bar	2	1.6
Crane (construction)	4	3.2
Butcher	2	1.6
Ice plant	2	1.6
Municipality	1	0.8
Ship	2	1.6
Hostess masseuse	1	0.8
Total	122	100

drugs at her place of employment, so that her death falls under the definition of a fatal accident at work.

The alcohol and toxicology results in Tables 11 and 12 are similar to the traffic-related deaths. To repeat, do not forget to analyze for intoxicating substances as a risk factor in the fatality. In this office, such "screening" either by EMIT methodology or other means is relevant from several standpoints. First, a positive screen implies the need to perform more rigorous quantification of drugs. Secondly, if the screen is positive it should alert investigators to search for such items at the job site or in the environment in which the decedent lives or both. Finally, it may explain why the decedent was acting in a nonroutine fashion before his or her

TABLE 14—*Nontraffic occupational accidental fatalities: "who is at fault."*

Party	Number	Percent
Decedent (worker)	20	16.4
Why?:		
Careless	1	0.8
Wrong location	3	2.4
Used torch next to flammable	1	0.8
Used no safety equipment	5	4.1
Alcohol/drugs	5	4.1
Wrong device/improper use	4	3.3
Lack of experience	1	0.8
Company machinery	18	14.6
Why?:		
Safety gear defect	2	1.6
Machine defect	13	10.6
Improper storage	1	0.8
Lack of training	1	0.8
Poorly designed equipment	1	0.8
Other worker careless	3	2.4
Material gave way	2	1.6
Not ascertained	79	65.0
Total	122	100

demise at the job site. The data presented, however, suggests that alcohol is not that common. Given the younger age group involved, should not a drug screen be routine for every nonhospitalized death?

Table 13 itemizes the occupation or industry involved in the fatality. Construction work, loading/forklift, painting, and electrical industries lead the list. This is similar to Baker et al [*2*] and to national statistics [*1*].

An attempt at assigning the fault or the reason for the fatality is given in Table 14. This "fault" is what was determined after the case was investigated by various agencies and was obvious to the reviewer. For example, if it were a case of a worker's blatant disregard for using safety equipment, then the worker was assigned the "fault." However, if it were a case in which the company did not provide safety equipment or knowingly allowed unsafe equipment to be utilized, then the company was assigned the "fault."

While this is problematic in reviewing any series of cases, in approximately one third of the cases this could be done. Considering the fact that other studies [*2,1*] do not give any information on this, such results should be cautiously interpreted. From this study, in those cases in which "fault" could be assigned, the worker was at fault an equal amount of time as the company or other factors. Given the large percentage of cases in which fault was not ascertained, it is difficult to extrapolate to a general premise for those investigating these cases as to why the accident occurred. Axiomatically, any investigation should "keep an open mind" on these fatalities and not prejudicially favor labor or management. In other words, each case should be decided by itself. A special point in Table 14 is noteworthy. The alcohol drug "reason for the fatality" was noted in five cases or approximately 4% of the cases. This correlates well with the previous data on alcohol content at autopsy and drugs detected by screen data. However, "human error" in Table 14 leads the list of reasons for the accident in the worker's category.

In summary, nontraffic occupational fatalities, the most common involving construction work, have been presented and involve multiple injuries, while electrocution and drowning are also common. The forensic scientist should be mindful of risk factors, as for example, drugs and carelessness. They are as relevant as alcohol and human error are in traffic-related fatalities.

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