第四部　アンケート調査による慢性疾患の正確性について

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目的

アンケート調査による慢性疾患の有無とカルテ調査における慢性疾患の有無について調査し、2003年に相良村・大三島町で行なわれた慢性疾患調査の正確性について検討した。

方法

2医療機関において、1999年前後に罹患していた疾患名をカルテから抽出し、その結果をアンケート調査の結果と比較することにより、アンケート調査による慢性疾患調査の正確性について検討する。アンケート調査において、用いた疾患名は、骨そしょう症、関節疾患、骨折（大腿骨骨折・その他の骨折)、慢性疼痛（神経痛・腰痛・頭痛等)、脳血管障害（脳出血・脳梗塞)、パーキンソン病、心疾患（不整脈・心不全・弁膜症等)、高血圧、糖尿病、高脂血症、慢性肺疾患（気管支喘息・慢性肺気腫・慢性気管支炎)、腸・内臓疾患（胃潰瘍・慢性胃炎・肝疾患等)、うつ、アルツハイマー病、腎・泌尿器疾患（慢性腎炎・前立腺肥大等)、眼疾患（白内障・網膜症等)、悪性腫瘍であった。

カルテ調査においては、相良村の住民が利用している二つの医療機関において、カルテに記載されている診断名を用いた。原則として 1999 年時点の診断名を抽出した。抽出した診断名について、アンケート調査に用いた疾患カテゴリー別に分類し、さらにカッパを用いてその信頼性をアンケート調査とカルテ調査の間で検討した。

なお、カッパは下記の式によって表される。

$$k = \frac{P_0 - P_e}{1.0 - P_e}$$

P0 対象において一致した割合　Pe　偶然により一致する割合

すなわち、偶然による一致する割合を考慮した場合の一致率であり、0．4以下は悪い一致、0.4-0.6は中程度の一致、0.6以上であれば良好な一致とされている。

結果

表1に対象者132名について、疾患の男女別割合と、カッパ値を示した。もっとも高い一致率を示したのは慢性肺疾患と糖尿病で、逆に低い一致を示したのは腎・泌尿器疾患であった。

考察

アンケート疾患による慢性疾患の調査は、その正確性について十分注意を払う必要がある。これまでアメリカ合衆国で慢性関節疾患や、アスピリンの使用については、医師の診断と患者の報告間に差があったという報告がある[22]。本邦は患者が複数の医師にかかる場合も多く、一医療機関の診断名が患者の疾患名を代表していない可能性もある。

そのような条件にもかかわらず、アルツハイマー病・腎疾患・泌尿器疾患以外の疾患では、０．４以上の値を示した。特に高血圧、糖尿病、慢性肺疾患では高い傾向が認められた。

その他の多くの疾患名は、中間にあたり、特に高い一致率を示したわけではないが、本研究に用いられている診断名の妥当性について、アルツハイマー病と腎・泌尿器疾患については、これらのカッパ値の示す精度の範囲内において、適切と考えられた。

		度数		
疾患名	情報源	男性	女性	カッパ
骨そしょう症	アンケート	3	13	0.416
	カルテ	0	6	
リウマチ・関節疾患	アンケート	2	8	0.490
	カルテ	1	8	
骨折	アンケート	2	10	0.565
	カルテ	0	5	
慢性疼痛	アンケート	5	36	0.526
	カルテ	13	34	
脳血管障害	アンケート	8	4	0.443
	カルテ	11	16	
パーキンソン病	アンケート	1	0	0.494
	カルテ	3	0	
心疾患	アンケート	15	9	0.617
	カルテ	18	18	
高血圧	アンケート	28	56	0.717
	カルテ	27	64	
糖尿病	アンケート	2	6	0.705
	カルテ	4	10	
高脂血症	アンケート	0	3	0.482
	カルテ	2	7	
慢性肺疾患	アンケート	4	4	0.788
	カルテ	4	3	
腸・内臓疾患	アンケート	3	3	0.573
	カルテ	7	7	
うつ病	アンケート	0	3	0.494
	カルテ	0	1	
アルツハイマー病	アンケート	0	2	0.389
	カルテ	1	2	
腎疾患・泌尿器疾患	アンケート	7	5	0.291
	カルテ	3	3	
眼疾患	アンケート	7	25	0.424
	カルテ	4	8	
悪性腫瘍	アンケート	1	1	0.492
	カルテ	1	1	

これまで、本邦ではアンケート調査による診断名の確認の精度については報告が少ないため、以上の結果は、アンケート調査における診断名の選択や、分析結果の判断等に寄与できると考えら

れた。

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Ⅱ．研究成果の刊行に関する一覧表

書籍

著者氏名	論文タイトル名	書籍全体の編集者名	書　籍　名	出版社名	出版地	出版年	ページ
大河内郎他	相良村における介護予防のシステムづくり	鳥羽研二	介護予防マニュアル	厚生科学研究所	東京	2006	未定
大河内二郎	介護予防への取り組み、地域・在宅生活支援のための具体的対策	全国老人保健施設協会	老人保健施設職員ハンドブック	厚生科学研究所	東京	2006	未定

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Jiro Okochi	Increase of mild disability in Japanese elders : A seven year follow-up cohort study	BMC public health(online Journal)	5	55 http://www.biomedcentral.com/1471-2458/5/55	2005
Jiro Okochi, Sakiko Utsunomiya Tai Takahashi	Health measurement using the ICF: Test-retest reliability study of ICF codes and qualifiers in geriatric care	*Health and Quality of Life Outcomes*	3	46 http://www.hqlo.com/content/3/1/46	2005

Ⅲ. 研究成果の刊行物・別刷

1）**Increase of mild disability in Japanese elders : A seven year follow-up cohort study**
BMC public health(online Journal)

Jiro Okochi、Sakiko Utsunomiya and Tai Takahashi

2）**Regional difference in disability development**
-Result from two longitudinal studies of elderly cohorts in Japan-

Jiro Okochi Kyushu University Graduate school of Medicine

Regional difference in disability development
-Result from two longitudinal studies of elderly cohorts in Japan-

Jiro Okochi Kyushu University Graduate school of Medicine

Aim

This study examines the process of functional deterioration of community dwelling elders in two Japanese towns.

Background

In the preliminary phase of the study between 1999 and 2003, Town B was found to have higher percentage of disability incidence than town A, while the death was more frequent in Town A. Interestingly, the elders in town A also showed higher possibility to remain without disability. This tendency was reproduced between 2003 and 2005 as shown in Table 1. Therefore, this study aimed at examining the process of functional deterioration in two towns in Japan.

Method

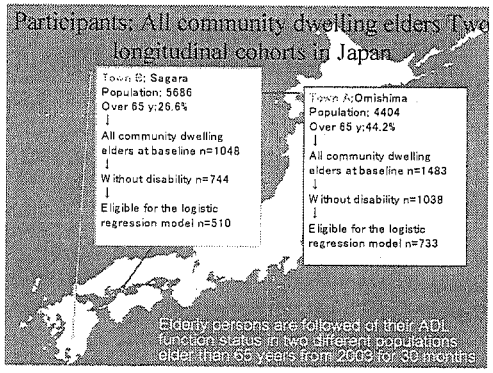
All community dwelling elder (65<) was measured of their functioning in February 2003 using four item measure of Typology of the Aged with Illustrations. In addition, all elders were asked to provide questionnaire regarding their chronic conditions, activity, health behavior and family status. Depressive mood were assessed using 5 item version of the Geriatric Depression Scale. Stepwise logistic regression was used to analyze factors associated with disability development from elders without any disability.

Result

A total of 1429 and 1031 elders were identified in town A and B respectively. **Table 1** shows the transitional probability between town A and town B. Of these, 1038 and 744 showed no disability, and 733 and 510 elders provided all answers to the questionnaire. **Figure 1** shows the process of the study sample of both towns.

Table 2 shows the factors associated with the development of disability from no disability.

When both towns were analyzed simultaneously in one logistic regression model, dummy variable of town was a independent factor as shown in Table 2. When two towns were analyzed separately, Participation to work was related only in town A, and participation in volunteer activity, Consumption of alcohol, living with children was related only in town B.



Discussion

This study showed marked regional difference in transitional probability of disability development in two towns. The regional difference was an independent factor that suggests role of environmental factors in the disability development. Age, depressive mood were common factor related to disability development in both towns. Town A, which is one of the most elder population in Japan, did not show marked increase of disability compared to town B, However as seen in the proportion of the proportion of institutionalized and dying after 2.5 years, it is possible that elders in town A can not suffer from disability in the community when a catastrophic event occurs. In contrast, living with their children was a factor associated with disability development in town B suggesting the support from the children may be required to live continuously in the community.

Table 1

Functional status in 2003 February		Functional status in 2005 August(30 months later), percentage and 95% confidence interval				
		no disability	with disability	institutionalization	emigrated	dead
Town A	no disability(n=1038)	0.74 (0.71-0.77)	0.16 (0.14-0.18)	0.03 (0.02-0.04)	0.03 (0.02-0.03)	0.05 (0.04-0.06)
	with disability(n=445)	0.07 (0.05-0.10)	0.51 (0.47-0.56)	0.15 (0.11-0.19)	0.06 (0.04-0.09)	0.21 (0.17-0.24)
	Total(n=1483)	0.54 (0.51-0.56)	0.27 (0.24-0.29)	0.06 (0.05-0.08)	0.04 (0.03-0.05)	0.10 (0.08-0.11)
Town B (n=1048)	no disability(n=744)	0.66 (0.63-0.70)	0.26 (0.23-0.30)	0.03 (0.01-0.04)	0.01 (0-0.01)	0.04 (0.03-0.06)
	with disability(n=304)	0.07 (0.04-0.09)	0.67 (0.61-0.72)	0.07 (0.04-0.10)	0.04 (0.02-0.07)	0.15 (0.11-0.19)
	Total	0.49 (0.46-0.52)	0.38 (0.35-0.41)	0.04 (0.03-0.05)	0.02 (0.01-0.02)	0.07 (0.06-0.09)

transition higlighted in red indicates higher probability in town A than in town B
transition higlighted in yellow indicates higher probability in town B than in town A

Table 2 Factors associated with development of disability

variable	proportion(%) or average(SD)	P	odds ratio	95% C.I	
Total samples(Town A+Town B)					
age	76(SD5)*	0.00	4.25	3.13	5.78
Chronic conditions					
cerebrovascular accident	3.9%	0.00	2.75	1.41	5.37
bone fracture	6.2% not selected				
depressive mood	1.1(SD1.1)	0.01	1.19	1.05	1.36
activity					
any work	64.4%	0.02	0.68	0.50	0.93
recrelational activity	36.4% not selected				
volunteeractivity	55.0%	0.00	0.64	0.47	0.87
health behavior					
taking painkiler > twice/week	20.8%	0.00	1.68	1.18	2.39
taking sleeping pills > twice/week	14.3% not selected				
drink alcohol every day	34.5%	0.03	0.67	0.47	0.96
quit smoking	18.5%	0.01	0.56	0.35	0.88
environmental factor					
living with children	40.7% not selected				
Town B	41.5%	0.00	2.78	2.01	3.86
Town A					
age	76(SD5)	0.00	4.09	2.77	6.04
Chronic conditions					
cerebrovascular accident	3.7%	0.01	1.19	1.05	1.36
bone fracture	6.2%	0.02	2.35	1.15	4.80
depressive mood	1.1(SD1.1)	0.03	1.20	1.01	1.42
activity					
any work	70.4%	0.00	0.46	0.30	0.71
recrelational activity	38.7% not selected				
volunteeractivity	49.5% not selected				
taking painkiler > twice/week	22.5% not selected				
taking sleeping pills > twice/week	15.1% not selected				
drink alcohol every day	26.9% not selected				
quit smoking	19.1% not selected				
Environmental factor					
living with children	24.7% not selected				
Town B					
age	76(SD5)	0.00	5.34	3.19	8.92
chronic conditions					
cerebrovascular accident	4.3%	0.03	3.31	1.12	9.84
bone fracture	6.2% not selected				
depressive mood	1.0(SD1.1)	0.04	1.26	1.01	1.56
activity					
any work	56.0% not selected				
recleational activity	33.2%	0.01	0.51	0.30	0.87
volunteeractivity	62.8%	0.02	0.56	0.34	0.91
health behavior					
taking painkiler > twice/week	18.3%	0.01	2.11	1.18	3.80
taking sleeping pills > twice/week	13.2%	0.00	2.62	1.34	5.11
drink alcohol every day	45.2%	0.01	0.50	0.31	0.82
quit smoking	17.7%	0.00	0.29	0.13	0.64
environmental factor					
living with children	64.5%	0.02	1.81	1.10	2.97

* age effect of 10 year increase

- The study showed difference in the transitional probability of Functional deterioration in two regions in Japan.
- The difference was independent from other factors such as age, gender, chronic conditions, and health behavior.
- "Living with children" was one of the causes of disability in the community.
- Support of family is required to live continuously in the community after disability development.

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Increase of mild disability in Japanese elders: A seven year follow-up cohort study

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Abstract

Background: Japan has the highest life expectancy in the world. In a 2002 census government report, 18.5% of Japanese were 65 years old and over and 7.9% were over 75 years old. In this ageing population, the increase in the number of dependent older persons, especially those with mild levels of disability, has had a significant impact on the insurance budget. This study examines the increase of mild disability and its related factors.

Methods: All community-dwelling residents aged 65 and over and without functional decline (n = 1560), of Omishima town, Japan, were assessed in 1996 using a simple illustrative measure, "the Typology of the Aged with Illustrations" to establish a baseline level of function and were followed annually until 2002. The prevalence and incidence of low to severe disability, and their association with chronic conditions present at the commencement of the study, was analyzed. A polychotomous logistic regression model was constructed to estimate the association of each chronic condition with two levels of disability.

Results: An increase in mild functional decline was more prevalent than severe functional decline. The accumulation of mild disability was more prominent in women. The major chronic conditions associated with mild disability were chronic arthritis and diabetes in women, and cerebrovascular accident and malignancy in men.

Conclusion: This study showed a tendency for mild disability prevalence to increase in Japanese elders, and some risk factors were identified. As mild disability increasingly prevalent, these findings will help determine priorities for its prevention in Japanese elders.

Background

Japan has the highest life expectancy in the world. In a 2002 Japanese census report, 18.5% of Japanese were 65 years old and over and 7.9% were over 75 years old. A long-term care insurance (LTCI) law was introduced in 2000 to cover both home-based and institutional care services for the large elderly population [1]. Since then, the rapid increase in the number of beneficiaries has enlarged the budgetary balance of calls and its premium rates. To access LTCI-provided services, elderly persons must comply with an eligibility test. This test is based on the physical and mental status, and it divides care needs into six categories or levels, based on the estimated amount of care resource utilization[2]. According to

Ministry of Health, Labor and Welfare (MHLW) figures, beneficiaries of the at-home care service and the institutional service increased by 99% and 38%, respectively, between April 2000 and April 2003. During the same period, the number of elderly persons insured by LTCI increased by only 11%. As a result of a recent report of the MHLW, which confirmed an increase in the need for mild level care (grade 1 – support needed) from 46% to 53%, the prevention of mild disability became a focus of attention. A recent government commission on elderly care in Japan also reported that the increase in the number of elderly persons, especially those with mild disability, is endangering the insurance scheme, and the government is in the process of redesigning the scheme to refocus services for the elderly with mild disability away from direct care to preventive services. Thus, prevention or delay of the onset of functional limitation is an important objective in the health care system.

The theory of compression of morbidity suggests that lifestyle changes and suitable treatment for chronic illnesses can postpone the development of chronic conditions and their unwanted sequelae [3]. In the United States, later levels of disabilities and death rates are predictable from specific chronic conditions [4-7]. Very few such studies have been conducted for the Japanese population [8,9] and even fewer provide information on mild disability, which is the most common and increasing source of dependency[8].

This study aims to describe incidence and prevalence of functional decline, and to determine whether the incidence of disability at mild and severe levels is associated with age, gender and chronic conditions.

Methods

This research combines two distinct methodologies: a longitudinal cohort study, from 1996 to 2002, of functional decline based on the entire population of the elderly in a single town, and a retrospective questionnaire study of chronic conditions in the same population.

Longitudinal cohort study

The base population of the study was the population of Omishima town, Ehime prefecture. According to the 1995 census, the total population of the town was 4782, and elderly persons (aged over 65) numbered 1935 (40% of the population). The local municipality provided the researchers with a list of all elderly persons of 65 years and older taken from the residential register, and 1843 elderly persons living at home (95% of this total) were identified in August 1996. Persons who did not give written informed consent (n = 5) were excluded from the study, and this left an initial cohort of 1838.

Measurement of disability

The majority of studies estimating the incidence of elderly functional decline are based on interview or questionnaire, as opposed to the probably more reliable approach of observation [10]. The present study uses an observational instrument which, because of its simplicity and ease of use, should permit more frequent observational studies of elderly functional decline. This method is the Typology of the Aged with Illustrations (TAI).

The TAI is an instrument for the measurement of elderly function, and is composed of four scales representing mobility, eating, toileting, and mental status (Figures 1,2,3,4) [11,12].

Each item in the TAI has six hierarchical states (5 to 0), representing levels of disability in each domain. Five represents no disability and 0 represents extreme disability. Each state is defined by a threshold and illustrated as shown in the example of the mobility scale (Figure 1). The levels on the mobility scale are as follows: level 5, ability of the elder to climb stairs without aid or assistive devices; level 4, can not climb stairs without aid but can walk on flat surface without aid or assistive devices; level 3, cannot walk on a flat surface without aid, but can move around using assistive devices and perform transfer independently while seated; level 2, cannot either move around or transfer while seated using assistive device or aid from the others, but can sit up and maintain seated position ; level 1, cannot either sit up or maintain seated position but can roll over on the bed without aid; and level 0, cannot roll over on a bed while lying without aid.

Its reproducibility, construct validity and concurrent validity have been established in a previous study [11]. Average weighted kappa of the four scales was 0.65 and there were no significant differences between experienced and non-experienced TAI users. It has high concurrent validity with the Functional Independence Measure (FIM).

Using TAI, 1560 elderly persons were identified as not having any functional decline, and were used to assess the incidence of disability each year for successive seven years from 1996 to 2002, in order to follow its association with age, gender, living status and presence of chronic conditions. Eighteen non-professional district welfare commissioners recorded information pertinent to elderly function in the four above-mentioned domains using the TAI. Following intensive training in its use, they assessed the function of the participants in 1996, and again each August for six consecutive years. The evaluators were asked to observe and classify the present status in the measurement month using TAI mobility, eating and toileting scales. In case of TAI mental status scale, the evaluators were asked

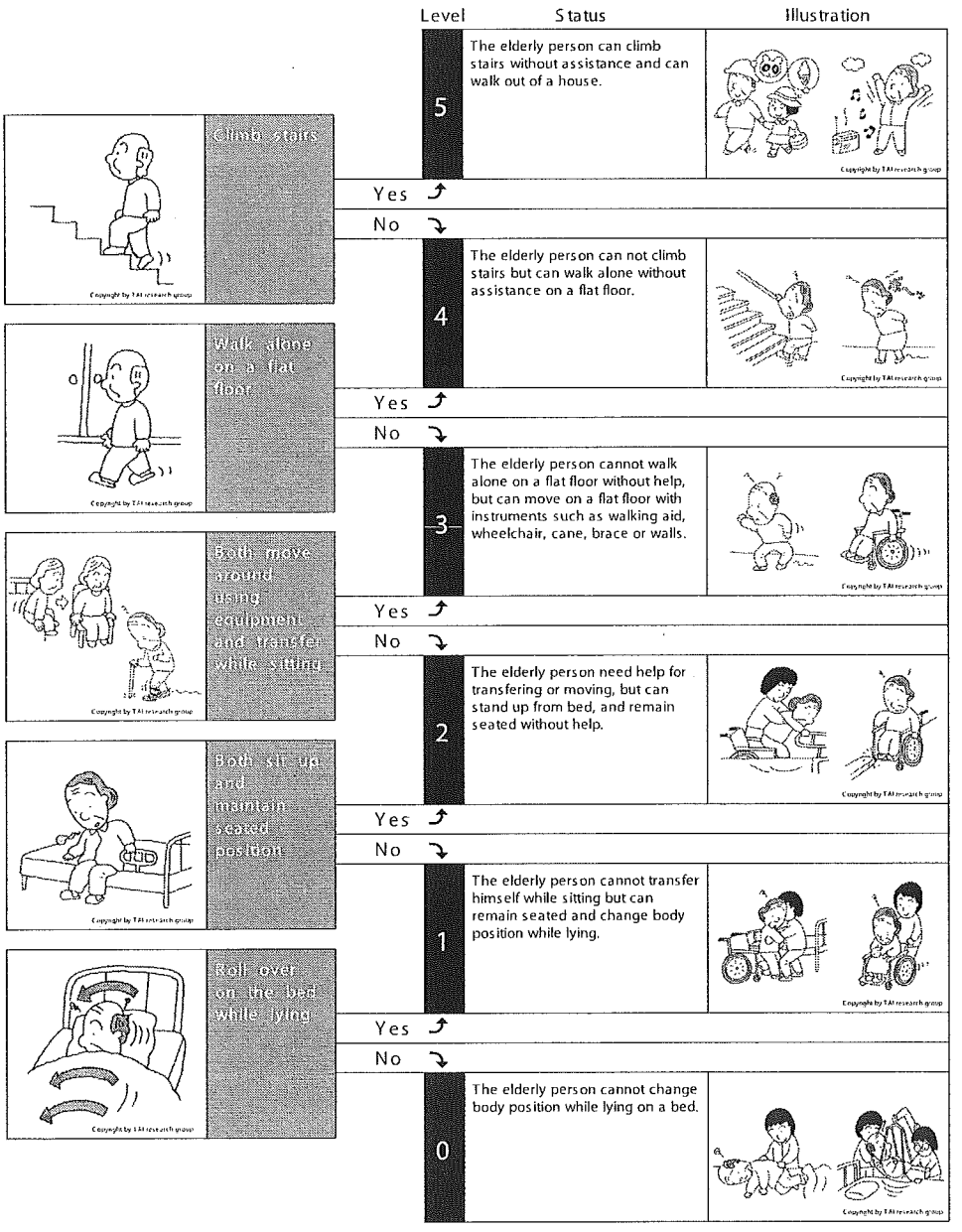

Figure 1
TAI mobility

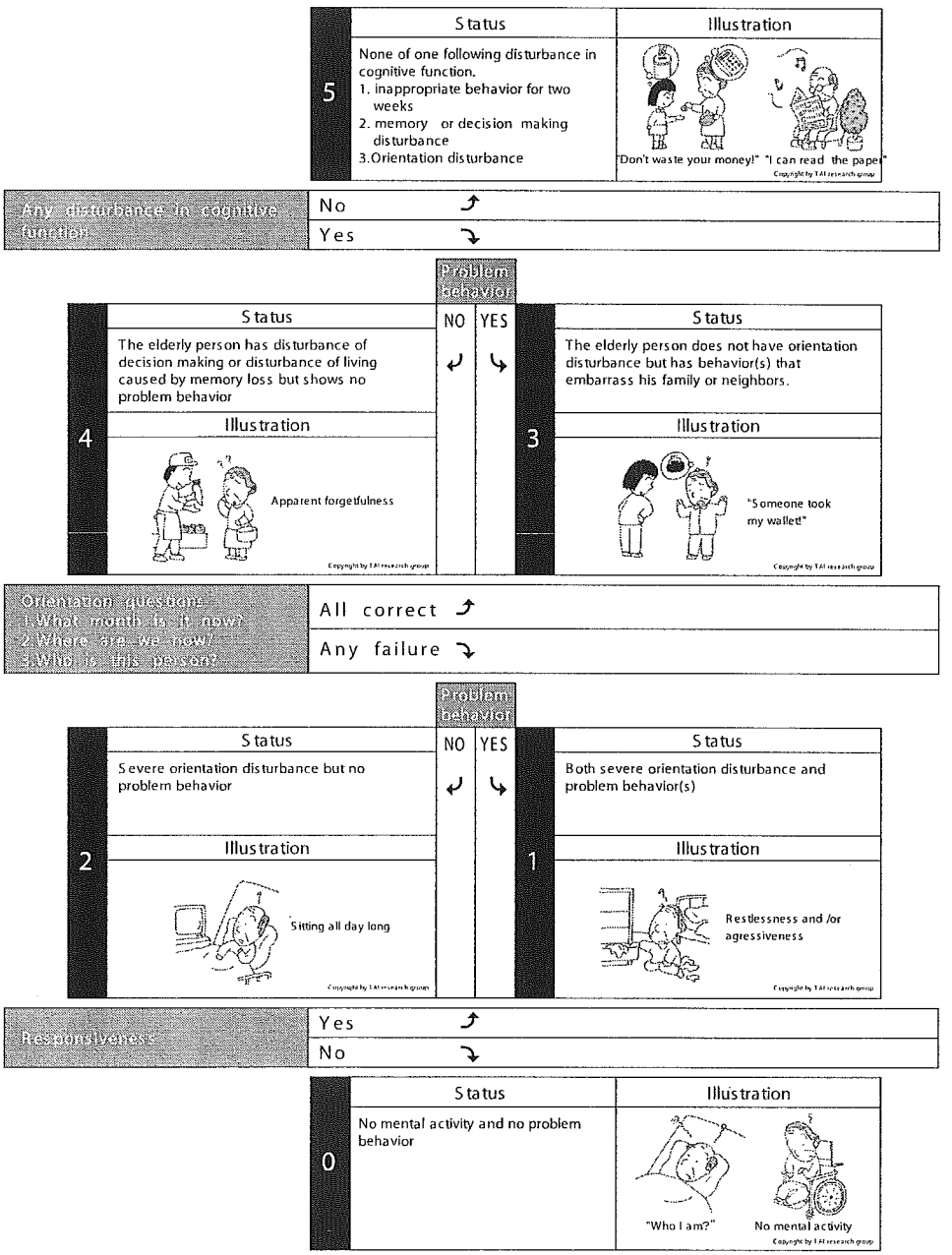

Figure 2
TAI mental status

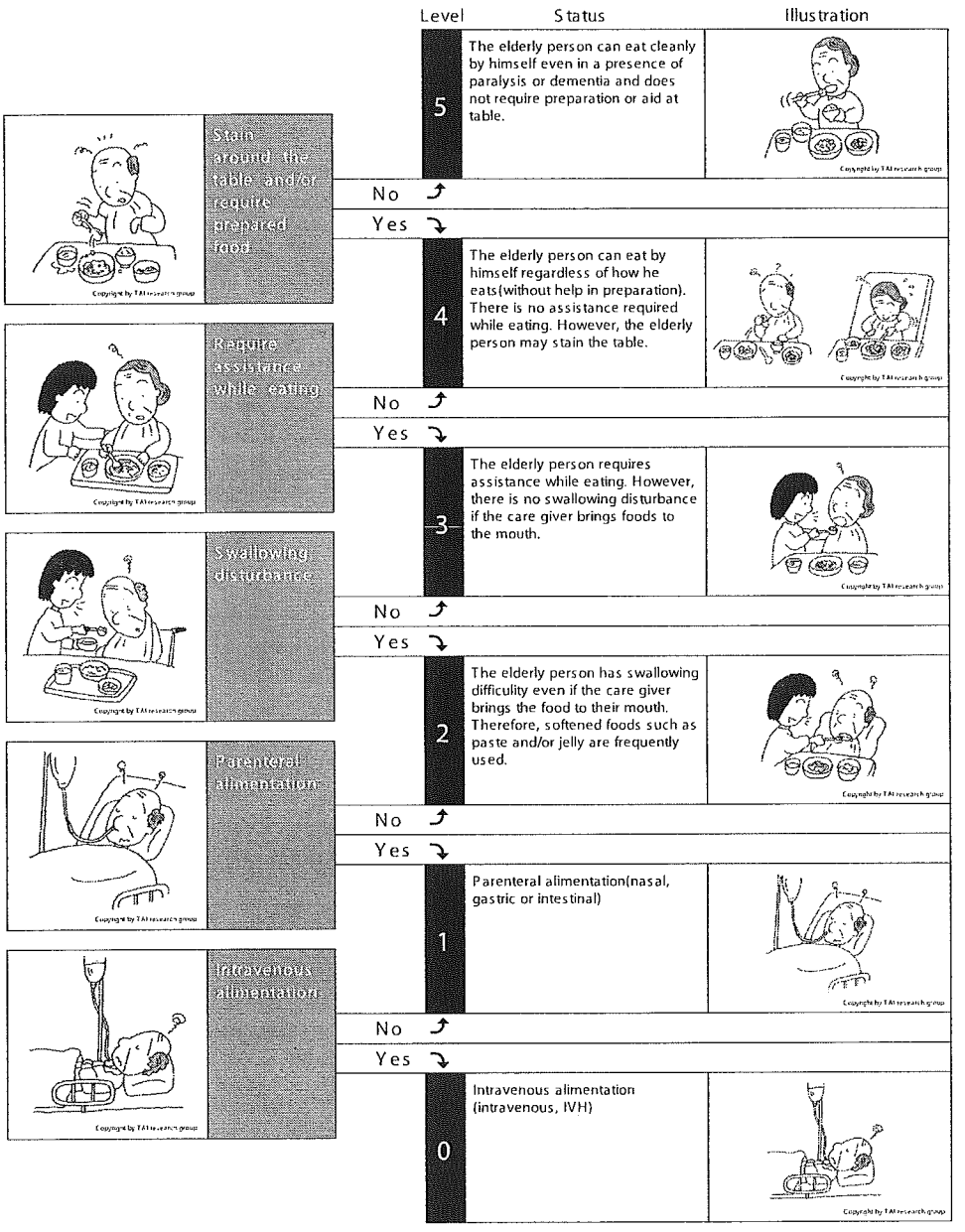

Figure 3
TAI eating

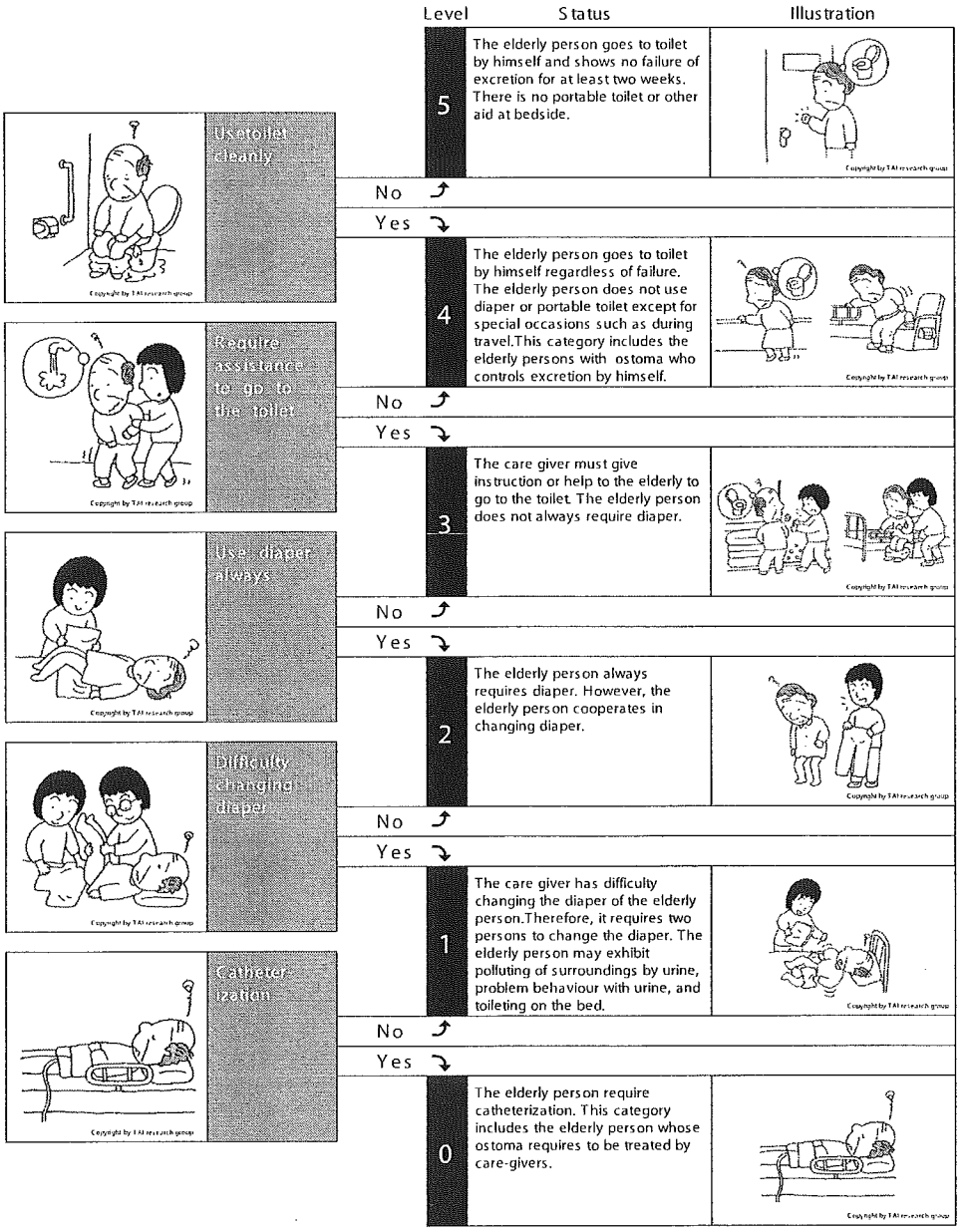

Figure 4
TAI toileting

to observe and also to interview the relative functional status. In cases of cognitive impairment, the assessment was based on interviews with family members as proxies, together with observation of the elderly person.

Retrospective questionnaire on chronic conditions

In addition to the yearly observation of elderly functions, a questionnaire covering seventeen chronic medical conditions (including the onset) was completed by the participants remaining in February 2003. Those elders who were hospitalized, institutionalized or died by 2002 were excluded from the questionnaire study since they were unable to complete the questionnaire survey. The same district welfare commissioner, who originally carried out the observation with TAI, distributed and collected the questionnaires. They also assisted respondents who had difficulty in completing the questionnaire.

The seventeen chronic medical conditions were decided based on a Ministerial statistical report on long-term care insurance law [13], and modified for the purpose of this study. They were: chronic arthritis, osteoporosis, bone fracture, chronic pain, cerebrovascular accident (CVA), heart disease, high blood pressure, diabetes, hyperlipidemia, chronic lung disease, intestinal disease, renal disease, eye disease, malignancy, depression, Alzheimer's disease and Parkinson's disease.

The questionnaire provided descriptions and definitions of the chronic conditions to facilitate understanding and eliminate recall bias as far as possible. It also included the onset years of chronic conditions. Data of social status, social activities, and health-related behavior was also recorded, but were not used in the current analysis.

Analysis

The initial sample of 1838 was used to describe the correlation of initial disability and future severity. Of these, samples not providing a disability index due to death, emigration or institutionalization were not included in the analysis of disability index.

The data of 1560 elderly persons without initial functional decline were used to assess the incidence of disability in the population studied. Using the TAI scale, the author devised a disability index [14,15], as follows. Each of the four scales of TAI has a six-level structure (Figure 1,2,3,4). Level 5 of elderly function in each scale represents no disability and was scored as 0. At level 4, the elder has one functional problem, for example in TAI mobility, in climbing stairs, and is assigned a score of 1; at level 3, the score is 2, and so on. The results of all four scales are summed to form a single index, theoretically ranging from 0 to 20, and then divided by 20 to give each individual's score for each year of the survey.

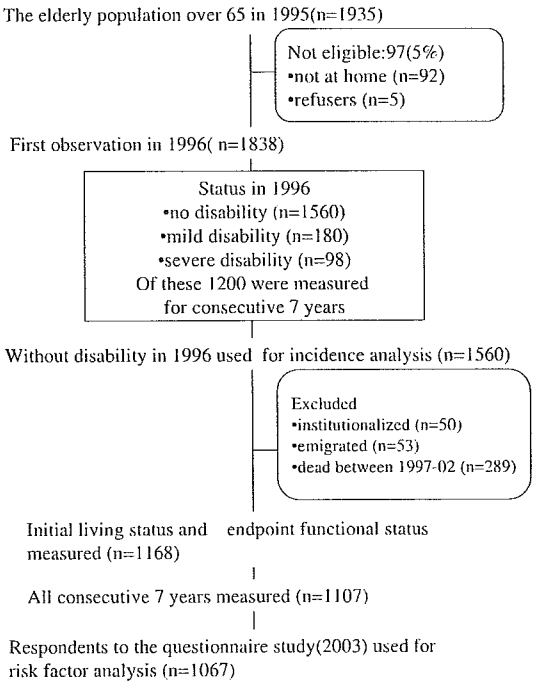

Figure 5
Population of elderly people living at home: Flow of subjects through the study

Elders with a disability score of 0 in any year were defined as no disability. Those with scores of 0.05 to 0.10 (maximum of two disabilities) were defined as suffering from mild disabilities. Those elders with an index score equal to or greater than 0.15 (more than three disabilities) were defined as suffering from severe disabilities.

The disability-free sample (n = 1560) was used to describe the prevalence and incidence of disability. For the analysis of point prevalence, the result of each year's measurement was applied. For the analysis of incidence of new mild disability from disability-free samples, the person-year method was used. Incidence of severe disability included progression of mild disability to severe disability.

The association of disability index with gender, age and chronic medical condition, over the seven years, was analyzed using applicable data from the 1560 samples.

A polychotomous logistic regression model was constructed to test the effect of each covariate on the development of functional decline at the two levels of severity using eligible data [16]. The covariates were age at base line, living status and the seventeen chronic conditions. Only chronic conditions diagnosed before 1996 were included in the analysis so as to avoid the inclusion of acute episodes of diseases, such as CVA and bone fractures.

The associations of the chronic conditions with each of the two outcome variables were tested independently, using the chi-square or Fisher's exact test, by stratification and non-stratification of gender and endpoint functional status. Only those conditions that achieved a significance level of $P < 0.05$ were incorporated in the logistic regression.

Finally, as the population studied showed gender differences in functional decline, separate models for men and women were constructed. All p values were two-tailed. The analyses were conducted using SPSS 11.5.1J, Windows.

Results

The cohort of 1838 elderly persons aged 65 and over was 40% male at the beginning of the study in 1996. Age range was 65 to 99 years, and average age was 73.6 years (SD 6.5) for males and 74.8 years (SD 7.1) for females.

When first observed in 1996, 1560 (85 %) of these elders had no functional decline, 180 (10 %) showed a mild level of disability, and 98(5%) showed severe disability. Additional file 1 shows the change of the status from 1996 to 2002. Higher transition to severe disability was more prominent in mild disability group (14%) compared with no disability group (4%). There was a difference of transition from no disability to mild disability between genders (male 10% versus female 23%). The transition from no disability to dead was higher in male (26% versus 13%).

The average age of sample without disability of men (n = 654) and women was 73.0(SD6.0) and 73.6(SD6.3), respectively.

By 2002, 289 of the original 1560 participants without initial disability had died, 53 were lost to follow up or emigrated, and 50 were hospitalized or institutionalized. All of them were excluded from the analysis of risk factors. Of the 1168 participants remaining in the study in 2002, 1107(96%) participants provided the initial living status data and were measured for all consecutive 7 years, and 1067 (93%) responded to the questionnaire in 2003.

Figure 5 summarizes the subjects' progress through the study.

The disability index in 1996 was significantly higher in those who died before the last measurement in 2002 using the 1273 surviving cases and 433 deaths (Mann-Whitney's U Test, $P < 0.001$). These 1200 cases who were measured for consecutive 7 years were analyzed to show the result of the rank correlation between the initial disability index and the disability index of subsequent years, after excluding elderly who died (n = 433), emigrated (n = 66), or were unable to participate further due to hospitalization or institutionalization (n = 66) (Table 1).

Table 1: The Mean and median of disability index and rank correlation between disability index of 1996

	year	1996	1997	1998	1999	2000	2001	2002
Male (n = 453)	Mean	0.006	0.006	0.010	0.012	0.015	0.018	0.027
	SD	0.035	0.034	0.053	0.058	0.060	0.067	0.080
	Median	0.003	0.003	0.003	0.004	0.007	0.008	0.012
	Correlation*		0.629	0.475	0.433	0.363	0.324	0.327
	P		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Female (n = 747)	Mean	0.007	0.009	0.009	0.011	0.016	0.022	0.036
	SD	0.031	0.032	0.035	0.043	0.055	0.061	0.082
	Median	0.005	0.006	0.006	0.007	0.010	0.014	0.020
	Correlation*		0.615	0.521	0.460	0.363	0.324	0.256
	P		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

*Spearman's rank correlation between disability index of 1996

Table 2: Disability level and result measured with the typology of the aged with illustrations (TAI) in 1996

		mild disability (n = 180)		
TAI level	mobility	mental	eating	toileting
5	14%	76%	99%	92%
4	78%	24%	1%	8%
3	7%	1%	1%	0%
2	0%	0%	0%	0%
1	0%	0%	0%	0%
0	0%	0%	0%	0%
		severe disability (n = 98)		
TAI level	mobility	mental	eating	toileting
5	4%	44%	61%	16%
4	21%	27%	28%	34%
3	32%	1%	7%	20%
2	21%	21%	2%	16%
1	15%	3%	1%	12%
0	6%	4%	1%	1%

Table 2 shows the distribution of disabilities, according to TAI grade, of subjects at the two levels of the index of disability, in1996. For example, of those with mild disability (n = 180), 141 (78%) could not climb stairs by themselves, but could walk on a flat surface without aid or assistive devices, and 13 (7%) could move about only on a flat surface with aid. Forty-three (24%) had mild memory problems and 15 (8%) had mild difficulty using toilet. Only two had a problem with eating. In those with mild disability, 145 (81%) showed disability on only one scale, while 35 (19%) showed disability on two scales. 84 percent of the elders had disability only in the mobility scale and this suggested that the mild disability group is composed mostly of the elders with mobility problem, without other functional problem.

Subjects with severe disability (n = 98) had a variety of functional impairment. In this group, only two cases (2%) showed disability on only one scale, both of which involved mental status dysfunction, and 4 cases (4%) had no problem with mobility.

Only one subject had a TAI mental level of 3 and only four a TAI mental level of 1, all of whom exhibited problem behaviors, as shown in the Figure 2.

Prevalence and incidence of disability

Figure 6 shows the change of the median of the disability index for consecutive seven years (n = 1107). In this analysis, only the samples that were measured for consecutive 7 years were included, and therefore, the elderly persons who were hospitalized, institutionalized, dead or emigrated were excluded. Older age at base line had an effect on the rate of the disability development. In base line age group older than 75, the increase of the disability index was more prominent in woman than that of man after year 2000. Most of the curves, except for the man aged 75 and over, showed an exponential increase pattern.

The associations of gender and age with scores on the disability index were tested separately on yearly data using the eligible samples from the same population (n = 1107). Gender difference was not obvious from 1997 to 2001, but in 2002 women showed a higher mean disability index score than men (male 0.22, female 0.30, T test, $P < 0.05$). Age at enrolment, in 1996, correlated positively with disability index scores for every year of measurement (Spearman's rank correlation, $P < 0.01$).

The point prevalence of disability at the two severity levels, and of institutionalization and death, is shown in Fig. 7. Mild disability was more increased in women than in men, rising to 22% in women versus 10% in men by 2002. By contrast, loss from the study population by

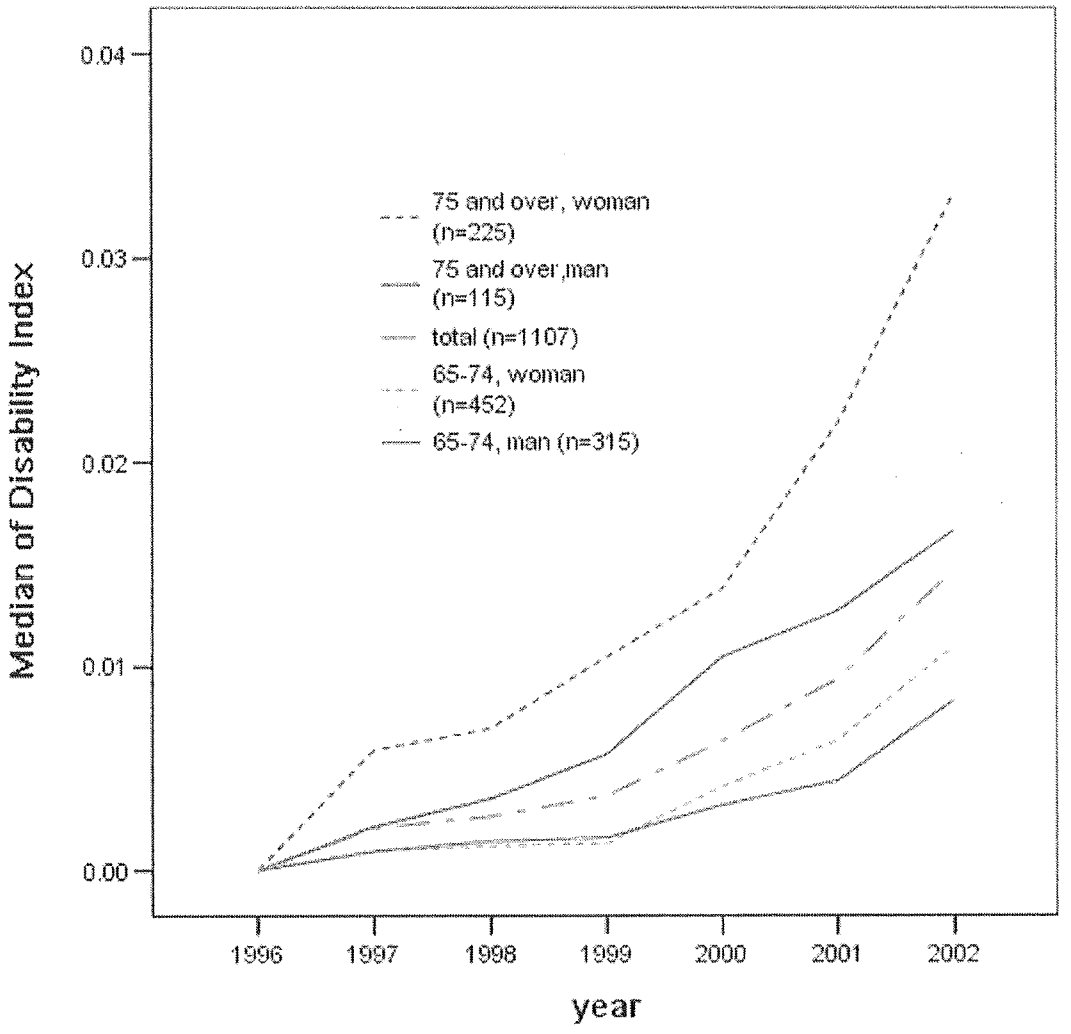

Figure 6
Pattern of disability index median, in gender and age groups (n = 1107)

death was more common in men, reaching 26% in men versus 13% in women by 2002. The proportion of severe disability in 2002 was 3.4% and 4.2% for men and women, respectively, and the proportion of elders who were institutionalized in 2002 was 3.4% and 4.2%, respectively.

As shown in Table 3, age-group in 1996 also had an effect on the development of the disability. In men, higher age group showed higher proportion of death in 2002, while institutionalization was higher in younger age group. In women, both the proportion of death and institutionalization were higher in older age group.

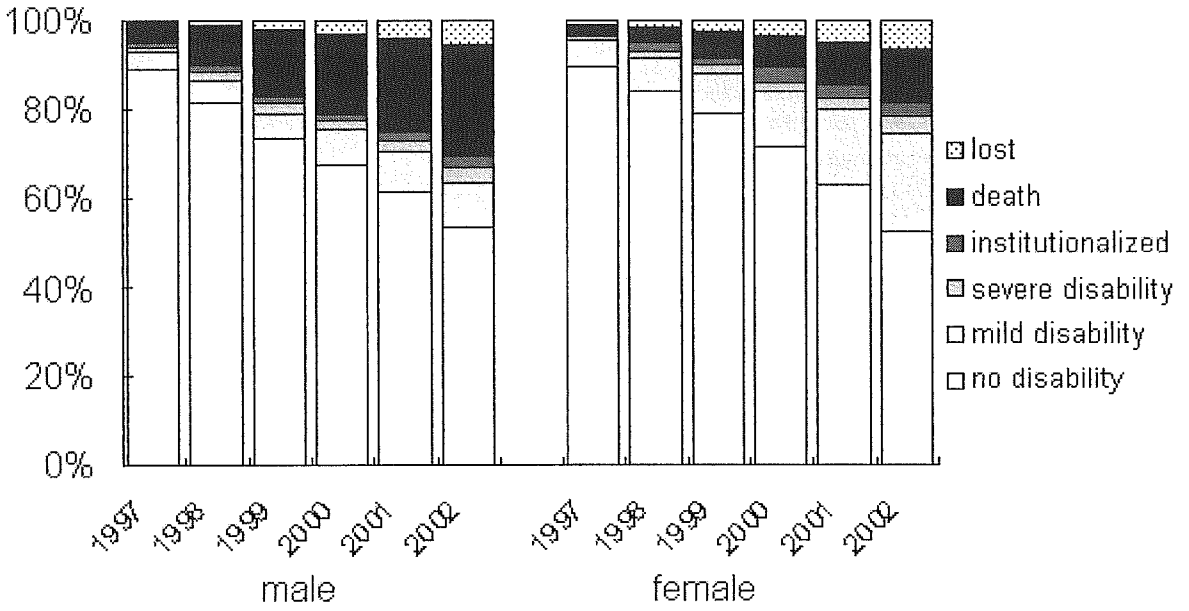

Figure 7
Prevalence of disability, institutionalization and death in men versus women without initial disability (n = 1560)

Table 3: Age and gender difference of the disability, institutionalization and death without initial disability (n = 1560)

gender	age group		no disability	mild disability	severe disability	institution*	emigrated†	death
Male	65 to 74	n	271	38	14	15	11	78
	(n = 427)	%	63	9	3	4	3	18
	75 and over	n	82	29	8	4	10	94
	(n = 227)	%	36	13	4	2	4	41
	Total	n	353	67	22	19	21	172
	(n = 654)	%	54	10	3	3	3	26
Female	65 to 74	n	375	94	12	15	11	39
	(n = 546)	%	69	17	2	3	2	7
	75 and over	n	108	111	26	16	21	78
	(n = 360)	%	30	31	7	4	6	22
	Total	n	483	205	38	31	32	117
	(n = 906)	%	53	23	4	3	4	13

* including hospitalization
† including loss from the sample with unknown reasons

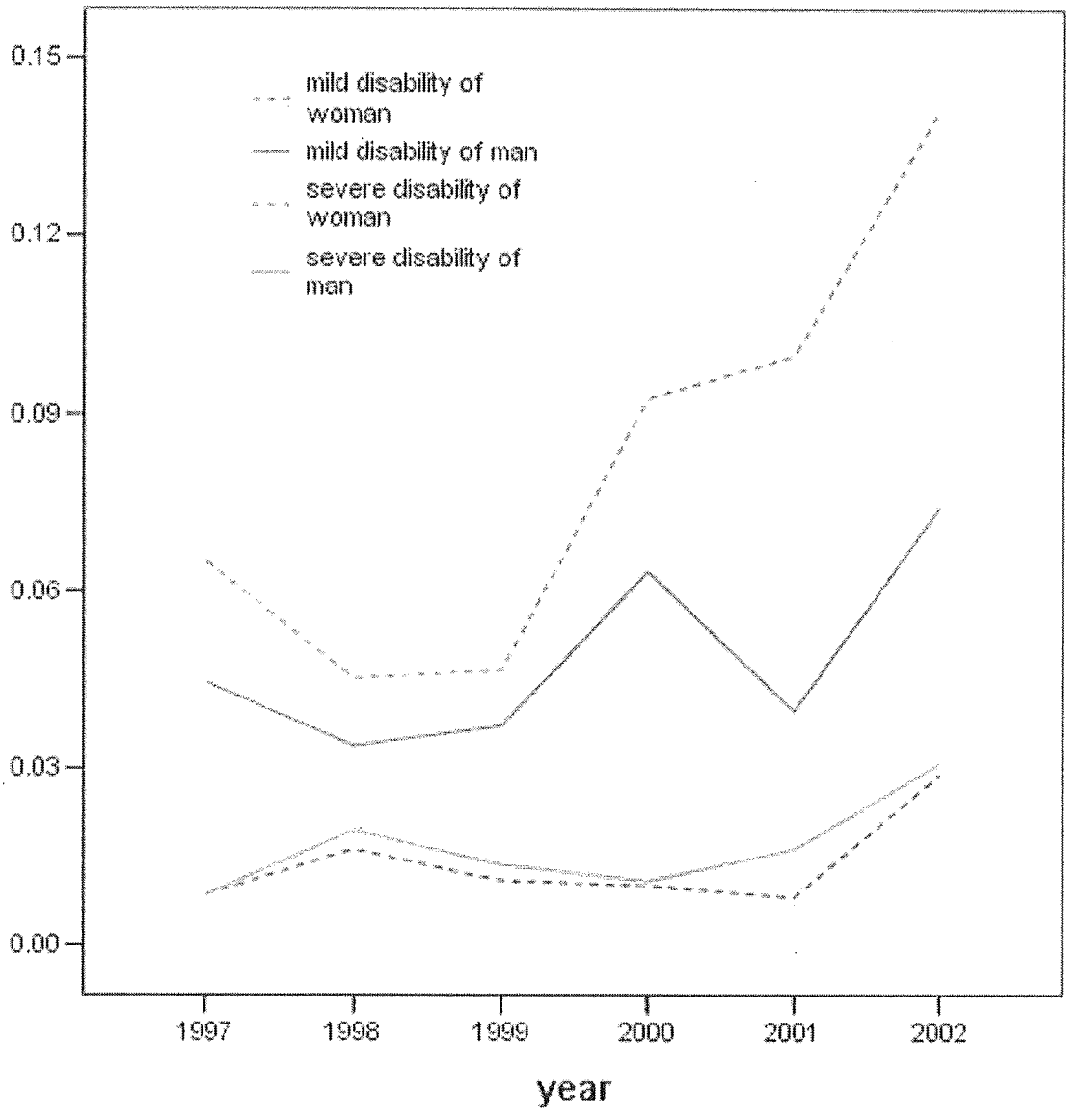

Figure 8
Incidence of disability by severity and gender

Figure 8 shows the yearly incidence of new cases at the two levels of disability by gender. A high incidence of mild disability compared to severe disability was particular to females. The incidence of death was higher in men in all 6 consecutive years (data not shown).

Factors associated with disability

Additional file 2 shows baseline chronic conditions in 1996, cross-tabulated with the outcome level of disability by gender. The average age of males (n = 405) completing this part of the study was 71.6 years (SD 4.9), and of

Table 4: Associations of Chronic Conditions and Age with Functional Decline in Participants Without Initial Functional Limitation (n = 1067)

		outcome level mild			severe		
Gender	Covariate	R.R	95% C.I.	P	R.R	95% C.I.	P
Male							
	age*	2.5	(1.4–4.5)	P < 0.01	5.3	(2.1–13.2)	P < 0.01
	chronic arthritis	1.9	(0.6–6.2)		1.6	(0.3–8.6)	
	osteoporosis†	4.4	(0.5–36.2)		n.a		
	bone fracture	2.6	(0.8–8.1)		1.7	(0.2–14.8)	
	CVA§	5.6	(1.7–19.1)	P < 0.01	20.3	(5.2–78.6)	P < 0.01
	diabetes	1.2	(0.4–3.1)		2.5	(0.6–10.1)	
	chronic lung disease	2.2	(0.9–5.6)		2.9	(0.7–12.0)	
	eye disease	1.0	(0.4–2.4)		1.0	(0.3–3.6)	
	malignancy†	5.4	(1.6–18.3)	P < 0.01	n.a		
Female							
	age*	4.9	(3.4–7.1)	P < 0.01	9.0	(4.4–18.2)	P < 0.01
	chronic arthritis	2.8	(1.5–5.2)	P < 0.01	5.4	(1.9–15.8)	P < 0.01
	osteoporosis	1.4	(0.6–3.2)		2.6	(0.7–9.9)	
	bone fracture	1.3	(0.6–3.1)		1.1	(0.3–4.9)	
	CVA§	3.4	(0.6–19.8)		22.3	(2.5–198.5)	P < 0.01
	diabetes	2.6	(1.2–5.9)	P < 0.05	1.5	(0.2–13.2)	
	chronic lung disease	0.3	(0.1–1.1)		1.5	(0.3–8.0)	
	eye disease	1.1	(0.6–1.8)		0.8	(0.3–2.3)	
	malignancy†	0.8	(0.3–2.3)		n.a		

*effect of ten-year increase, † insufficient numbers in category, §cerebrovascular accident

females, 72.6 years (SD 5.8). At least one chronic conditions was reported by 671 (61.4%) of this group.

The association of number of chronic conditions with scores on the disability index was tested separately on yearly data using this sample (n = 1067). The number of chronic condition was correlated with disability index score in 1998 (P < 0.05), 2000, 2001 and 2002 (P < 0.01, respectively).

The selection of elderly persons without functional decline at the commencement of the study excluded the participants suffered from Alzheimer disease or other dementia. Depression (n = 11), Parkinson's disease (n = 7) and Alzheimer disease (n = 0), which were too low in prevalence in 1996 to permit statistically meaningful analysis, are not included in this table. Chronic arthritis, osteoporosis, bone fracture, cerebrovascular accident (CVA), diabetes, chronic lung disease, eye disease and malignancy all showed significant associations with level of disability (chi-square test or Fisher's exact test, stratifying and non-stratifying the outcome severity level).

The chronic conditions with statistically significant associations and age at initial measurement were used to construct the polychotomous logistic regression model shown in Table 4. The conditions found to be related to mild disability in males were CVA and malignancy, and that to severe disability was CVA. The chronic conditions related to mild disability in women were chronic arthritis and diabetes, and those related to severe disability were chronic arthritis and CVA. The results for severe disability must be interpreted cautiously, because of the limited number in the end-point sample; the confidence interval for relative risk is larger than that for mild disability.

Because of the relatively low prevalence of chronic conditions, the sum of chronic conditions suffered was used to determine the effect of multiple conditions. The relative risks, of adding 1 chronic condition for severe and for mild disability were 1.2 (95%CI 1.0–1.4) and 1.2 (1.1–1.3), respectively, controlling for age and gender.

Discussion

The aim of the current study was to describe incidence and prevalence of disability and to identify the effect of a age,