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Relationships Between the Deinstitutionalization of Healthcare for Patients with Mental Disorder, Substance Abuse, and Isolated Death

ABSTRACT: Isolated death (ID) (i.e., dying alone without anyone noticing for several days) has been suggested to be related to social isolation, mental disorder, and alcohol and/or drug abuse. A major transfer of patients with a mental disorder and/or alcohol and/or drug abuse from institutionalized care to treatment as outpatients has been enacted in Sweden during the past decade. On the basis of the assumption that such deinstitutionalization is likely to result in increased social isolation, our working hypothesis was that the incidence of ID among patients belonging to these categories has increased in Sweden. The present study involved all deaths subjected to a medicolegal examination in Stockholm County (with a population of approximately 1.9 million people) during the period 1992–2000. The pattern of ID (defined as cases involving a postmortem delay between death and discovery of at least 1 week), as well as the incidence of fatalities subjected to medicolegal examination with a record of mental disorder and/or alcohol and/or drug abuse was evaluated. Throughout this period, the proportion of the deceased with a record of a mental disorder was high among all the cases examined and higher still among the cases of ID, especially among those younger than 65 years of age. There was a rather limited increase in the incidence of ID and a much more pronounced increase in the number of former psychiatric patients whose deaths were subjected to medicolegal examination, but did not satisfy the criteria for ID. A record of alcohol and/or drug abuse was more common than a diagnosis of mental disorder among both the males and females who died at an age of less than 65, with a clear difference between the cases of ID and non-ID in the case of men. There was no significant increase in incidence over the course of this study. Thus, this study reveals a slight increase in the number of IDs and a more pronounced increase in the number of medicolegal examination of non-IDs of individuals with a record of a mental disorder.

KEYWORDS: forensic science, isolated death, substance abuse, mental illness

Fatalities involving a prolonged delay between the time of death and discovery of the body (referred to here as ID) usually are subjected to medicolegal investigation, because the decomposition that occurs may obscure signs of trauma. Although by far most IDs prove to be from natural causes, the occasional homicides have motivated studies of the mechanisms and time-course of different aspects of postmortem decomposition (1). However, the question of ID as an indicator of social isolation has received far less scientific interest. Thus, we only have been able to find a single study relating isolated death to social isolation (2) and only a few reports on factors associated with dying alone, regardless of how much time passes before the body is discovered (3,4).

The factors shown to be associated with dying alone include low social class, advanced age, sudden and unexpected death (e.g., from ischemic heart disease, or injury or poisoning) and some degree of social isolation (e.g., not being married, having no family and/or living alone) (4). In a search through the records of the San Francisco emergency services department and hospitals Gurley et al. (3) found similar factors to be associated with being found dead or helpless

and immobilized in the home. In the majority of these cases, the individuals involved were 65 years of age or older and the events were precipitated by acute disease, such as a stroke or heart attack or by physical injury, primarily from falls. Approximately 25% of these patients had related problems such as alcoholism, use of illicit drugs, or major psychiatric illness. Most were not impoverished, but belonged to the middle class.

Recently, Hönigschnabel et al. (2) evaluated the medical and social information on deceased individuals who demonstrated signs of prolonged postmortem decomposition on discovery and were subjected to medicolegal examination during one of two 5-year periods, one in the middle of the 1960s and the other in the 1990s, in Vienna, Austria. The proportion of these individuals who died from natural causes was significantly lower during the 1990s (46.2%) than in the 1960s (62.6%). However, in the later period there was an increased frequency of natural deaths attributable to diseases of the digestive system, such as gastrointestinal hemorrhage or hepatic failure, indicating an elevated incidence of alcohol-related deaths. Among the deaths from unnatural causes, the suicide rate exhibited a pronounced increase from 9.2% in the 1960s to 25.3% in the 1990s.

Regarding the social characteristics of these groups of deceased individuals, the major finding was a marked increase in the 1990s in the proportion of individuals 25–54 years of age. Furthermore, there was a dramatic increase in the number of unemployed persons from two of the 412 cases in the 1960s to 58.3% of the 320 cases in the 1990s. The authors also noted a significant decrease in the proportion of females from 56.3% during the 1960s to 29.1% during the 1990s. Thus, the involvement of social factors such as

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unemployment and alcoholism increased, especially among men, whereas advanced age became less frequent in connection with ID in Vienna during the later part of the last century.

Altogether, these findings suggest that ID among persons 65 years of age or less often is related to social vulnerability, possibly attributable to mental disorders and/or substance abuse. On the other hand, ID among more elderly people often results from living alone with a potentially life-threatening disease, which is, of course, more frequent in this age group.

Although only marginal changes have occurred in the demographic structure of Stockholm County during the past decade, major changes in the care of psychiatrically ill patients and drug abusers have been implemented. Thus, the capacity for institutionalized psychiatric care in Stockholm was reduced from 3,200 beds in 1991 to slightly more than 800 beds in 1998 (5). Similarly, the number of beds available for institutionalized care of alcoholics was reduced from 222 in 1991 to 112 in 1998 (5) and the corresponding beds for abusers of illicit drugs are 84 (1991) and 52 (1998), respectively. During this same period, the proportion of homeless people in the Stockholm area who exhibited manifest psychiatric disturbances almost tripled from 17% to 47%; while the proportion of alcohol and drug abusers in this group increased from approximately 50% to 75% (6).

These observations indicate that in Stockholm County social isolation has become more widespread among individuals suffering from psychiatric illness and/or substance abuse. If this is the case, it would be predicted that during the past decade the number of isolated deaths in this region or, at least, the involvement of these factors in isolated deaths also has increased.

The goal of the present investigation was to test this prediction.

Methods

This study included the entire population of Stockholm County during the period of 1992 to 2000. Swedish legislation requires that all cases of death in which the body is found be decomposed on discovery shall be reported to the police. In practice, virtually all cases exhibiting signs of decomposition, even rather subtle changes, are subjected to medicolegal examination.

Isolated death was defined here as those cases where a period of 7 days or more elapsed between the time of death and discovery of the body. These cases were identified by examining the computerized records of individuals examined at our department from 1992–2000. These records provide three variables concerning the time of death:

- “Date of death 1” = the date on which the person died (in the case of witnessed death) or, was last seen alive (unwitnessed death).
- “Date of death 2” = the date on which the person’s body was discovered (not relevant for witnessed death).
- “Date of death 3” = In cases where the time at which the person was last seen alive is uncertain, an approximate date of death (e.g., June 1998), is noted.

In such cases, severe decomposition of the body usually had occurred.

This examination revealed 1,287 cases of ID. In 497 of these cases, information concerning the date of death was either incomplete or included “date of death 3”. These cases were categorized as “obscure cases” and each such case was scrutinized further by examining the police records and the autopsy protocol in detail. In cases lacking circumstantial evidence from which the postmortem

interval between death and discovery could be concluded, those demonstrating preserved rigor mortis (virtually always gone within a week) were excluded from the present study; whereas cases with signs of severe putrefaction involving loss of soft tissue and/or widespread invasion by maggots and/or mummification were included. In addition, cases involving inconclusive circumstantial evidence and inconclusive bodily signs also were excluded. Thus, 248 of the obscure cases were excluded because of lack of conclusive data and an additional 94 were categorized as non-IDs on the basis of the short postmortem delay. Accordingly, 154 of the original 497 obscure cases were grouped with the initial 1287 cases of ID to obtain a total of 1,441 such cases.

Information concerning somatic and mental disorder in connection with both isolated and all other deaths was obtained from the national records of inpatient hospital care for the same period. These records cover more than 99% of all hospitalizations in Sweden since 1987. The psychiatric diagnoses as well as the diagnoses concerning substance abuse were derived using the ICD-9 and ICD-10 classifications. The category “substance abuse” covers both alcohol and drug abuse. The following ICD codes were used:

Psychiatric Diagnoses

ICD-9: 291-299

ICD-10: The entire F-series with the exception for F10.0-F10.3, F11.0-F11.3, F12.0-F12.3, F13.0-F13.3, F14.0-F14.3, F15.0-F15.3, F16.3-F16.3, F17.0-F17.3, F18.0-F18.3, F19.0-F19.3.

Drug Abuse (Including Alcohol-Related Diagnoses)

ICD-9: 303-305

ICD-10: F10.0-F10.3, F11.0-F11.3, F12.0-F12.3, F13.0-F13.3, F14.0-F14.3, F15.0-F15.3, F16.3-F16.3, F17.0-F17.3, F18.0-F18.3, F19.0-F19.3.

The manner and cause of death in the cases of ID also were obtained from the computerized records at the Department of Forensic Medicine in Stockholm. Furthermore, this procedure served as a second control that the categorization as ID was correct. In cases of unnatural death where the manner of death was not registered, this was determined to be homicide, suicide, accident, unclear unnatural death or natural death on the basis of these findings of the medicolegal investigation, together with the documented circumstances. Natural causes of death were subdivided into (1) cardiac death, which included acute myocardial infarction, ischemic heart disease NOS, cardiomyopathy (excluding alcoholic), cardiac hypertrophy (all forms), myocarditis, and valvular disease; (2) alcohol-related disease, which consisted of chronic alcoholism, hepatic failure attributable to liver cirrhosis, alcoholic cardiomyopathy, acute pancreatitis and internal bleeding from ruptured esophageal varices; (3) stroke (cerebral or cerebellar hemorrhage or infarction); (4) ruptured aortic aneurysm; and (5) natural death not involving rapid onset (pneumonia, meningitis, diabetes mellitus, volvulus, etc.). This last category was constructed because these kinds of natural death were predicted to be overrepresented among socially isolated individuals. For the non-ID cases, the manner of death was obtained directly from the records of the Department of Forensic Medicine. Because of incomplete registration of the manner of death during 1992 and 1993, this information only was available for the period 1994–2000.

Statistical Analyses

Trend test analyses for changes in the number of individuals over time were performed employing a regression model with the number

of individuals as the outcome variable and the year of death as the independent variable. Both t values and p values were calculated. Differences in proportions between groups were examined by using chi square analyses, to obtain chi square and p values. Changes in proportions over time were investigated by calculating p values using Mantel-Haenszel statistics for non-zero correlation. Finally, the stability of the differences in proportions between groups over time (controlling for year) was tested by employing Mantel-Haenszel statistics. Non-zero correlation and p values were calculated.

Ethical Considerations

This study was approved by the ethical committee of the Karolinska Institute.

Results

During our study period, the annual number of cases fulfilling the criteria for ID fluctuated between approximately 140 and 180, with the lowest value (143 cases) being obtained in 1996 and the highest figure (186 cases) obtained in the year 2000 (Table 1). At the end of this period there appeared to be an increase of the number of IDs among women, but this change was not statistically significant ($t = 1.69$, $p = 0.13$). There was no such trend with respect to men ($t = 0.72$, $p = 0.49$).

During this same period, the total number of cases subjected to medicolegal examination exhibited a decline from slightly more than 1500 cases in 1991 and 1992 to somewhat less than 1300 cases in 1999 and 2000 (Table 1). Thus, there was an increase in the proportion of ID, from approximately 10% to about 16% of the total number of cases examined (Fig. 1). This increase was statistically significant for both sexes (for males Mantel Haenszel statistics = 4.55 and $p = 0.03$; for females, Mantel-Haenszel statistics = 9.12 and $p = 0.0025$).

The overall data revealed no differences between cases of ID and non-ID with respect to the proportion of individuals who had a record of mental disorder (Table 2, Fig. 2). However, the proportion of men who suffered ID and had a record of mental disorder increased significantly toward the end of the study period (Mantel-Haenszel statistics for non-zero correlation = 5.18, $p = 0.02$), but this was not the case for women (Mantel-Haenszel statistics = 1.03, $p = 0.31$) (Table 3, Fig. 2). The absolute number of IDs associated with a record of mental disorder demonstrated a similar trend ($t = 2.49$ and $p = 0.04$ for males; $t = 1.92$, and $p = 0.10$ for females; $t = 2.42$ and $p = 0.05$ (0.0458) for all cases).

For the entire study period, there was a statistically significant (chi-square = 10.27, $p = 0.0014$), but small and clinically insignificant difference between female ID and non-ID with respect to the proportion of individuals with a record of drug abuse (Table 2). There were no significant changes over time with regards to the

TABLE 1—The numbers of isolated deaths and of deaths subjected to medicolegal examination in Stockholm County during the period 1992–2000.

Year	Males		Females		All	
	Isolated deaths	All deaths subjected to medicolegal examination	Isolated deaths	All deaths subjected to medicolegal examination	Isolated deaths	All deaths subjected to medicolegal examination
1992	104	1047	46	441	151	1516
1993	124	1060	50	467	174	1546
1994	113	979	37	439	150	1442
1995	122	1029	32	390	154	1437
1996	98	965	43	424	143	1412
1997	104	916	48	411	152	1341
1998	106	1013	45	393	152	1430
1999	124	967	56	434	180	1420
2000	128	907	58	366	186	1289
<i>P</i> -value for change during this period*		0.09		0.02		0.02

* As analyzed by linear regression.

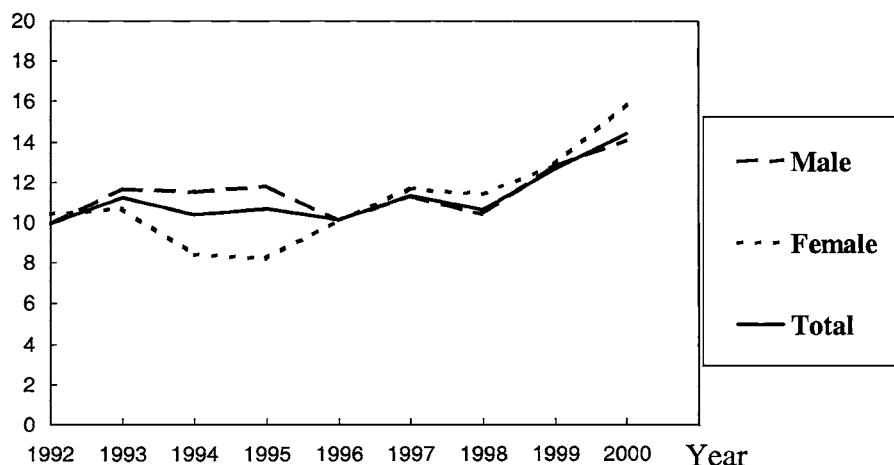


FIG. 1—The proportion of isolated deaths of all medicolegally examined deaths in Stockholm County 1992–2000.

TABLE 2—Numbers of isolated and non-IDs subjected to medicolegal examination in Stockholm County during the period 1999–2000 and involving institutionalized care for mental disorder, drug abuse, and all categories of disorder.

Cases	Registered mental disorder (including psychosis)		Registered drug abuse (non-psychotic)		Institutionalisation for all causes	
	ID*	non-ID [†]	ID*	non-ID [†]	ID*	non-ID [†]
Men						
<i>N</i>	138	1078	323	2248	868	6453
Total	1023	7860	1023	7860	1023	7860
% of total	13.5%	13.7%	31.4%	28.6%	84.8%	82.1%
<i>p</i> -value [‡]		0.84		0.05		0.03
Women						
<i>N</i>	69	600	53	645	315	2750
Total	415	3350	415	3350	415	3350
% of total	16.6%	17.8%	12.8%	19.3%	75.9%	82.9%
<i>p</i> -value [‡]		0.52		0.0001		0.002
All						
<i>N</i>	207	1678	376	2893	1183	9203
Total	1442	11391	1442	11391	1442	11391
% of total	14.4%	14.3%	26.0%	25.4%	82.2%	80.8%
<i>p</i> -value [‡]		0.70		0.58		0.26

* ID = isolated deaths, of which the total numbers were 1023 males + 415 females = 1442.

[†] non-ID = non-isolated deaths, of which the total numbers were 7860 males + 3350 females = 11391.

[‡] *p*-value for the comparison of the % of the total for ID and non-ID using chi-square analyses.

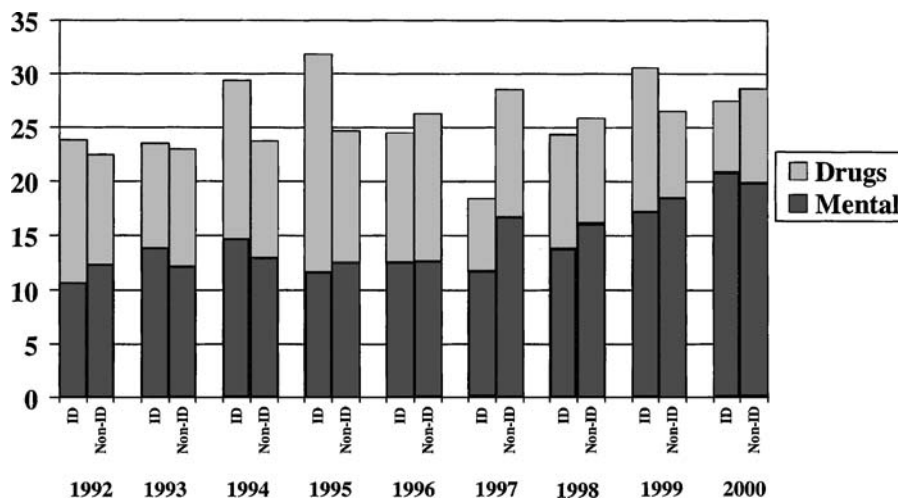


FIG. 2—The proportion of mental disorder and substance abuse among isolated and non-IDs 1992–2000.

association of drug abuse with either ID or non-ID in men or women (Table 4).

A more detailed evaluation of the cases of non-ID revealed highly significant increases for both sexes in both the proportion (Mantel-Haenszel statistics = 37.7, $p = 0.00$ (< 0.0001) for males; Mantel-Haenszel statistics = 19.6, $p = 0.00$ (< 0.0001) for females) and the change over time ($t = 5.29$, $p = 0.0011$ for males, $t = 2.75$, $p = 0.03$ for females) in the actual number of individuals with a record of a mental disorder in the later part of the study period (Table 5). In contrast, the actual number of individuals among the cases of non-ID with a record of drug abuse remained relatively stable throughout the study period (Table 6).

The proportion of individuals 65 years of age or older was significantly higher (chi-square = 241.09, $p < 0.0001$) in the ID group (54.6%) than in the non-ID group (33.8%). This difference was observed throughout the entire period (Mantel-Haenszel statistics controlling for year = 241.92, $p < 0.0001$).

Natural causes of death dominated among the cases of ID, with the exception of females less than 65 years old who exhibited a strikingly high proportion of suicide (30.5%) (Table 7.)

In the case of males, all types of unnatural death (with the exception of homicide) were significantly more common in the younger age group than in the older age group (Table 7). Acute cardiac death was significantly more common in the older age group for both females (chi-square = 57.18, $p < 0.0001$) and males (chi-square = 126.45, $p < 0.0001$); whereas natural alcohol-related death was significantly more common in the younger group of males (chi-square = 64.97, $p < 0.0001$). Statistically, alcohol-related natural death also was overrepresented among the younger women (chi-square = 28.82, $p < 0.0001$); but because there only were three women 65 years of age or older with this diagnosis, no reliable conclusion can be drawn regarding the relationship of this mode of death in females to age (Table 7). The manner/causes of death among all cases of non-ID are documented in Table 8.

Discussion

The present investigation reveals a significant increase of cases of ID with a record of mental disorder, but not of alcohol and/or drug abuse, in Stockholm County during the period of 1992–2000.

TABLE 3—The number of isolated deaths in Stockholm County from 1992–2000 subjected to medicolegal examination involving a record of institutionalized care for mental disorder.

Year of death	Males		Females		All	
	Cases with a record of mental disorder (including psychosis)	Total number of isolated deaths	Cases with a record of mental disorder (including psychosis)	Total number of isolated deaths	Cases with a record of mental disorder (including psychosis)	Total number of isolated deaths
1992	9	104	7	46	16	151
1993	16	124	8	50	24	174
1994	16	113	6	37	22	150
1995	12	122	6	32	18	154
1996	13	98	5	43	18	143
1997	13	104	5	48	18	152
1998	13	106	8	45	21	152
1999	21	124	10	56	31	180
2000	25	128	14	58	39	186
<i>P</i> -value for change during this period*	0.04		0.10		0.05	

* As analyzed by linear regression.

TABLE 4—The number of isolated deaths in Stockholm County from 1992–2000 subjected to medicolegal examination involving a record of institutionalized care for drug abuse.

Year of death	Males		Females		Total	
	Cases with a record of drug abuse (excluding psychosis)	Total number of isolated deaths	Cases with a record of drug abuse (excluding psychosis)	Total number of isolated deaths	Cases with a record of drug abuse (excluding psychosis)	Total number of isolated deaths
1992	29	104	7	46	36	151
1993	34	124	7	50	41	174
1994	42	113	2	37	44	150
1995	44	122	5	32	49	154
1996	34	98	1	43	35	143
1997	23	104	5	48	28	152
1998	33	106	4	45	37	152
1999	45	124	10	56	55	180
2000	39	128	12	58	51	186
<i>P</i> -value for change during this period*	0.58		0.26		0.36	

* As analyzed by linear regression.

TABLE 5—The number of non-IDs in Stockholm County from 1992–2000 subjected to medicolegal examination involving a record of institutionalized care for mental disorder.

Year of death	Males		Females		All	
	Cases with a record of mental disorder (including psychosis)	Total number of non-isolated death	Cases with a record of mental disorder (including psychosis)	Total number of non-isolated death	Cases with a record of mental disorder (including psychosis)	Total number of non-isolated death
1992	107	943	61	395	168	1365
1993	106	936	62	417	168	1372
1994	105	866	62	402	167	1292
1995	101	907	60	358	161	1283
1996	109	867	52	381	161	1269
1997	127	812	72	363	199	1189
1998	131	907	75	348	206	1278
1999	147	843	82	378	229	1240
2000	145	779	74	308	219	1103
<i>P</i> -value for change during this period*	0.0011		0.03		0.0033	

* As analyzed by linear regression.

TABLE 6—The number of non-IDs in Stockholm County from 1992–2000 subjected to medicolegal examination involving a record of institutionalized care drug abuse.

Year of death	Males		Females		All	
	Cases with a record of drug abuse (excluding psychosis)	Total number of non-isolated deaths	Cases with a record of drug abuse (excluding psychosis)	Total number of non-isolated deaths	Cases with a record of drug abuse (excluding psychosis)	Total number of non-isolated deaths
1992	254	943	52	395	306	1365
1993	241	936	75	417	316	1372
1994	239	866	67	402	306	1292
1995	245	907	72	358	317	1283
1996	270	867	64	381	334	1269
1997	253	812	86	363	339	1189
1998	253	907	77	348	330	1278
1999	249	843	80	378	329	1240
2000	244	779	72	308	316	1103
<i>P</i> -value for change during this period*		0.03		0.0005		0.002

* As analyzed by linear regression.

TABLE 7—The cause/manner of death among IDs subjected to medicolegal examination in Stockholm County from 1992–2000 in relationship to age.

Age (in years)	Males		Females		All	
	<65 (<i>n</i> = a total of 524 cases) N (% of <i>n</i>)	≥65 (<i>n</i> = a total of 499 cases) N (% of <i>n</i>)	<65 (<i>n</i> = a total of 128 cases) N (% of <i>n</i>)	≥65 (<i>n</i> = a total of 287 cases) N (% of <i>n</i>)	<65 (<i>n</i> = a total of 654 cases) N (% of <i>n</i>)	≥65 (<i>n</i> = a total of 788 cases) N (% of <i>n</i>)
Cause/manner of death						
Unnatural death						
Homicide	1 (0.2%)	0	2 (1.6%)	0	3 (0.5%)	0
Suicide	80 (15.3%)	15 (3.0%)	39 (30.5%)	11 (3.8%)	120 (18.3%)	27 (3.4%)
Accidental death	50 (9.5%)	18 (3.6%)	7 (5.5%)	6 (2.1%)	58 (8.9%)	25 (3.2%)
Unclear cause	43 (8.2%)	8 (1.6%)	9 (7.0%)	3 (1.0%)	52 (7.9%)	11 (1.4%)
Natural death*						
Cardiac death	111 (21.2%)	276 (55.3%)	24 (18.7%)	169 (58.9%)	135 (20.6%)	445 (56.5%)
Stroke	18 (3.4%)	18 (3.6%)	6 (4.7%)	16 (5.6%)	24 (3.7%)	34 (4.3%)
Ruptured or dissecting aortic aneurysm	6 (1.1%)	12 (2.4%)	1 (0.8%)	3 (1%)	7 (1.1%)	15 (1.9%)
Pulmonary embolism	2 (0.4%)	8 (1.6%)	0	4 (1.4%)	2 (0.3%)	12 (1.5%)
Other acute death	7 (1.3%)	5 (1.0%)	2 (1.6%)	3 (1.0%)	9 (1.4%)	8 (1.0%)
Alcohol-related (excluding intoxication)	101 (19.3%)	27 (5.4%)	17 (13.3%)	3 (1.0%)	118 (18.0%)	30 (3.8%)
Long-term disorder	25 (4.8%)	43 (8.6%)	9 (7.0%)	18 (6.3%)	34 (5.2%)	61 (7.7%)
Unclear cause	80 (15.3%)	69 (13.8%)	12 (9.4%)	51 (17.8%)	92 (14.1%)	120 (15.2%)

* For the detailed classification, see the Methods section.

However, this increase was rather limited and there was a much more pronounced increase in the number of individuals with a record of mental disorder among the total population (ID and non-ID). In contrast, the proportion of non-ID cases with a record of drug abuse also was stable over time.

Although the formal criteria for subjecting a dead person to medicolegal examination remained unchanged during the period studied here, practical application of these criteria may have changed during this time. However, the strikingly uniform distribution of the manner of death during this period (Table 8) indicates that there was no pronounced change. The decrease in the proportion of natural deaths toward the end of the study period was the result of a deliberate strategy to reduce medicolegal examination of such cases. Thus, a new routine, designed to eliminate obvious natural deaths was implemented in 2000. Furthermore, a record of mental disorder or drug abuse, as well as a lack of relevant information, was routinely considered to be criteria for medicolegal examination during this period. Thus, selection bias should not have contributed

significantly to the increase in cases subjected to medicolegal examination involving a record of mental disorder.

There is no generally accepted definition of ID. Our choice to use a postmortem delay between death and discovery of at least 1 week as our present definition was based on the observation that many police records indicate that deceased persons who had regular contact with relatives or friends usually are recognized as missing within a few days, and only exceptionally after longer than a week. According to this definition, our findings indicate that the decreased capacity for institutionalized care of psychiatrically ill patients has not resulted in any major increase in the proportion of such patients who live in severe social isolation.

Nonetheless, the overrepresentation of individuals with a record of institutionalized psychiatric care among both the cases of ID and non-ID suggests that a mental disorder is associated with an increased risk for unnatural death and, probably, also for dying under unclear circumstances. Indeed, similar correlations have been described in earlier (7). Not surprisingly, this correlation is most

TABLE 8—Manner of death for non-IDs 1994–2000.

Year	Manner of death	Number of cases
1994	Homicide	49
	Suicide	285
	Accident	227
	Unclear unnatural death	126
	Natural death	790
	Total	1477 (46.5%)*
1995	Homicide	33
	Suicide	291
	Accident	267
	Unclear unnatural death	99
	Natural death	789
	Total	1479 (46.6%)*
1996	Homicide	31
	Suicide	248
	Accident	270
	Unclear unnatural death	135
	Natural death	772
	Total	1456 (47.0%)*
1997	Homicide	29
	Suicide	266
	Accident	252
	Unclear unnatural death	104
	Natural death	721
	Total	1372 (47.4%)*
1998	Homicide	37
	Suicide	297
	Accident	259
	Unclear unnatural death	114
	Natural death	780
	Total	1487 (46.0%)*
1999	Homicide	27
	Suicide	269
	Accident	286
	Unclear unnatural death	89
	Natural death	786
	Total	1457 (46.0%)*
2000	Homicide	29
	Suicide	253
	Accident	287
	Unclear unnatural death	76
	Natural death	641
	Total	1286 (50.1%)*

pronounced among individuals younger than 65 years of age. The significant and rather dramatic increase in the number of such cases during the present study period may reflect either an increase in the incidence of unnatural death and/or of unwitnessed natural death among psychiatrically ill persons. In either case it is possible that increased social isolation and changes in the medical care of psychiatric patients may be underlying factors. The high and increased proportion of female suicides among the younger cases of ID suggests that women with a diagnosis of mental disorder particularly are vulnerable in a care-system characterized by poor control.

As in the case of mental disorder, drug abuse clearly is overrepresented among the total number of deaths subjected to medicolegal examination, without any major difference between the cases of ID and non-ID. This pattern is much more pronounced among the deaths in people younger than 65 years of age. However, in contrast to mental disorder, this pattern remained constant throughout the study period and thus cannot be regarded as a causative factor in connection with the increased number of IDs. One possible explanation for this might be that institutional care for drug abuse usually involves detoxication for a limited period and that in Stockholm such care has been transferred from specialized drug care units to other units. Furthermore, when drug addicts have been detoxified

they usually are discharged from institutionalized care, and there is no reason to believe that this routine was changed during our study period.

The substantial proportion of IDs over 65 years of age, the nearly unchanged mean age of IDs (i.e., approximately 61 years for males and 68 years for women), together with the high incidence of cardiac death among the cases of ID, in particular among those 65 years of age or older, strongly suggest that sudden unexpected death from medical illness exerts a considerable impact on the incidence of ID. This finding is consistent with the finding by Gurley et al. (3) that rapid onset of disabling disease among people who live alone is the major risk factor for being found helpless in the home.

Conclusion

In Stockholm County, a record of mental disorder or drug abuse is associated with an increased risk for ID (defined as cases where there is a postmortem delay between death and discovery of at least 1 week). However, compared with the rather drastic increase in the number of psychiatric patients whose death has been subjected to medicolegal examination that has taken place during the past decade, the increase in the proportion of IDs accounted for by this group of individuals is relatively small. This finding, together with a stable incidence of isolated deaths among patients with a record of drug abuse subjected to medicolegal examination, suggests that ID (at least as we have defined it) is correlated poorly to the change in healthcare services, with a pronounced decrease in inpatient care, which has been enacted in Sweden during the past decade.

However, the above mentioned finding of an increase in the number of psychiatric patients whose deaths have been subjected to medicolegal examination indicates that deinstitutionalization of the care of psychiatric patients increases their risk of dying under circumstances that motivate a medicolegal investigation, which in turn indicates that the incidence of death attributable to unnatural causes and/or dying alone from natural causes has increased in this group. This conclusion emphasizes the need for further research regarding healthcare strategies and their connection to morbidity and mortality among mentally ill patients.

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