

Lost Alzheimer's Subjects-Profiles and Statistics

By Robert I. Koester and David E. Stooksbury

Introduction

Incident commanders in missing person searches rely on lost person behavior profiles for the initial deployment of resources and development of objectives. To characterize the behavior of lost Alzheimer's subjects in the Middle Atlantic States, five years of search and rescue data from Virginia has been analyzed.

William Syrotuck was the first to systematically collect and analyze lost person behavior¹. Barry Mitchell presents several subject profiles based on a large data set collected by the National Association for Search and Rescue.² Mitchell's work provides both behavior profiles and statistics to help predict the lost subject's location. The profiles include hunters, hikers, children (by age group), the mentally retarded, berry pickers and the elderly. These studies are incorporated into the major textbooks and field guides used by incident commanders.^{3,4} More importantly, planners use this information during searches. Unfortunately, search subjects suffering from Alzheimer's disease have either been grouped with elderly subjects or been undocumented.

Early estimates of the prevalence of Alzheimer's disease was two million cases in the United States.⁵ Current estimates are four million.⁶ The increase is believed to be due to both an increase in awareness of the disease and an increase in medium age of the U.S. population. Regional demographics also greatly affect the percentage of Alzheimer's cases found in each state.

Alzheimer's disease is known as a disease of exclusion since it can only be diagnosed positively after the subject's death. However, Dementia of Alzheimer's Type (DAT) has been well characterized and can be documented with behavioral tests.^{7,8} DAT is a chronic progressive disorder of unknown onset in which the affected individual suffers:

- A "loss of intellectual abilities of sufficient severity to impair their social or occupational functioning"
- Severely impaired memory
- Problems with abstract thinking, judgment, higher order cortical functioning or personality changes⁹

Initially, these changes are difficult to detect. However, they will eventually lead to such problems as wandering, pacing, aggression, irritability, withdrawal, fear and anxiety.

DAT is delineated into mild, moderate and severe categories.¹⁰ The earliest signs of DAT often appear during trips to unfamiliar surroundings. The patient is often visiting friends or family and becomes confused only a short distance from the residence. The patient with moderate DAT often appears normal even though they suffer from memory problems. Usually the caregiver relates stories about the patient previously becoming lost, a decline in personal hygiene, an inability to carry out financial matters and an

inability to remember recent conversations. Those patients suffering from severe DAT will clearly be recognized as suffering from "mental problems." Caregivers will usually report a patient with incontinence, an inability to feed or groom themselves, and a lack of recognition of loved ones.¹¹ In cases of severe DAT:

- 71% suffer from poor personal hygiene.
- 50% tend to wander.
- 50% become restless-
- 38% are easily agitated-
- 30% have hallucinations-
- 30% experience difficulty with incontinence.
- 29% experience falls.
- 29% become suspicious of those around them.

Four of these characteristics, wandering, agitation, poor hygiene and incontinence, significantly increase with further deterioration of the DAT patient. Among mild cases of DAT, 18% of the patients wander, while in severe cases wandering increases to 50%.¹² This particular trait has serious consequences when the patient wanders into a wilderness or rural location.

It is important to realize that 35% of DAT patients have a coexisting diagnosis.¹³ The most common additional problems are depression (25%), overmedication, hypothyroidism, hyperparathyroidism, diabetes, acute infections and Parkinson's disease.¹⁴ Most of these problems tend to decrease activity and the potential distance a DAT patient may travel.¹⁵

DAT subjects differ significantly from other lost subject behavioral profiles. Hikers, hunters and other groups venture into the woods with both a purpose and equipment. Therefore, the types of clues they leave often involve multiple physical objects. Containment is an effective technique in searches for hikers and hunters. The tactic relies upon the lost subject recognizing and following features such as a road, trail or string barrier. DAT subjects may simply wander into the woods and tend not to leave physical clues other than signs of passage and scent. The only other potential physical clues are the subjects' discarded clothing or pocket contents. DAT subjects may not recognize the value of such features or even recognize the fact they are lost

Materials and Methods

The Virginia Department of Emergency Services (DES) is responsible for coordinating search and rescue (SAR) activities throughout the state. In 1986, a new management system was introduced that utilizes selected operations personnel to handle all requests for SAR assistance.

Therefore, all SAR requests are handled by personnel involved in SAR education and operations. Additionally, it created a new record-keeping system and database.¹⁶ This retrospective study begins in June 1986 with the first state recorded mission (VAOO1) and ends in June 1991 (VA234). Due to duplications in the numbering of some missions, 245 incidents are covered.

System Description. The DES SAR duty officer is responsible for alerting state field operational resources, coordination between the local law enforcement agency and state police, coordination with local emergency coordinators, coordination between state and federal resources, field support and data collection.

State field operational resources are tested by the independent Virginia Search and Rescue Council (VASARCO). VASARCO has representatives from all active statewide SAR resources. State resources include air scent dog teams, dog tracking teams, mounted horse teams, explorer scouts, management teams, ground teams, tracking teams, the Civil Air Patrol and government resources. The state peacetime disaster plan places responsibility with the local law enforcement agency if the local plan does not otherwise specify the role. The initial response from local law enforcement varies depending upon the locality. While some law enforcement officials contact DES immediately to request state resources, many localities will conduct search operations for six hours to several days before requesting state help.

To activate the system, a citizen reports the missing person to a local law enforcement agency, rescue squad or fire department. Once a request for state assistance is made, the initial response usually consists of an overhead management team, air scent dog teams, tracking dog teams, hasty teams and helicopters. After assessing the situation, the overhead team is responsible for requesting additional resources.

Criteria for Inclusion. Only searches issued a DES mission number are included in the relationship studies and the point last seen analysis. Five additional searches before 1986 and four additional searches after June 1991 are added to the clues, roadway crossings, techniques used, medical conditions and attraction analysis. Mission numbers are issued only when state SAR resources are dispatched to the incident. All data was collected from a combination of the DES Missing Person Reports, DES after Action Reports and Virginia SAR Council mission summaries. These reports generally are completed by the incident commander or a general staff member. Missing information is often collected later by the DES SAR officer. Copies of the original reports were furnished by DES.

The state data forms do not include information concerning the medical diagnosis of injured or dead subjects, clues discovered during the search, techniques used to locate the subject or whether the subject crossed any roads. Therefore, a review of state records, search team records and personal records of the incidents was performed.

Classification as a DAT missing person is based solely upon the caregiver's description of the subject. Incident commanders have no specific training to allow them to determine the validity of such claims. The data collection form has no specific question concerning a DAT description or mental status of the search subject. Therefore, it is completely voluntary for the compiler to fill in a DAT description in the "other pertinent information" blank. If the compiler did not mention Alzheimer's disease, dementia, senility or confused, the missing person was classified as either elderly (if over 60 years of age) or placed into another category (retarded, despondent, etc.).

Year	Total Searches	DAT Searches	%DAT
1987	33	1	3%
1988	40	4	10%
1989	49	8	16%
1990	54	9	16%

Data Coding. The information provided on the *state form* includes: state mission number, age and sex of subject, time the subject was last seen, date subject was last seen, type of location where last seen (nursing home, residence, etc.), air distance from subject last seen to where subject found, description of terrain where subject located and a brief summary of subject's medical condition.

The information recorded from *personal records* includes date, subject name, location, condition of subject, successful or suspended mission, field diagnosis of subject's medical condition, any verifiable clues located, terrain description of find location, whether the subject crossed or left roads and the search technique that located the subject.

Results

Twenty-nine (12%) out of 245 recorded state incidents involved possible DAT sufferers. This particular category was the largest in the data set. The other most prevalent search types included suicidal (12%), children (11%), hikers (10%), drownings (9%) and murders (9%) (figure 1). The drowning and murder cases usually reflect requests for dog teams. There has been an increase in the number of DAT searches and in the percentage of total search load (table 1). The increase in the median age of the U.S. population and an increased awareness of Alzheimer's disease are believed to be responsible for this increase.¹⁷

The medical condition of the DAT subjects after being found varied greatly. Eleven subjects (38%) required no medical attention (class one) and were able to be escorted out of the woods. Twelve subjects (41 %) required evacuation team (class two) (the forms do not always state the specific medical problem). Six subjects (21 %) were found deceased (class three). In searches for elderly subjects not suffering from DAT (n=10), six subjects were classified as class one (60%); one subject was class two (10%) due to hypothermia and dehydration; and three subjects (30%)

were found deceased (heart attack, drowning, unrecorded). There is no relationship between the age of the DAT subject and outcome (class) of the subject (figure 2).

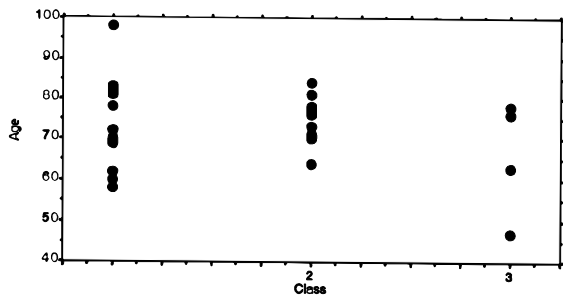


Figure 2: Class vs. Age.

Twenty-five (25) of the DAT searches have data on the subject's distance from the point last seen (PLS). In all 29 searches, the subject was located by either the search effort or by others. The four missing data points represent a failure to complete the data form correctly. The mean distance from the PLS is 0.6 miles (1.0 km). The median distance is 0.5 miles (0.8 km) with a range of 0-2 miles (0-1.2 km) (figure 3). This can be compared to elderly cases without DAT where a mean distance from the PLS is 2.3 miles (3.8 km). The median distance is 2.5 miles (4.2 km) with a range of 0.1-5 miles (0.2-8.3 km) (table 2). There is no relationship between the DAT subject's age and distance from the PLS (figure 4). However, there is a positive relationship between the distance from the PLS and subject class (figure 5).

Most DAT subjects are last seen at either their own residence or a nursing home (table 3). In addition, the five subjects spotted on a road initially departed from a nursing home or residence. The terrain the subject was located in was recorded in 24 cases. *The majority of subjects are found in drainages/creeks or heavy brush/briars* (table 4). With the three cases found in a house, two were found hiding in their own house and one traveled to a previous residence. In most searches, the subject is found wandering by nonsearchers and not by search teams. In many cases, the subject is located before trained searchers arrive on the scene. Sweep teams are the most successful search technique (table 5).

DAT subjects requiring evacuation (n=10) suffered from hypothermia (56%) and/or dehydration (44%). No hospital records were reviewed to support the field diagnosis. Deceased subjects (n=6) appeared to have succumbed to hypothermia (4), drowned (2) or died from heart disease (1). Physical clues were located in only three searches (14%). These included broken branches leading to the subject's shoe, sugar packets taken from a cafeteria and a personal letter. *Fourteen subjects walked across a road* (67%), *three subjects entered the woods after walking on a road* (14%) and *four subjects did not cross any roads* (19%).

Discussion

The data characterizing missing persons as suffering from DAT was provided by caregivers during the investigative component of the search. Investigators within Virginia are suspicious of the potential of DAT in elderly subjects. The Lost Person Questionnaire, a standard data collection tool used on all state searches, prompts the investigator to pursue mental alterations. While several other conditions can cause dementia and therefore be confused with Alzheimer's disease, this has minimal impact on the usefulness of the collected data. During searches (by definition the subject is not present), a definitive classification as DAT is impossible unless previously made by a physician. This is particularly true of subjects who become lost in wilderness and rural settings who often belong to a lower socioeconomic group and receive less healthcare.¹⁸ Therefore, search managers will almost always be unable to differentiate between dementia and DAT. If the predictive database (this study) potentially includes both groups, then this dilemma is controlled.

The data allows the development of a DAT subject profile. The subject usually disappears from their residence or nursing home. While not documented in this study, it is worth noting that it has been the principal investigator's personal observation on 25 searches for DAT subjects that almost all had become lost before. Generally, the family or local authorities had been able to locate the subject rapidly. This tendency to become lost is consistent with an increasing tendency to wander. Once the subjects become lost they are generally found close to the PLS. While the investigators have heard numerous reports of Alzheimer's subjects walking great distances (10-15 miles), no such case appeared in the Virginia caseload. As a larger data pool develops, the mean distance of 0.6 miles will almost certainly increase. However, the median distance of 0.5 miles may remain stable.

Table 2: Search Statistics for DAT and Elderly Searches

Statistic	DAT Searches	Elderly Searches
Number of Searches	25	7
Mean Distance from PLS	0.6 miles	2.3 miles
Standard Deviation of Distance	0.5 miles	2.1 miles
Median Distance from PLS	0.5 miles	2.5 miles
Number of Subjects	29	10
Age of Subject	73.3	71
Standard Deviation of Age	9.9	8.2
Subjects Yelling for Help	0	0
Subjects Responding to Yells	0	0
Males	17 (59%)	6 (67%)
Females	12 (41%)	3 (33%)
Class 1 Find (Walked Out)	11 (38%)	6 (60%)
Class 2 Find (Evacuated)	12 (41%)	1 (10%)
Class 3 Find (Deceased)	6 (21%)	3 (30%)
25% Probability Zone	0.4–0.5 miles	
50% Probability Zone	0.3–0.6 miles	
80% Probability Zone	0.2–1.0 miles	
90% Probability Zone	0.0–1.1 miles	
96% Probability Zone	0.0–1.5 miles	

It is unknown if the subjects spend considerable time wandering or if they walk a fairly direct path. Following a path of least resistance is supported by the considerable number (63%) of DAT subjects found in drainage/creeks or brush/briars. This indicates they walked downhill. Another 25% of the subjects appear to have become stuck in thick brush or briars (a feature untrained searchers often avoid). Both terrain features indicate a scenario of the subject traveling a path of least resistance until they reach a creek or get stuck in briars.

Based on the authors' personal search notes, subjects are often found a short distance off a road or other feature that is easily traveled. The possibility of following a direct path is also supported by a number of subjects who were found between the PLS and a target location (favorite place, former residence, etc.). A line drawn from the subject's residence and the PLS (if a later sighting occurred) often predicts where the subject can be found. The difficulty the incident commander faces is determining the potential target.

The age of the subject has no predictive value for the subject's survivability or distance found from the PLS. It would be worthwhile to investigate the relationship between the severity of DAT (mild, moderate, severe) with search outcome and distance found from the PLS. The relationship between the survivability of the subject and distance from the PLS can be easily explained. The search area and time required to find the subject grows exponentially as the

radius increases. The longer the subject is exposed to the elements, the less their chance of survival. This relationship has little operational use since during a search the distance the subject is from the PLS is unknown.

Unfortunately, the data forms do not consistently provide information about the exact medical condition of the subject when found. If the subject was found deceased, the incident commander did not receive a copy of the autopsy or the autopsy did not specify the exact cause of death. In those subjects requiring evacuation, making a field diagnosis is often difficult. However, none of the data forms report trauma. The only indicated disorders included hypothermia, dehydration, drowning, heart disease and unknown. Therefore, it appears DA T subjects are most likely to succumb to the environment and not to any injuries or pre-existing diseases

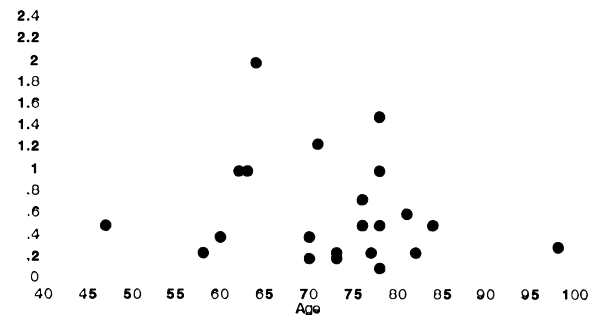
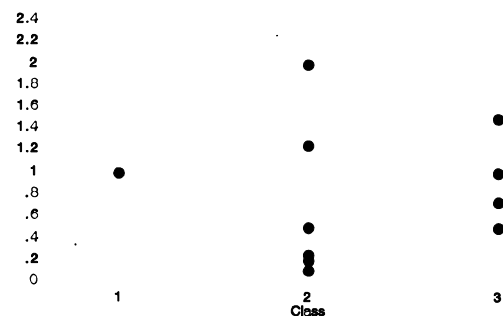


Figure 4: Age vs. Distance Found From PLS.

Figure 5: Class vs. Distance Found From PLS.



An important aspect in redeploying resources and ultimately finding the missing subject is looking for and analyzing clues. The large percentage of searches without clues (86%) is most likely due to the fact that DAT subjects have no equipment, food or extra clothes to discard. Almost all subjects are found with all their clothes, so very few personal clues exist for searchers to find. All of the clues located required an active investigation to verify and determine their value. Resources capable of locating scent (dog teams) or passage (trackers) may play a critical role in locating the subjects.

Containment plays a small role in locating DAT subjects. Periodic road patrols still have value due to the number of DAT subjects located on roads (8%). Indeed, within Virginia the technique is seldom used. It is clear that DAT subjects will cross roads. In many of these cases the subject crossed two lane paved roads that are heavily traveled.

To better predict DAT missing subject behavior, a much larger pool of data is required. It is important to recognize the critical role that local terrain may have in distances covered. Virginia consists of a swampy tidewater region, rolling hills in a piedmont region and a heavily forested mountainous region. Numerous roads and paths crisscross most wilderness regions. An obvious need to better document the observations that DAT subjects have wandered previously, aimed for some target, crossed roads, generally traveled downhill, usually traveled only a short distance, easily became stuck in briars and easily died or succumbed to environmental disorders must be pursued in larger national prospective studies.

Summary

- Subject leaves own residence or nursing home, possibly with last sighting on a roadway.
- Subject has previous history of wandering
- Coexisting medical problems that limit mobility are common.

Table 3 Point Last Seen (PLS)

Personal Home	9 (36%)
Nursing Home	9 (36%)
Roadway	5 (20%)
Relatives	2 (8%)

Table 4: Location of Find

Creeks/Drainages	9 (38%)
Bushes/Briars	6 (25%)
Open Field	4 (17%)
Roadway	3 (12%)
House	2 (8%)

Table 5: Successful Field Techniques

Non Searchers	10 (42%)
Sweep	6 (25%)
Scratch (Hasty)	3 (13%)
Air Scent Dog	3 (13%)
Helicopter	2 (8%)

- Subject will usually be found within 0.5 miles of point last seen.
- Subject usually found a short distance from a road.
- Subject usually found in creek or drainage and/ or caught in briars/bushes (63%).
- Subject will not cry out for help or respond to shouts.
- Subject will not leave many physical clues.

- Subject may attempt to travel to a former residence or to a favorite place.
- Subject usually succumbs to the environment (hypothermia, dehydration).

Suggested Search Techniques

- Early use of trackers at point last seen (PLS)
- Early use of tracking dogs at PLS and along roadways.
- Early deployment of air scent dog teams into drainages and streams, starting nearest PLS.
- Early deployment of hasty ground teams into drainages and streams nearest PLS.
- Thoroughly search the residence/nursing home and surrounding grounds and buildings; repeat every few hours.
- Cut for signs along roadways.
- Search heavy briars/bushes; remind field team leaders of this.
- Dog teams and ground sweep teams (in separate sectors) expanding from PLS.
- Air scent dog teams and ground sweep teams task 100 yards (initially) parallel to roadways.
- Search nearby previous homesites and the region between homesites and PLS.

Acknowledgements

We would like to thank Winnie Pennington and Ralph Wilfong of the Virginia Department of Emergency Services for supplying copies of state mission records.

End Notes

1. Syrotuck, W.1973. *A statistical analysis of lost persons in wilderness areas*. Westmoreland, NY: Arner Publications.
2. Mitchell, B. 1986. A summary of the National Association for Search and Rescue data collection and analysis program for 1980- 1985. Fairfax, VA: NASAR.
3. NASAR. 1987. *Managing the search function*. Fairfax, V A: NASAR.
4. NASAR. 1987. *Incident commander field hand- book: Search and rescue*. Fairfax, V A: NASAR.
5. Gruetzner, H. 1988. *Alzheimer's-A caregivers guide and sourcebook*. New York: John Wiley & Sons, Inc.
6. Evans, D., et al. 1989. Prevalence of Alzheimer's disease in a community population of older persons. *JAMA* 262:2551-6.
7. Folstein, M.R.; Folstein, S.; and McHugh, P.R. 1975. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician. *J Psychiatric Res.* 12:189.
8. Blessed, G.; Tomlinson, B.; and Roth, M. 1968. The association between quantitative methods of dementia and senile change in the cerebral gray matter of elderly subjects. *Br. J Psychiatry* 114:797.
9. American Psychiatric Association. 1980. *Diagnostic and statistical manual-III*. Washington, DC: American Psychiatric Press.
10. Kahn, R., e) al. 1960. A brief objective measure for the determination of mental status in the aged. *Am. J Psychiatry* 117:326- 328.
11. Reifler, B. 1983. Clinical aspects of Alzheimer's disease. *Modem Med. Canada* 38:17-20.
12. Teri, L.; Larson, E.; and Reifler, B. 1988. Behavioral disturbance in dementia of the Alzheimer's type. *American Geriatrics Society* 36:1-6.
13. Reifler, B., et al. 1981. Treatment results at a multispecialty clinic for impaired elderly and their families. *Am. Geriatric Soc.* 29:279.

14. Reifler, B.; Larson, E.; and Hanley, R. 1982. Coexisting cognitive impairment and depression in geriatric outpatients. *Am. J Psychiatry* 139:623.
15. Adams, R., and Victor, M. 1989. *Principles of neurology, 4th ed.* New York: McGraw-Hill.
16. Wilfong, R. 1987. Time frame for survival-minutes and counting-Virginia enhances search and rescue capabilities. *Lifeline* 11:2:10-13.
17. CDC Editorial Note. 1990. Mortality patterns-United States-1987. *MMWR* , 39:193-6.
18. Rosenblatt, RA. 1991. The potential of the academic medical center to shape policy-Oriented rural health research. *Acad. Med.* 66:662-7.

Robert J Koester has an MS in neurobiology from the University of Virginia and is currently a member of the faculty in the Division of Natural Science. He is the chairman of the Appalachian Search and Rescue Conference, where he has been a member for 11 years. Koester has served as incident commander on 70 search sites and participated in 25 searches for Alzheimer's subjects. David E. Stooksbury is with the Department of Environmental Sciences' Virginia State Climatology Office at the University of Virginia. He is also a member of the Appalachian Search and Rescue Conference.

Citation: Koester, R. & Stooksbury, D (1992) "Lost Alzheimer's Subjects-Profiles and Statistics" *Response* 11:4:20-26