

# Psychotic Symptoms and Paranoid Ideation in a Nondemented Population-Based Sample of the Very Old

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**Background:** Psychotic symptoms are reported to be uncommon in the elderly, and may be underrated in traditional epidemiological studies.

**Methods:** Psychotic symptoms, physical disorders, disability in daily life, and sensory impairments were assessed using results of psychiatric and physical examinations, key-informant interviews, and medical record reviews in a representative sample of nondemented individuals aged 85 years living in the community or in institutions in Göteborg, Sweden (n=347). The sample was observed for 3 years regarding psychotic symptoms, mortality, and incident dementia.

**Results:** The prevalence of any psychotic symptom was 10.1% (95% confidence interval [CI], 7.1%-13.7%); hallucinations, 6.9% (95% CI, 4.5%-10.1%); and delusions, 5.5% (95% CI, 3.3%-8.4%). The prevalence of paranoid ideation was 6.9% (95% CI, 4.5%-10.1%). Stepwise logistic regression analyses showed that hallucinations were

associated with major depressive syndrome (odds ratio [OR], 3.9; 95% CI, 1.3-11.9), disability in daily life (OR, 5.2; 95% CI, 1.8-14.9), and visual deficits (OR, 3.4; 95% CI, 1.0-11.1). Delusions were associated with disability in daily life (OR, 4.9; 95% CI, 1.8-13.3). Paranoid ideation was associated with visual deficits (OR, 3.6; 95% CI, 1.2-10.5) and myocardial infarction (OR, 4.6; 95% CI, 1.7-12.6). Hallucinations (OR, 3.1; 95% CI, 1.4-6.8), delusions (OR, 2.9; 95% CI, 1.2-6.9), and paranoid ideation (OR, 2.7; 95% CI, 1.2-6.2) were each related to increased incidence of dementia from 85 to 88 years of age. Hallucinations and paranoid ideation were associated with increased 3-year mortality in women but not in men.

**Conclusions:** We found a higher prevalence of psychotic symptoms and paranoid ideation in the elderly than previously reported, and these symptoms were associated with a poor prognosis.

*Arch Gen Psychiatry.* 2002;59:53-59

**P**OPULATION studies reporting psychotic symptoms and paranoid ideation in elderly persons indicate a low prevalence of these symptoms,<sup>1-11</sup> although frequencies may be higher in the very old.<sup>12,13</sup> It has been suggested that this prevalence is underrated because the elderly persons may be reluctant to report psychotic symptoms.<sup>14</sup> Thus, it is necessary to collect information from collateral sources, eg, key informants and medical records, to obtain more accurate estimates. Studies of demented individuals report that information from caregivers yields higher rates of psychopathology than do the results of clinical examinations alone.<sup>15,16</sup> We examined the prevalence of psychotic symptoms and paranoid ideation in relation to psychosocial risk factors, psychiatric and somatic disorders, sensory impairments, cognitive and daily living functioning, mortality rate, development of dementia, and symptom stability over time in a representative sample

of nondemented subjects aged 85 years using information from psychiatric examinations, key-informant interviews, and medical records.

## RESULTS

### PSYCHIATRIC SYMPTOMS AT 85 YEARS OF AGE

Key informants reported the highest frequencies of psychotic symptoms and paranoid ideation, whereas medical records revealed the lowest (**Table 1**). Among those 18 individuals with psychotic symptoms

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or paranoid ideation in the psychiatric examination who had a key-informant interview, 13 (72.2%) had symptoms in the key-informant interview also (**Table 2**). It was the same symptom in only about half of the cases. Most symptoms identified in

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## SUBJECTS AND METHODS

### SAMPLE

From January 1, 1986, through December 31, 1987, all individuals born July 1, 1901, to June 30, 1902, and registered for census purposes in Göteborg, Sweden (N=1502, living in the community or in institutions), were invited to participate in a health survey, the Longitudinal Gerontological and Geriatric Population Study (project leader for 1971-1987, Alvar Svanborg, MD, PhD; for 1988, Bertil Steen, MD, PhD).<sup>17-19</sup> All individuals in the census register were consecutively (after date of birth) given a number from 1 to 5 or 11 to 15. Those with numbers 1, 2, 11, 12, or 14 (n=826) were selected for a psychiatric examination. Forty-three individuals died before the psychiatric examination, leaving an effective sample of 783 individuals, of whom 494 (63.1%) were examined by a psychiatrist. This sample was representative of its population base with regard to sex, marital status, status as psychiatric outpatients or inpatients, institutionalization rate, and 3-year mortality.<sup>17</sup> Demented subjects (n=147) were excluded in this study, leaving 347 individuals. Forty of the participants and key informants for 2 participants refused the key-informant interview, leaving 305 individuals for this examination. Participants (n=305) and nonparticipants (n=42) in the key-informant interview did not differ regarding the prevalence of psychotic symptoms in the psychiatric examination (data not shown). Medical records from all major hospitals, geriatric and psychiatric institutions, and outpatient services in Göteborg were found for 283 individuals and reviewed by trained psychiatrists. Two hundred fifty-five individuals had information from all 3 sources; 55, from the psychiatric examination and the key-informant interview; 30, from the psychiatric examination and medical records; and 7, from the psychiatric examination only.

Six individuals were living in an institution. The level of education was elucidated by self-report and classified as low ( $\leq 6$  years; n=245) or high ( $> 6$  years; n=92), with the information missing for 10 individuals.

At 88 years of age, 73 (21.0%) of the nondemented sample had died, 86 (24.8%) refused further examina-

tions, and dementia had developed in 63 (18.2%), leaving 125 nondemented individuals for the follow-up on psychotic symptoms and paranoid ideation.

All participants (or their nearest relatives) gave their informed consent for inclusion in the study. The study was approved by the Ethics Committee for Medical Research at Göteborg University, Göteborg.

### PROCEDURE AND ASSESSMENTS OF PSYCHIATRIC SYMPTOMS

The psychiatric examination was performed according to the semi-structured Comprehensive Psychopathological Rating Scale,<sup>20</sup> including ratings of delusions and hallucinations, paranoid ideation, depressed mood, blunted or flat affect, anxiety, and irritability. Suicidal ideation during the last month was rated according to the methods of Paykel et al.<sup>21</sup> The examination also included the Mini-Mental State Examination (MMSE), a global test of cognitive function.<sup>22</sup>

The interobserver reliability of assessing psychotic symptoms and signs was calculated by means of dual ratings of 49 single interviews by 2 psychiatrists (including I.S.). The Spearman rank correlation coefficient was 1.00 for delusions, auditory hallucinations, and other hallucinations; 0.71 for visual hallucinations; and 0.72 for paranoid ideation.

A close informant (eg, spouse, sibling, child, close friend, or nurse) was interviewed by a psychiatrist. The interview included questions about delusions, hallucinations, and paranoid personality traits.

The psychiatric examination recorded symptoms during the preceding month, whereas information from the key-informant interview and medical records was based on symptoms present any time during an individual's 85th year.

Complete information from all 3 sources was reviewed by an experienced psychiatrist (S.Ö.). Hallucinations, delusions, and paranoid ideation were classified according to the Glossary of Technical Terms in *DSM-IV*.<sup>23</sup> Hallucinations were classified as visual, auditory, and other. Systematic information on transient hallucinatory experiences, hypnagogic perceptions, and illusions was available only in the psychiatric interview and rated as illusions. Delusions were classified as persecutory or

the key-informant interview were not elucidated by other sources of information. One individual had symptoms recorded only in the medical records.

Overall, psychotic symptoms were identified in 10.1% (hallucinations in 6.9%, delusions in 5.5%, and both in 2.3%), paranoid ideation in 6.9%, and illusions in 8.1% (**Table 3**). There were no significant differences between sexes. Among those with paranoid ideation, 8 (33.3%) also had hallucinations or nonpersecutory delusions (5 individuals had hallucinations, 2 had nonpersecutory delusions, and 1 had both). Suspiciousness was found in 49 individuals (14.1%), but only 24 of those fulfilled criteria for paranoid ideation.

Individuals with hallucinations had an increased frequency of depressed mood, anxiety, irritability, suicidal ideation, and paranoid personality traits (**Table 4**). Individuals with delusions had an increased frequency of depressed mood, blunted affect, and paranoid personal-

ity traits. Individuals with paranoid ideation had an increased frequency of depressed mood, irritability, and paranoid personality traits. No individuals had a formal thought disorder or incoherence of speech.

### HEALTH STATUS AND DISABILITY AT 85 YEARS OF AGE

**Table 5** shows univariate analyses of hallucinations, delusions, and paranoid ideation in relation to sociodemographic factors, health status, and disability. Stepwise logistic regression analyses were performed and showed that hallucinations were associated with major depressive syndrome (odds ratio [OR], 3.9; 95% confidence interval [CI], 1.3-11.9), disability in daily life (OR, 5.2; 95% CI, 1.8-14.9), and visual deficits (OR, 3.4; 95% CI, 1.0-11.1). Delusions were associated with disability in daily life (OR, 4.9; 95% CI, 1.8-13.3). Paranoid ideation was associated with

nonpersecutory. Belief of being persecuted, harassed, or unfairly treated that did not reach delusional proportions was classified as paranoid ideation. In the classification based on all sources of information, the subject was classified as having persecutory delusions if one source reported paranoid ideation and another reported persecutory delusions.

Psychotic symptoms were not diagnosed if they occurred during an acute medical condition, during a suspected delirium, or in the terminal stage of life.

All individuals underwent systematic assessment during the psychiatric examination at 85 years of age for major depressive disorder (52 individuals with this diagnosis were found) and dysthymia (35 individuals with this diagnosis were found) according to the *DSM-III-R*.<sup>24</sup> Paranoid personality traits were diagnosed if the individual had a lifetime history of suspiciousness or paranoid ideation according to the key-informant interview.

#### ASSESSMENT OF MEDICAL CONDITIONS, FUNCTIONING, AND MORTALITY

A registered nurse recorded the participants' drug use according to the Anatomical Therapeutic Chemical classification system.<sup>25,26</sup>

The examinations also included a physical examination (which included history of previous and current diseases) by a geriatrician, an electrocardiogram, a chest x-ray film, a battery of blood tests, and computed tomography of the brain.

The diagnosis of myocardial infarction was based on medical history and electrocardiographic findings. Cerebrovascular disorders (stroke, transient ischemic attacks, and brain infarcts) were diagnosed using information from the results of the physical examination, computed tomographic scans, the psychiatric examination, and the key-informant interview. Information on cancer was obtained from the Swedish Cancer Registry. Hearing impairment and visual deficits were rated if the symptoms interfered with conversation and execution of tasks at the psychiatric examination.

Activities of daily living (ADL) were assessed during the key-informant interview. These included the ability to

use a telephone and public transportation, to manage in unfamiliar environments, to manage finances, and to dress, eat, prepare meals, and manage personal hygiene and other domestic duties, and the status of fecal and urinary continence. Disability was defined as needing assistance in 2 or more of these areas.

A diagnosis of dementia was first made from the results of the psychiatric examination and the key-informant interview, with each considered separately by using a symptom algorithm based on the *DSM-III-R* criteria.<sup>24</sup> Each symptom had to attain a level causing significant difficulties in social life. The final diagnosis of dementia was made if the subject had dementia according to both sources of information, or if the subject had dementia according to results of one examination and if the results of the other showed subthreshold symptoms of dementia.<sup>17</sup> Thus, subjects with subthreshold dementia based on results of the psychiatric examination and a history of decline in cognitive function compatible with dementia according to key informants were classified as demented. This approach increased the likelihood of excluding individuals with very mild dementia in this study.

Information on the date of death was available from the census register in Göteborg, which records all deaths in the region.<sup>27</sup>

#### STATISTICAL METHODS

Individuals with hallucinations, delusions, or paranoid ideation were compared with those without these symptoms. The association between psychotic symptoms and different background factors was first studied using univariate analyses, followed by a stepwise logistic regression. Differences in proportions were tested for significance using the Fisher exact test.<sup>28</sup> We chose not to correct for multiple comparisons in the analyses, as this may give rise to false-negative results.<sup>29</sup>

Survival was analyzed with the use of a nonparametric log-rank test. The incidence of dementia was based on person-years at risk and computed using the following equation<sup>27</sup>:  $I = (\text{Subjects Affected in the Interval}) / (\text{Person-years at Risk})$ , where I indicates incidence of dementia.

visual deficits (OR, 3.6; 95% CI, 1.2-10.5) and myocardial infarction (OR, 4.6; 95% CI, 1.7-12.6).

#### USE OF PSYCHOTROPIC DRUGS AT 85 YEARS OF AGE

Among individuals without hallucinations, delusions, or paranoid ideation (n=297), 15 (5.1%) were prescribed neuroleptics; 13 (4.4%), antidepressants; 99 (33.3%), anxiolytics or sedatives; and 108 (36.4%), any psychotropic drug. Among individuals with hallucinations or delusions (n=35), 7 (20.0%;  $P=.004$ ) were prescribed neuroleptics; 6 (17.1%;  $P=.009$ ), antidepressants; 8 (22.9%;  $P=.25$ ), anxiolytics or sedatives; and 13 (37.1%;  $P>.99$ ) any psychotropic drug. No individuals with paranoid ideation without concomitant hallucinations or delusions were prescribed neuroleptics. No individuals with hallucinations or delusions had received dopamine agonist drugs (data not shown).

#### COGNITIVE PERFORMANCE AT 85 YEARS OF AGE

Compared with individuals without psychotic symptoms or paranoid ideation (270 individuals [90.9%] completed the MMSE, with a mean score of 27.8 [SD, 2.0]), MMSE score was lower among individuals with hallucinations (17 [70.8%] completed; mean [SD] score, 25.6 [3.7];  $P=.001$ ), but did not differ from those with delusions (17 [89.5%] completed; mean [SD] score, 27.1 [1.9];  $P=.18$ ) or those with paranoid ideation (19 [79.1%] completed; mean [SD] score, 27.2 [1.8];  $P=.19$ ).

#### OUTCOME AT 88 YEARS OF AGE

Thirty-four men (32.7%) and 46 women (18.8%) died during the 3-year follow-up. The 3-year mortality rate was increased in women with hallucinations (40.0%

**Table 1. Prevalence of Psychotic Symptoms in Relation to Source of Information\***

Symptoms	Psychiatric Examination (n = 347)		Key-Informant Interview (n = 305)		Medical Records (n = 347)†	
	No. (%)	95% CI, %	No. (%)	95% CI, %	No. (%)	95% CI, %
Psychotic						
Any	17 (4.9)	2.9-7.7	24 (7.9)	5.1-11.5	4 (1.2)	0.3-2.9
Any hallucination	12 (3.5)	1.8-6.0	15 (4.9)	2.9-8.0	4 (1.2)	0.3-2.9
Visual	7 (2.0)	0.8-4.2	7 (2.3)	0.1-4.6	4 (1.2)	0.3-2.10
Auditory	6 (1.7)	0.1-3.7	8 (2.6)	1.1-5.1	0	NA
Other	1 (0.3)	0.0-1.6	3 (1.0)	0.2-2.8	0	NA
Any delusion	7 (2.0)	0.8-4.1	14 (4.6)	2.5-7.6	2 (0.6)	0.1-2.1
Persecutory	6 (1.7)	0.6-3.7	7 (2.3)	0.9-4.7	1 (0.3)	0.0-1.6
Nonpersecutory	1 (0.3)	0.0-1.6	7 (2.3)	0.9-4.7	1 (0.3)	0.0-1.6
Other						
Paranoid ideation	8 (2.3)	1.0-4.5	21 (6.9)	4.3-10.3	1 (0.3)	0.0-1.5
Illusions‡	28 (8.1)	0.2-1.4	...	...	...	...

\*Participants were nondemented individuals aged 85 years. CI indicates confidence intervals; NA, not applicable; and ellipses, not available. There were no significant differences between the sexes.

†Individuals with no medical record were rated as having no symptoms.

‡Information on illusions was available only from results of the psychiatric examination.

**Table 2. Overlap of Hallucinations, Delusions, and Paranoid Ideation Between Different Sources of Information\***

	No Key-Informant Interview (n = 42)	Key-Informant Interview				Paranoid Ideation (n = 21)
		No Symptoms (n = 264)	Any Symptoms (n = 41)	Hallucinations (n = 15)	Delusions (n = 14)	
Psychiatric examination						
No symptoms (n = 325)	38	259†	28‡	9	8	17
Any symptoms (n = 22)	4	5	13†	6	6	4
Hallucinations (n = 12)	1	4	7	5	4	1
Delusions (n = 7)	2	1	4	2	3	1
Paranoid ideation (n = 8)	2	1	5	1	2	2

\*Data are given as number of subjects.

†One individual had any symptom present in medical records.

‡Two individuals had any symptom present in medical records.

**Table 3. Prevalence of Psychotic Symptoms, Paranoid Ideation, and Illusions\***

Symptoms	Women (n = 243)		Men (n = 104)		Total (N = 347)	
	No. (%)	95% CI, %	No. (%)	95% CI, %	No. (%)	95% CI, %
Psychotic						
Any	27 (11.1)	7.4-15.8	8 (7.7)	3.4-14.6	35 (10.1)	7.1-13.7
Any hallucination	20 (8.2)	5.4-12.9	4 (3.8)	1.1-9.6	24 (6.9)	4.5-10.1
Visual	11 (4.5)	2.3-8.0	2 (1.9)	2.6-8.5	13 (3.7)	2.0-6.3
Auditory	11 (4.5)	2.3-8.0	2 (1.9)	0.2-6.8	13 (3.7)	2.0-6.3
Other	2 (0.8)	0.1-2.9	2 (1.9)	0.2-6.8	4 (1.2)	0.3-2.9
Any delusion	13 (5.3)	2.9-9.0	6 (5.8)	2.1-12.1	19 (5.5)	3.3-8.4
Persecutory	8 (3.3)	1.4-6.4	4 (3.8)	1.1-9.6	12 (3.5)	1.9-6.0
Nonpersecutory	5 (2.1)	0.7-4.7	3 (2.9)	0.6-8.2	8 (2.3)	1.0-4.5
Other						
Paranoid ideation	19 (7.8)	4.8-11.9	5 (4.8)	1.6-10.9	24 (6.9)	4.5-10.1
Illusions	23 (9.5)	6.1-13.9	5 (4.8)	1.6-10.9	28 (8.1)	0.2-1.4

\*The prevalence rate is based on results of the psychiatric examination, the key-informant interview, and medical records, except for illusions, which is based only on results of the psychiatric examination. There were no significant differences between the sexes. CI indicates confidence interval.

[n=8];  $P=.02$ ) and paranoid ideation (36.8% [n=7];  $P=.04$ ) compared with women without these symptoms (15.8% [n=32]). A stepwise logistic regression analysis controlling for the presence of previous myocardial

infarction, hypertension, congestive heart failure, cerebrovascular disorder, diabetes mellitus, and cancer showed that hallucinations were associated with the 3-year mortality (OR, 3.1; 95% CI, 1.3-7.8), but paranoid ideation

**Table 4. Associated Psychiatric Symptoms**

Symptoms	No. (%) of Individuals			
	No Psychotic Symptoms or Paranoid Ideation (n = 297)	Hallucinations (n = 24)	Delusions (n = 19)	Paranoid Ideation (n = 24)
Depressed mood (n = 79)	58 (19.5)	13 (54.2)*	8 (42.1)†	11 (45.8)‡
Anxiety (n = 60)	48 (16.2)	10 (41.0)‡	6 (31.6)	5 (20.8)
Irritability (n = 18)	13 (4.4)	4 (16.7)†	1 (5.3)	4 (16.7)†
Blunted or flat affect (n = 23)	14 (4.7)	3 (12.5)	6 (31.6)*	3 (12.5)
Suicidal ideation (n = 55)	41 (13.8)	9 (37.5)‡	3 (15.8)	6 (25.0)
Paranoid personality traits (n = 18)§	6 (2.4)	4 (19.0)‡	6 (40.0)*	4 (25.0)‡

\* $P < .001$  (Fisher exact test), compared with no psychotic symptoms or paranoid ideation.

† $P < .05$  (Fisher exact test), compared with no psychotic symptoms or paranoid ideation.

‡ $P < .01$  (Fisher exact test), compared with no psychotic symptoms or paranoid ideation.

§Information is only from participants in the key-informant interview (n = 305); information on having no psychotic symptoms or paranoid ideation (n = 247), hallucinations (n = 20), delusions (n = 15), and paranoid ideation (n = 16) is from all 3 results of the psychiatric examination, key-informant interview, and medical records.

**Table 5. Factors Associated With Psychotic Symptoms and Paranoid Ideation\***

	Hallucinations (n = 24)		Delusions (n = 19)		Paranoid Ideation (n = 24)	
	No.	OR (95% CI)	No.	OR (95% CI)	No.	OR (95% CI)
Sociodemographic variables						
Female sex (n = 243)	20	2.3 (0.8-6.9)	13	1.0 (0.3-3.0)	19	1.7 (0.6-5.5)
Being divorced (n = 30)	3	1.7 (0.5-6.1)	2	1.5 (0.2-7.3)	4	2.5 (0.7-8.7)
Being childless (n = 78)	4	0.6 (0.2-1.9)	5	1.1 (0.3-3.5)	1	0.1 (0.0-1.0)
Low education (n = 245)	19	3.7 (0.9-16.4)	14	1.4 (0.4-5.2)	16	0.9 (0.2-2.5)
Psychiatric disorders						
Major depressive disorder (n = 52)	8	3.3 (1.3-8.2)	6	3.0 (1.0-9.3)	7	2.7 (0.9-7.5)
Dysthymia (n = 35)	5	2.8 (1.0-8.3)	3	2.0 (0.4-8.2)	4	2.3 (0.6-7.9)
Deficits						
Disability in daily life (n = 85)	17	9.4 (3.6-25.1)	10	4.9 (1.6-14.9)	10	3.1 (1.1-8.3)
Hearing impairment (n = 91)	10	2.2 (0.9-5.1)	4	0.8 (0.2-2.7)	11	2.5 (1.0-6.4)
Visual deficits (n = 34)	7	4.6 (1.8-13.0)	2	1.4 (0.2-6.9)	6	3.9 (1.3-11.9)
Somatic disorders						
Cancer (n = 64)	8	2.5 (1.0-6.1)	4	1.3 (0.4-4.5)	7	2.0 (0.7-5.5)
Cerebrovascular disorder (n = 39)	4	1.2 (0.3-4.2)	3	1.6 (0.3-6.3)	5	2.2 (0.7-7.0)
Myocardial infarction (n = 43)	4	1.7 (0.5-5.3)	2	1.0 (0.2-4.8)	8	4.2 (1.5-11.6)
Hypertension (n = 75)	9	2.1 (0.9-5.1)	4	0.9 (0.3-3.2)	2	0.3 (0.1-1.5)
Congestive heart failure (n = 72)	7	1.7 (0.7-4.4)	4	1.1 (0.3-3.9)	10	3.0 (1.2-7.8)
Any (n = 225)	19	2.3 (0.8-6.3)	12	1.0 (0.4-3.0)	20	3.0 (0.9-10.8)

\*OR indicates odds ratio; CI, confidence interval. ORs are compared with individuals with no psychotic symptoms or paranoid ideation.

was not. Hallucinations, delusions, and paranoid ideation were not associated with mortality in men.

During the 3-year follow-up, dementia developed in 63 (13 men and 50 women) of the 347 nondemented individuals aged 85 years. Hallucinations, delusions, and paranoid ideation were each related to an increased 3-year incidence of dementia (**Figure**).

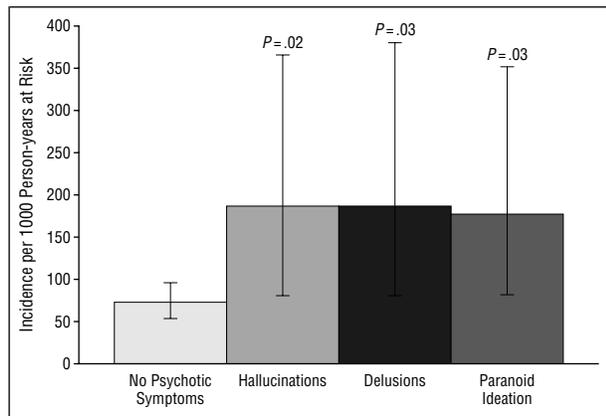
Seven nondemented individuals with psychotic symptoms at 85 years of age in whom dementia did not develop during follow-up were re-examined at 88 years of age. Of these, 3 individuals had psychotic symptoms and 1 had paranoid ideation. Another individual had suspiciousness that did not reach the threshold for paranoid ideation.

Of 8 individuals with paranoid ideation at 85 years of age in whom dementia did not develop, 4 had paranoid ideation. Another had suspiciousness that did not reach the threshold for paranoid ideation at follow-up.

## COMMENT

Our figures for psychotic symptoms are difficult to compare with those of other studies because of the older age of our sample and the multiple sources of information. Population studies based only on interview data suggest that psychosis is rare in the nondemented elderly, with frequencies of less than 3%.<sup>1,2,5-7</sup> There are a number of possible reasons for our higher prevalence estimates. First, trained psychiatrists performed all examinations and evaluations. Second, our sample was older than most other populations, and there may be a higher frequency of psychotic disorders in old age.<sup>12,13</sup>

Third, to our knowledge, the use of complementary information from key informants and medical records to elucidate psychotic symptoms in a nondemented population sample is unique. One study on psychosis not otherwise specified used informant inter-



Incidence of dementia from 85 to 88 years of age in relation to psychotic symptoms at 85 years of age. For individuals in whom dementia developed with no psychotic symptoms or paranoid ideation,  $n=46$ ; hallucinations,  $n=8$  (hazard ratio [HR], 2.5; 95% confidence interval [CI], 1.0-5.3); delusions,  $n=7$  (HR, 2.5; 95% CI, 1.0-5.7); and paranoid ideation,  $n=8$  (HR, 2.4; 95% CI, 1.0-5.2).

views, but it is not clear how often they were used or if they were used only in the cognitively impaired.<sup>3</sup> Another study used informant interviews for hallucinosis, but it is not clear in how many cases it was performed.<sup>11</sup> Most cases of psychotic symptoms and paranoid ideation in our study were reported by key informants, and most of those were not elucidated by any other source of information. It may be that many individuals denied having hallucinations or delusions and that the examining psychiatrist did not elicit them. We do not know the validity of the key informant interviews, but all were conducted and evaluated by psychiatrists, and the information had to be detailed enough to make a classification. Support for the validity of this strategy is that 75.0% ( $n=3$ ) of cases identified from medical records and 72.2% of those identified from results of the psychiatric examination had symptoms also in the key-informant interview. Finally, the psychiatric examination assessed symptoms during the previous month, whereas the key-informant and medical record information covered 1-year prevalence. This may partly, but not entirely, explain differences between the results of our study and others and between different sources of information.

The symptoms of an individual often differed according to the source of information and often changed during follow-up, indicating that psychotic symptoms and paranoid ideation may be part of a spectrum. Symptoms also appeared within the context of broad psychopathology. Emotional bluntness was common among those with delusions (36.6% [ $n=6$ ]), in contrast to previous reports that emotional bluntness is rare in late-life psychosis (3.7%-8.5%).<sup>30-32</sup> We confirmed previous findings that late-life psychotic symptoms are associated with depression<sup>10,11,33</sup> and with previous paranoid personality traits,<sup>12,34</sup> but that formal thought disorder or incoherence of speech is rare.<sup>12</sup>

Sensory impairments have been associated with late-life psychosis<sup>12</sup> and paranoid symptoms.<sup>35,36</sup> In our study, paranoid ideation was associated with hearing impairment only in the univariate analysis, whereas visual deficits were associated with hallucinations and paranoid ide-

ation. It may be that suboptimal correction of these deficits plays a role in late-life psychotic symptoms.<sup>37</sup> We were unable to replicate earlier reports on associations with female sex<sup>34</sup> and being divorced or childless.<sup>10,34</sup> We even found an inverse relation for the latter. Factors that increase risk among young elderly might no longer be important in very old age, or the statistical power might have been too weak in some of our analyses.

The association between physical disorders and late-life psychosis is not well studied, with disparate results.<sup>11,10</sup> We found that paranoid ideation was associated with myocardial infarction, a finding that has not been reported previously, although paranoid symptoms are reportedly common in the acute phase of coronary care.<sup>38</sup> Because of the cross-sectional design, we cannot elucidate the direction of the association.

Impairment in ADL was associated with delusions and hallucinations. Other population studies have reported that persecutory ideation<sup>8</sup> and psychotic symptoms<sup>11</sup> are related to ADL impairment, but these studies also included demented individuals. In another population study, the association between paranoid symptoms and ADL impairment disappeared after adjustment for cognitive dysfunction.<sup>10</sup> Thus, we could not elucidate in this study whether ADL impairment is a consequence of the psychosis, or whether loss of independence provokes psychotic symptoms.

Hallucinations, delusions, and paranoid ideation were associated with an increased incidence of dementia from 85 through 88 years of age. Psychotic symptoms frequently accompany dementia and are more common late in the course.<sup>16,39</sup> Our findings suggest that psychotic symptoms are also a prodromal expression of dementing illnesses. Visual hallucinations are early symptoms in dementia with Lewy bodies,<sup>40</sup> but our examinations did not allow us to make this diagnosis.

The mortality rate was increased in women with hallucinations, independent of a number of physical disorders. An association between psychotic symptoms and mortality in the elderly has been reported previously, but was not adjusted for physical disorders.<sup>11</sup>

Some methodological factors have to be considered. First, the response rate was 63.1%, a fairly satisfactory response rate in this age group. A comparison between responders and nonresponders showed that the sample investigated was representative of its population base of individuals aged 85 years,<sup>17</sup> but we cannot exclude the possibility that those who did not participate differed from participants regarding psychotic symptoms or sensory or functional impairment. Second, individuals with severe physical disorders might be at increased risk for psychotic symptoms due to transient episodes of confusion<sup>41</sup> or adverse effects of medication. Psychotic symptoms were not diagnosed if they occurred during a suspected delirium, and although we studied the influence of a large number of physical disorders, there was only an association between myocardial infarction and paranoid ideation. Third, exclusion of demented individuals is a key factor in this study. The use of proxy informants to obtain a history of decline in cognitive function increased the likelihood of excluding subjects with very mild dementia. In fact, 30.0% of the sample

was excluded because of dementia. The findings that dementia developed in only a minority of those with hallucinations, delusions, or paranoid ideation and that only hallucinations were associated with poor performance on the MMSE suggest that our results are not the result of misclassification of mild dementia. Finally, multiple comparisons were made in this study, which may lead to false-positive findings. Because procedures that correct for this may give rise to false-negative results, we chose to make no adjustments for the number of comparisons but emphasize that the findings should be considered suggestive until further confirmed.<sup>29</sup>

Accepted for publication April 19, 2001.

We would like to thank Birgitta Tengelin and Yvonne Sundin for their technical assistance.

This study was supported by grants 90-27X-09131-01A, B95-27X-11267-01A, and K95-29P-11337-01A from the Swedish Medical Research Council, grant 0914 from the Swedish Council for Social Research, Stiftelsen Söderström-Königska Sjukhemmet, Konung Gustaf V: s och Drottning Victorias Stiftelse, Stiftelsen för Gamla Tjänarinnor, Stiftelsen Professor Bror Gadelius' Minnesfond, and The Swedish Society of Medicine, Stockholm; and Handlanden Hjalmar Svenssons Forskningsfond, The Göteborg Medical Society, and Alma och Anna Yhlen's Foundation, Göteborg.

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