



VIRGINIA EPIDEMIOLOGY BULLETIN

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May, 1989

Volume 89, Number 5

Health Hints For The International Traveler— Travelers' Diarrhea

Editor's comment: This is the second of several articles on the topic of health hints for the international traveler. The first article discussed AIDS and HIV infection and appeared in the February, 1989 issue. Information regarding specific vaccination requirements for individual countries is available from your local health department or the Office of Epidemiology at 804/786-6261.

Epidemiology

Travelers' diarrhea (TD) is a syndrome characterized by a twofold or greater increase in the frequency of unformed bowel movements. Commonly associated symptoms include abdominal cramps, nausea, bloating, urgency, fever, and malaise. Episodes of TD usually begin abruptly, occur during travel or soon after returning home, and are generally self-limited. The most important determinant of risk is the destination of the traveler. Attack rates in the range of 20 to 50 percent are commonly reported. High-risk destinations include most of the developing countries of Latin America, Africa, the Middle East, and Asia. Intermediate risk destinations include most



of the Southern European countries and a few Caribbean islands. Low risk destinations include Canada, Northern Europe, Australia, New Zealand, the United States and a number of the Caribbean islands.

TD is slightly more common in young adults than in older people. The reasons for this difference are unclear, but may include a lack of acquired immunity, more adventurous travel styles, and different eating habits. Attack rates are similar in men and women. The onset of TD is usually within the first week, but may occur at any time during the

visit, and even after returning home.

TD is acquired through ingestion of fecally contaminated food and/or water. Both cooked and uncooked foods may be implicated if improperly handled. Especially risky foods include raw meat, raw seafood, and raw fruits and vegetables. Tap water, ice, and unpasteurized milk and dairy products may be associated with increased risk of TD; safe beverages include bottled carbonated beverages (especially flavored beverages), beer, wine, hot coffee or tea, or water boiled or appropriately

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treated with iodine or chlorine.

The eating place appears to be an important variable, with private homes, restaurants, and street vendors listed in order of increasing risk.

TD typically results in four to five loose or watery stools per day. The median duration of diarrhea is 3 to 4 days. Ten percent of the cases persist longer than 1 week, approximately 2 percent longer than 1 month, and less than 1 percent longer than 3 months. Persistent diarrhea is thus quite uncommon and may differ considerably from acute TD with respect to etiology and risk factors. Travelers may experience more than one attack of TD during a single trip. Approximately 15 percent experience vomiting, and 2 to 10 percent may have diarrhea accompanied by fever or bloody stools, or both. Rarely is TD life-threatening.

Etiology

Infectious agents are the primary cause of TD. Travelers from industrialized countries to developing countries frequently develop a rapid, dramatic change in the type of organisms in their gastrointestinal tract. These new organisms often include potential enteric pathogens. Those who develop diarrhea have ingested an inoculum of virulent organisms sufficiently large to overcome individual defense mechanisms, resulting in symptoms.

Enteric Bacterial Pathogens

Enterotoxigenic *Escherichia coli* (ETEC) are the most common causative agents of TD in all countries where surveys have been conducted.

Salmonella gastroenteritis is a well-known disease that occurs throughout the world. In the industrialized nations, this large group of organisms is the most common cause of outbreaks of food-associated diarrhea. In the developing countries, the proportion of cases of TD caused by salmonellae varies but is not high. Salmonellae also can cause dysentery characterized by bloody mucus-containing small-volume stools.

Shigellae are well known as the cause of bacillary dysentery. However, few of the infected travelers have dysentery, but most have watery diarrhea. The shigellae caused TD in about 5 to 15 percent of trav-

elers in the few countries that have been studied.

Campylobacter jejuni is a common cause of diarrhea throughout the world. Recent, limited data have shown that *C. jejuni* is responsible for a small percentage of the reported cases of TD, some with bloody diarrhea. Additional studies are needed to determine how frequently it causes TD.

Vibrio parahaemolyticus is associated with ingestion of raw or poorly cooked seafood and has caused TD in passengers on Caribbean cruise ships and in Japanese people traveling in Asia. How frequently it causes disease in other areas of the world is unknown.



Other potential bacterial pathogens include *Aeromonas hydrophila*, *Yersinia enterocolitica*, *Pleisiomonas shigelloides*, *Vibrio cholerae* (non-01), and *Vibrio fluvialis*.

Viral Enteric Pathogens—Rotavirus and Norwalk-like Virus

Along with the newly acquired bacteria, the traveler may also acquire many viruses. In six studies, for example, 0 to 36 percent of diarrheal illnesses (median 22 percent) were associated with rotaviruses in the stools. However, a comparable number of asymptomatic travelers also had rotaviruses, and up to 50 percent of symptomatic persons with rotavirus infections also had nonviral pathogens. Ten to fifteen percent of travelers develop serologic evidence of infection with Norwalk-like viruses. The roles of adenoviruses, astroviruses, coronaviruses, enteroviruses, or other viral agents in causing TD are even less clear. Although viruses are commonly acquired by travelers, they do not appear to be frequent causes of TD in adults.

Parasitic Enteric Pathogens

The few studies that have included an examination for parasites reveal that 0 to 9 percent have *Giardia lamblia* or *Entamoeba histolytica*. *Cryptosporidium* has recently been recognized in sporadic cases of TD.

Dientamoeba fragilis, *Isospora belli*, *Balantidium coli*, or *Strongyloides stercoralis* may cause occasional cases of TD. While not major causes of acute TD, these parasites should be sought in persisting, unexplained cases.

Unknown Causes

No data have been presented to support noninfectious causes of TD such as changes in diet, jet lag, altitude, and fatigue. Current evidence indicates that in all but a few instances e.g., drug-induced or preexisting gastrointestinal disorders an infectious agent or agents cause diarrhea in tourists. However, even with the application of the best current methods for detecting bacteria, viruses, and parasites, in various studies 20 to 50 percent of cases of TD remain without recognized etiologies.

Prevention

There are four possible approaches to prevention of TD. They include instruction regarding food and beverage preparation, immunization, use of nonantimicrobial medications, and prophylactic antimicrobial drugs.

Data indicate that meticulous attention to food and beverage preparation, as mentioned above, can decrease the likelihood of developing TD. Most travelers, however, encounter great difficulty in observing the requisite dietary restrictions.

No available vaccines and none that are expected to be available in the next 5 years are effective against TD.

Several antimicrobial agents have been advocated for prevention of TD. Available controlled studies indicate that prophylactic use of difenoxine, the active metabolite of diphenoxylate (Lomotil*), actually increases the incidence of TD in addition to producing other undesirable side effects. No antiperistaltic agents e.g., Lomotil* and Imodium* are effective in preventing TD. No data support the prophylactic use of activated charcoal.

Bismuth subsalicylate, taken in liquid form as the active ingredient

of Pepto-Bismol* (2 oz four times daily), has decreased the incidence of diarrhea by 60 percent in one study. Available data are not extensive enough to exclude a risk to the traveler from the use of such large doses of bismuth subsalicylate over a period of several weeks. In patients already taking salicylates for arthritis, large concurrent doses of bismuth subsalicylate can produce toxic serum concentrations of salicylate. On the basis of its modest potential benefit achieved with large doses, together with its uncertain risks, bismuth subsalicylate is not recommended for prophylaxis of TD.

Controlled data are available on the prophylactic value of several antimicrobial drugs. Enterovioform* and related halogenated hydroxyquinoline derivatives e.g., clioquinol, iodoquinol, Mexaform*, Intestopan*, and others, are not helpful in preventing TD, may have serious neurological side effects, and should never be used for prophylaxis of TD.

Carefully controlled studies have indicated that two agents, doxycycline and trimethoprim/sulfamethoxazole (TMP/SMX), when taken prophylactically, are consistently effective in reducing the incidence of TD by 50 to 86 percent in various areas of the developing world. One study shows that trimethoprim alone is also effective.

The benefits of widespread prophylactic use of doxycycline or TMP/SMX or TMP alone in several million travelers must be weighed against the potential drawbacks. The known risks include allergic and other side effects (such as common skin rashes, photosensitivity of the skin, blood disorders, Stevens-Johnson syndrome and staining of the teeth in children) as well as other infections that may be induced by antimicrobial therapy (such as antibiotic-associated colitis, *Candida* vaginitis, and *Salmonella* (enteritis)). Because of the uncertain risk of widespread administration of these antimicrobial agents, their prophylactic use is not recommended. Nor

*Use of tradenames is for identification only and does not imply endorsement by the Public Health Service, the U.S. Department of Health and Human Services, or the Virginia Department of Health.

is there any basis for recommending their use prophylactically for special groups of travelers. Furthermore, there is no documented evidence that there are any groups of disease entities that are worsened sufficiently by an episode of TD to risk the rare undesirable side effects of prophylactic antimicrobial drugs. **On the basis of apparent risk/benefit ratios, prophylactic antimicrobial agents are not recommended for travelers.** Available data support only the recommendation that travelers be instructed in regard to sensible dietary practices as a prophylactic measure. This recommendation is justified by the excellent results of early treatment of TD as outlined below. Some travelers may wish to consult with their physician and may elect to use prophylactic antimicrobial agents for travel under special circumstances, once the risks and benefits are clearly understood.

Treatment

Individuals with TD have two major complaints for which they desire relief—abdominal cramps and diarrhea. Many agents have been proposed to control these symptoms, but few have been demonstrated to be effective by rigorous clinical trials.

Nonspecific Agents

A variety of "adsorbents" have been used in the treatment of diarrhea. For example, activated charcoal has been found to be ineffective in the treatment of diarrhea. Kaolin and pectin have been widely used for diarrhea. The combination appears to give the stools more consistency but has not been shown to decrease cramps and frequency of stools nor to shorten the course of infectious diarrhea.

Lactobacillus preparations and yogurt have also been advocated, but no evidence supports these treatments for TD.

Bismuth subsalicylate preparation (1 oz every 30 minutes for eight doses) decreased the rate of stooling by one-half in a study of travelers with diarrhea when compared with a placebo group. However, there was no difference between the two groups in stool output in the first 4 hours of the study. There is concern about taking, without supervision, large amounts of bismuth and salicylate, especially in individuals who may be intolerant to salicylates, who

have renal insufficiency, or who take salicylates for other reasons.

Antimotility Agents

Antimotility agents are widely used in the treatment of diarrhea of all types. Natural opiates (paregoric, deodorized tincture of opium, and codeine) have long been used to control diarrhea and cramps. Synthetic agents, diphenoxylate and loperamide, come in convenient dosage forms and provide prompt symptomatic but temporary relief. However, they should not be used in patients with high fever or with blood in the stool. These drugs should be discontinued if symptoms persist beyond 48 hours. Diphenoxylate and loperamide should not be used in children under the age of 2.

Antimicrobial Treatment

Travelers who develop diarrhea with three or more loose stools in an 8-hour period, especially if associated with nausea, vomiting, abdominal cramps, fever, or blood in the stools, may benefit from antimicrobial treatment. A typical 3- to 5-day illness can often be shortened to 1 to 1½ days by effective antimicrobial agents. Those best studied to date are daily TMP/SMX (160 mg TMP and 800 mg SMX) or TMP alone, 200 mg taken twice daily. Preliminary evidence suggests that doxycycline, taken 100 mg twice daily, is also effective. Three days of treatment is recommended, although 2 days or fewer may be sufficient. Nausea and vomiting without diarrhea should not be treated with antimicrobial drugs.

Travelers should consult a physician, rather than attempt self-medication, if the diarrhea is severe or does not resolve within several days; if there is blood and/or mucus in the stool; if fever occurs with shaking chills; or if there is dehydration with persistent diarrhea.

Oral fluids

Most cases of diarrhea are self-limited and require only simple replacement of fluids and salts lost in diarrheal stools. Fluid and electrolyte balance can be maintained by potable fruit juices, soft drinks preferably caffeine-free, and salted crackers. Iced drinks and noncarbonated bottled fluids made from water of uncertain quality should be avoided. Dairy products aggravate diarrhea in some people and should be avoided. Travelers may prepare

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their own fruit juice from fresh fruit. A good formula for the treatment of the more common diarrheal diseases is provided in Table 1. This formula can be used whether or not antidiarrheal drugs are taken. Individuals with severe dehydration may require special fluid and electrolyte replacement in the form of oral replacement solutions such as those recommended by the World Health Organization.

Infants and Diarrhea

The greatest risk to the infant with diarrhea is dehydration. Dehydration can often be prevented by feeding the infant thin porridges and soups which normally contain salt, in addition to the infant's usual food.



Infants with diarrhea who exhibit signs of mild dehydration, e.g. thirst and restlessness, should be given an oral rehydration solution (ORS), such as the one produced for the World Health Organization†. The packet of salts and carbohydrate should be added to a liter of boiled or treated water; once prepared, it

†Jiana Brothers Packaging Co., Inc. Kansas City, Missouri. Use of names is for identification only and does not imply endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Reprinted from: Centers for Disease Control. Health Information for International Travel 1988. HHS Publ. No. (CDC) 88-8280

Table 1. Formula For Treatment of Diarrheal Disease

Prepare 2 separate glasses of the following:

Glass Number 1

Orange, apple, or other fruit juice 8 ounces
(rich in potassium)
Honey or corn syrup ½ teaspoon
(contains glucose necessary for
absorption of essential salts)
Salt, table 1 pinch
(contains sodium and chloride)

Glass Number 2

Water 8 ounces
(carbonated or boiled)
Soda, baking ¼ teaspoon
(contains sodium bicarbonate)

Drink alternately from each glass until thirst is quenched. Supplement as desired with carbonated beverages, water, or tea made with boiled or carbonated water. Avoid solid foods and milk until recovery occurs. It is important that infants continue breast-feeding and receive water as desired while receiving these salt solutions.

TABLE 2. Assessment of the Dehydration Levels in Infants

	Signs		
	Mild	Moderate	Severe
General Condition	Thirsty, restless, agitated.	Thirsty, restless, irritable.	Withdrawn, somnolent, or comatose.
Pulse	Normal	Rapid and weak	Rapid and weak
Anterior fontanelle	Normal	Sunken	Very sunken
Eyes	Normal	Sunken	Very sunken
Tears	Present	Absent	Absent
Urine	Normal	Reduced and concentrated	None for several hours
Weight loss	4-5%	6-9%	10% or more

should be kept for no longer than 12 hours at room temperature, or 24 hours refrigerated. The dehydrated child will drink ORS avidly; ORS is given *ad lib* to the child as long as the dehydration persists. The infant who vomits the ORS will usually keep it down if the ORS is offered in frequent small sips. Breast-feeding, or formula, gruel, and soup feeding should be continued throughout the illness.

Immediate medical attention is required for the infant with diarrhea who develops signs of moderate to severe dehydration (Table 2), bloody diarrhea, fever greater than 102°F, or persistent vomiting. While medical

attention is being obtained, the infant should be offered ORS.

Precautions in Children and Pregnant Women

Although children do not make up a large proportion of travelers to high-risk areas, some children do accompany their families. Teenagers should follow the advice given to adults, with possible adjustment of doses of medication. Physicians should be aware of the risks of tetracyclines to children under 12 years. There is a paucity of data available about usage of antidiarrheal drugs in children. Drugs should be prescribed with caution for pregnant women and nursing mothers.

Disease Reporting Regulations Changed

The *Regulations for Disease Reporting and Control* have been amended, effective February 15, 1989. Each change reflects a response to either a legislative mandate or change in the field of public health. The major modifications are summarized below.

Additions to the list of conditions reportable by physicians and medical care facilities. *Chlamydia trachomatis* infections, invasive *Haemophilus influenzae* infections, listeriosis, and Lyme disease have been added to the list of conditions which physicians and medical care facilities must report to the health department.

Effective July 1, 1989 human immunodeficiency virus (HIV) infections will also be reportable, due to a change to the *Code of Virginia*. Until then, HIV infections may be reported by physicians, especially when health department assistance with patient and contact counseling and epidemiologic tracking is desired. Only individuals who have positive blood tests for HIV antibodies as demonstrated by at least two enzyme-linked immunosorbent assays (done in duplicate at the same time or singly at different times), and a supplemental test such as the western blot are considered to have HIV infection.

Additions to the list of conditions reportable by laboratory directors. The following additions were made to the list of conditions laboratory directors must report to the health department: *Chlamydia trachomatis* infections—by culture or antigen detection methods; *Haemophilus influenzae* infections—by culture or antigen detection assay of blood or cerebrospinal fluid; hepatitis A—by serology specific for IGM antibodies; listeriosis—by culture; and pertussis—by culture or direct fluorescent antibody test.

Additions to the list of conditions requiring rapid communications. Invasive *Haemophilus influenzae* infections and hepatitis A were added to the list of conditions requiring rapid communication.

Provisions for hospitals and pathology laboratories to report cancer. The *Code of Virginia* has been revised to require hospitals and independent pathology laboratories to

report information on all newly diagnosed cases of cancer to the Virginia Tumor Registry (VTR). These facilities may choose between two methods of reporting: (1) supplying only basic information (by either photocopying the hospital facesheet and the pathology report or completing a form supplied by the VTR), or (2) supplying the extensive set of data elements required for cancer programs approved by the American College of Surgeons. Annual reports and site studies will be supplied to hospitals reporting by the latter method.

For the purposes of these regulations, cancer is defined as "all carcinomas, sarcomas, melanomas, leukemias, and lymphomas excluding localized basal and squamous cell carcinomas of the skin, except for lesions of the mucous membranes." An independent pathology laboratory is "a nonhospital or a hospital laboratory performing surgical pathology, including fine needle aspiration biopsy and bone marrow examination services, which reports the results of such tests directly to physician offices, without reporting

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List of Reportable Diseases

Acquired Immunodeficiency syndrome (AIDS)	Lyme disease
Amebiasis	Lymphogranuloma venereum
Anthrax	Malaria
Arboviral infections	Measles (Rubeola)
Aseptic meningitis	Meningococcal infections
Bacterial meningitis (specify etiology)	Mumps
Botulism	Nosocomial outbreaks
Brucellosis	Occupational illnesses
<i>Campylobacter</i> infections	Ophthalmia neonatorum
Chancroid	Pertussis (Whooping cough)
Chickenpox	Phenylketonuria (PKU)
<i>Chlamydia trachomatis</i> infections	Plague
Congenital rubella syndrome	Poliomyelitis
Diphtheria	Psittacosis
Encephalitis	Q fever
primary (specify etiology)	Rabies in animals
post-infectious	Rabies in man
Foodborne outbreaks	Rabies treatment, post-exposure
Giardiasis	Reye syndrome
Gonorrhea	Rocky Mountain spotted fever
Granuloma inguinale	Rubella (German measles)
<i>Haemophilus influenzae</i> infections, invasive	Salmonellosis
Hepatitis	Shigellosis
A	Smallpox
B	Syphilis
Non A, Non B	Tetanus
Unspecified	Toxic shock syndrome
Histoplasmosis	Toxic substance related illnesses
Human immunodeficiency virus (HIV) infection*	Trichinosis
Influenza	Tuberculosis
Kawasaki syndrome	Tularemia
Legionellosis	Typhoid fever
Leprosy	Typhus, flea-borne
Leptospirosis	<i>Vibrio</i> infections including cholera
Listeriosis	Waterborne outbreaks
	Yellow fever

*Reportable beginning July 1, 1989

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to a hospital or accessioning the information into a hospital tumor registry."

Diseases that must be reported to funeral directors. The 1988 General Assembly passed legislation which directed the Board of Health to develop a list of conditions of which to notify funeral directors. In response, the regulations now include a list of diseases that must be reported to funeral directors receiving the body of a person who suffered from the disease immediately before death. This list includes HIV infection, hepatitis B, hepatitis nonA-nonB, rabies, infectious syphilis, and Creutzfeldt-Jakob disease. Such reports will be made by hospitals, nursing homes, homes for adults, and departments of corrections.

Other changes to the regulations—Other noteworthy changes include

the following:

1. While influenza is still reportable by number of cases only, the type should be specified when it is known. Therefore, reports of influenza should include a count of cases by type of influenza.

2. The definition of a medical care facility has been changed to include federal facilities operating in Virginia. According to the revised regulations, "medical care facility means any hospital or nursing home licensed in the Commonwealth, or any hospital operated by or contracted to operate by an entity of the United States government or the Commonwealth of Virginia."

3. The regulations now contain clauses specifying that physicians, laboratory directors, persons in charge of medical care facilities and persons in charge of schools are im-

mune from liability for reporting any disease as authorized by the regulations.

Because the *Code of Virginia* revision requiring the reporting of HIV infections occurred after this amendment to the *Regulations for Disease Reporting and Control*, another update to these regulations is needed. The Office of Epidemiology will therefore defer formal printing of the regulations until after the next revision. Anyone interested in obtaining a copy of this version of the regulations should refer to the January 16, 1989 *Virginia Register* or call the Office of Epidemiology at (804) 786-6261. Questions regarding the disease reporting requirements may be directed to Diane Woolard, Senior Epidemiologist, in the Office of Epidemiology.

Firearm-Associated Homicides Among Family Members, Relatives, or Friends

In 1985, 311 (56%) of 553 homicides in Ohio occurred among relatives or acquaintances; 191 (61%) of these 311 homicides involved the use of firearms (Federal Bureau of Investigation [FBI], unpublished data, 1985). To learn more about firearm homicide among persons who are closely acquainted, the Ohio Department of Health (ODH), Division of Epidemiology, interviewed offenders involved in homicides occurring between 1982 and 1985 that met the following six criteria: the homicide 1) occurred in Cleveland, Cincinnati, Columbus, Toledo, Dayton, or Akron; 2) occurred between family members, relatives, or friends; 3) was committed with a firearm kept in the household; 4) victim and offender were ≥ 18 years of age; 5) occurred in or within the immediate vicinity of a residence; and 6) was not secondary to another crime. The primary purposes of the investigation were to describe demographic characteristics of the offenders and to identify situational or environmental factors related to the homicide.

Using records from the Ohio State Department of Corrections and Rehabilitation and police records from

Cleveland, Cincinnati, and Columbus, investigators identified 105 homicides that met the above criteria. Of these, interviews were completed with 50 (48%) offenders. Of the 55 offenders who were not interviewed, 37 (67%) could not be located, 12 (22%) refused to participate, and three (5%) had died. Three (5%) interviews were not completed for other reasons.

Since the Ohio homicide study included only a subset of firearm-associated homicides that occurred among family members, relatives, or friends, selected offender characteristics were compared with Ohio data from the FBI. The distribution from the Ohio homicide study approximates Ohio estimates from the FBI for median age of the offender and type of firearm used in the homicide (Table 1) (FBI, unpublished data, 1985). However, in the Ohio homicide study, offenders were less likely to be male and less likely to be white.

Offenders' responses varied widely as to their perception of the single immediate cause of the homicide. Forty percent responded that some type of threatened (30%) or actual (10%) physical abuse was oc-

curing just before the incident, regardless of whether the victim or the offender initiated the abuse. Ten percent suggested that alcohol and/or drugs was the immediate reason for the incident. Other reasons for the incident included "jealousy," "money," or "the general stresses of living together" (10%), "accidental" (12%), "other" (10%), or "unknown" (18%).

Handguns were the type of firearm used in 76% of the homicides (Table 2). Less than half the offenders reported owning the firearm; only 26% reported that the weapon was purchased from a licensed dealer. Fifty-six percent of firearms were kept in the bedroom; 96% were always kept in the household in which the homicide occurred, and the remaining 4% were usually kept in the household. Self-protection was the most commonly reported (56%) purpose for obtaining the firearm.

Sixty-four percent of the firearms were always kept loaded, and at least 64% were always kept in an unlocked location. Forty-four percent were always kept loaded and in an unlocked location. Thirty-eight percent of the firearms had been owned <1 year; 66% had been owned ≤ 5

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years.

Alcohol was reported to have been consumed before the incident by 62% of the offenders, and alcohol and/or drugs, by 88% of the offenders and/or victims. Thirty percent of the offenders had the firearm in their immediate physical possession just before the incident; 54% reported drawing a firearm or some other weapon first, and 22% reported the victim drew a firearm or some other weapon first. Thirty-eight percent believed they could not have resolved the situation without the firearm, and 22% responded that the victims "dared" them. Forty-eight percent reported they did not intend to shoot the victim when they drew the weapon. Forty percent indicated that the victim was approaching them when the gun was fired, and 48% fired the weapon within 15 seconds of brandishing it. Seventy percent of the offenders reported never practicing shooting firearms; 50% recalled that their parents had owned a firearm during their childhood. Seventy-four percent indicated that just before or during the incident they did not consider that they could go to prison for using a gun.

Editorial Note: This investigation by the ODH helps describe the problem of firearm-associated homicide in Ohio. Homicide is the fourth leading cause of years of potential life lost before age 65 in the United States (1). In 1985, 59% of all U.S. homicides involved relatives and acquaintances (2).

Of the 46,618 deaths occurring to Virginia residents in 1987, homicides accounted for 1.0 percent. The 472 total homicides represented an increase of 3.1 percent over the 458 homicidal deaths in 1986. Virginia's death rate resulting from homicides, 8.0 per 100,000 population, has increased since 1986. The United States estimated rate for 1987 was 8.5.

In 1987, 207 of the Virginia homicide victims were white and 265 were nonwhite, producing rates of 4.5 and 20.9 per 100,000 population, respectively. Homicide was the fifth ranking cause of death for nonwhite males, the tenth for nonwhite females, the twelfth for white males, and the sixteenth for white females.

Homicide was the third leading cause of death in Virginia for the 15-

24 age group and fifth for the 25-44 age group. The median age at death for homicide victims was 32.9 years. For white males, it was 36.8 years; for white females, 39.2 years; for nonwhite males, 29.2 years; and for nonwhite females, 32.3 years.

Firearms and explosives were the implements used in 302, or 64.0 percent, of the Virginia homicides in 1987. Assault by cutting and piercing instruments, with 76, was the second most frequently used method. Eleven deaths were the result of injuries inflicted through legal intervention.

References

1. US Department of Health and Human Services. Report of the Secretary's Task Force on Black and Minority Health: executive summary. Washington, DC: US Department of Health and Human Services, Public Health Service, 1985.
 2. Federal Bureau of Investigation. Uniform crime reports for the United States, 1985. Washington, DC: US Department of Justice, Federal Bureau of Investigation, 1986.
- Adapted from MMWR 1989; 38:253-6 and the Virginia 1987 Vital Statistics Annual Report (VDH) pp. 38-39.*

Table 1. Distribution of type of firearms used and median age, race, and sex of offenders—Ohio Homicide Study, 1982-1985, and Ohio FBI data, 1985

	Homicide study		FBI data	
Firearm homicide among:	Family, relatives, or friends (n = 50)		Family or acquaintances (n = 191)	
Median age of offender:	35 yrs		31 yrs	
Offender characteristics	No.	(%)	No.	(%)
Sex				
Male	35	(70)	158	(83)
Female	15	(30)	31	(16)
Unknown	—	—	2	(1)
Race				
White	14	(28)	95	(50)
Other	36	(72)	94	(49)
Unknown	—	—	2	(1)
Firearm				
Handgun	38	(76)	151	(79)
Long gun	12	(24)	39	(20)
Other	—	—	1	(1)

Table 2. Type, owner, usual storage location, purpose, and source of firearms used in 50 homicides between family, relatives, or friends—Ohio, 1982-1985

Category	No.	(%)	Category	No.	(%)
Type			Purpose		
Handgun	38	(76)	Self-protection	28	(56)
Shotgun	8	(16)	Hunting	2	(4)
Rifle	4	(8)	Target shooting	2	(4)
Owner			Collecting	2	(4)
Offender	22	(44)	Other	10	(20)
Spouse/lover	9	(18)	Unknown	6	(12)
Friend	8	(16)	Source		
Parent/relative	7	(14)	Licensed dealer	13	(26)
Unknown	4	(8)	Gift	2	(4)
Storage location			Stolen	1	(2)
Bedroom	28	(56)	Illegal dealer	1	(2)
Kitchen	4	(8)	Relative (bought)	8	(16)
Living room	3	(6)	Stranger (bought)	7	(14)
Other room	9	(18)	Other	6	(12)
Unknown room	4	(8)	Unknown	12	(24)
Other	2	(4)			

Cases of selected notifiable diseases, Virginia, for the period April 1 through April 30, 1989.

Disease	State				Regions					
	This Month	Last Month	Total to Date		Mean 5 Year To Date	This Month				
			1988	1989		N.W.	N.	S.W.	C.	E.
Measles	1	0	67	1	17	0	1	0	0	0
Mumps	12	12	28	43	15	0	7	4	0	1
Pertussis	1	1	9	4	12	0	0	0	0	1
Rubella	0	0	0	0	0	0	0	0	0	0
Meningitis—Aseptic	10	13	30	57	46	0	2	2	1	5
*Bacterial	26	14	55	86	85	4	4	4	2	12
Hepatitis A (Infectious)	20	23	128	66	79	0	3	0	17	0
B (Serum)	19	15	89	92	143	2	2	7	3	5
Non-A, Non-B	7	2	22	19	27	0	1	3	1	2
Salmonellosis	61	86	322	283	313	7	18	8	14	14
Shigellosis	27	48	119	179	62	0	7	2	5	13
Campylobacter Infections	55	28	99	152	123	10	14	5	10	16
Tuberculosis	45	23	146	122	121	1	10	10	11	13
Syphilis (Primary & Secondary)	40	55	139	184	124	2	6	4	14	14
Gonorrhea	968	1539	4241	4942	5447	—	—	—	—	—
Rocky Mountain Spotted Fever	0	0	0	0	1	0	0	0	0	0
Rabies in Animals	18	29	148	89	102	3	4	3	7	1
Meningococcal Infections	4	9	25	21	33	3	0	0	0	1
Influenza	80	248	2369	1736	1855	3	5	3	28	41
Toxic Shock Syndrome	0	1	0	1	2	0	0	0	0	0
Reye Syndrome	0	1	0	1	1	0	0	0	0	0
Legionellosis	0	0	5	1	4	0	0	0	0	0
Kawasaki Syndrome	0	1	7	3	9	0	0	0	0	0
Acquired Immunodeficiency Syndrome	35	41	128	140	—	2	11	1	11	10

Counties Reporting Animal Rabies: Alexandria 1 raccoon; Amelia 1 raccoon; Chesterfield 2 raccoons; Culpeper 1 raccoon; Fluvanna 1 raccoon; Henrico 2 raccoons; Loudoun 1 fox, 2 raccoons; Madison 1 skunk; Nottoway 2 raccoons; Russell 2 skunks; Smyth 1 skunk; York 1 raccoon.

Occupational Illnesses: Asbestosis 20; Carpal Tunnel Syndrome 23; Chronic Bronchitis 1; Dermatitis 1; Loss of Hearing 18; Pesticide Exposure 1; Coal Workers' Pneumoconiosis 31; Repetitive Trauma Disorder 8.

*other than meningococcal

Published Monthly by the
VIRGINIA HEALTH DEPARTMENT
 Office of Epidemiology
 109 Governor Street
 Richmond, Virginia 23219

Bulk Rate U.S. POSTAGE PAID Richmond, Va. Permit No. 1225
