

Mortality, the dementias, death certificates,
Creutzfeld-Jakob disease and mad cows

or

if there were an epidemic of variant
CJD among older people would we
be able to detect it?

Michael Dewey

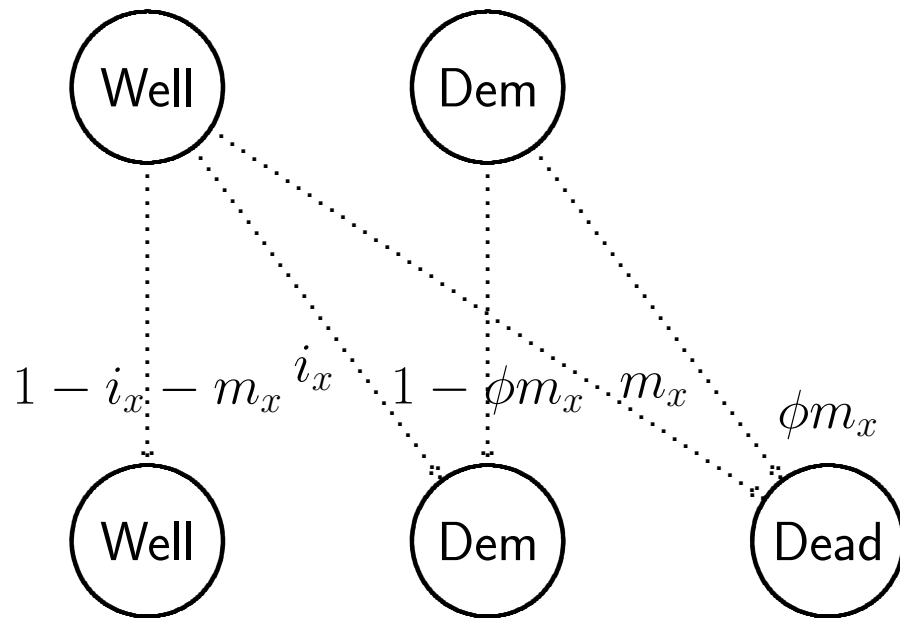
Jim Lowe

Sally Barton

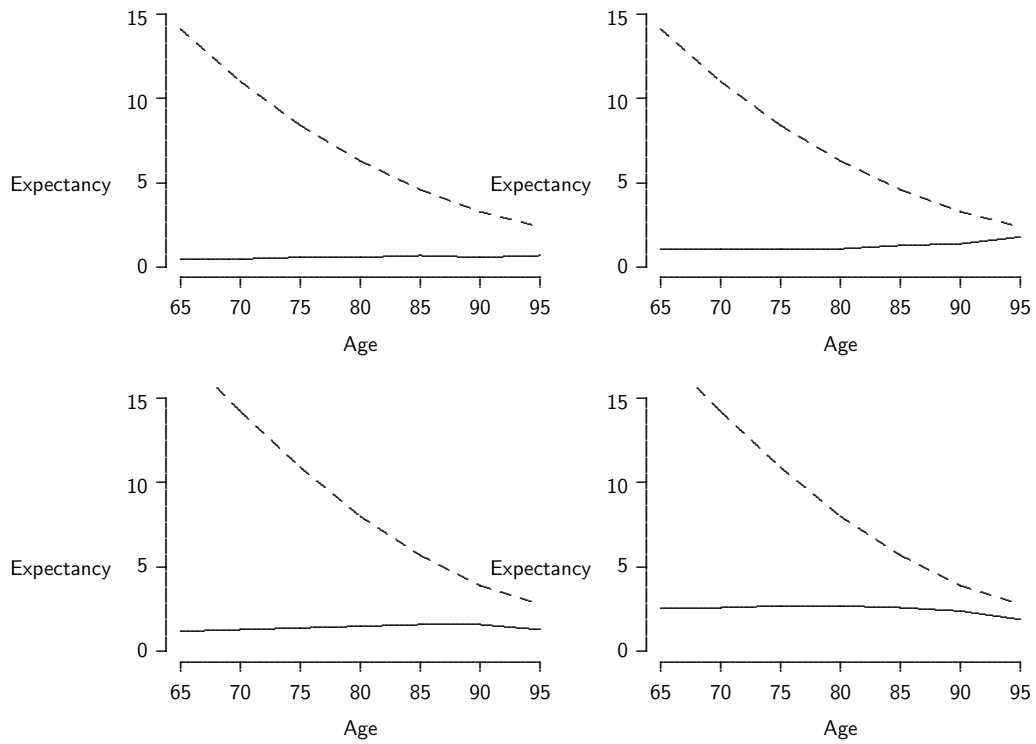
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Dementia and mortality

- Theory - relationship between prevalence, incidence and mortality
- Practical - what advice to give to patients and their carers
- Policy - healthy life expectancy



Incidence, prevalence and mortality



Top graphs men, left hand graph life expectancy and life expectancy with dementia right hand graph life expectancy and life expectancy with functional impairment

Many studies of dementia and mortality are of patient cohorts

Systematic review of community studies

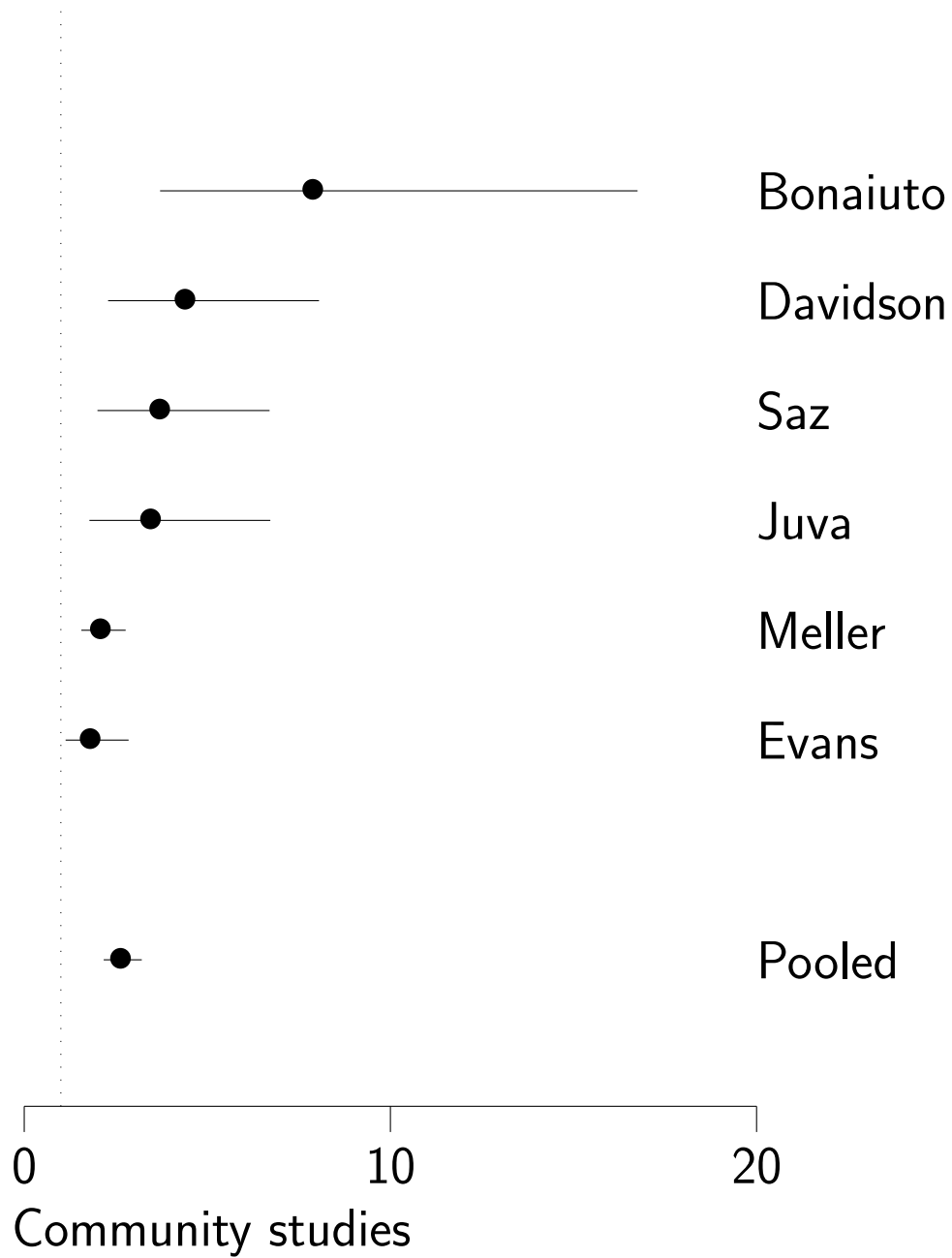
Found 68 studies of dementia or cognitive impairment and mortality using community samples

For 6 of the studies there is sufficient information in the published papers to combine age-adjusted odds ratios.

Study	OR	95% ci
Bonaiuto ^a	7.88	3.71 to 16.75
Davidson ^a	4.39	2.29 to 8.05
Saz ^b	3.7	2.0 to 6.7
Juva	3.45	1.78 to 6.72
Meller	2.08	1.56 to 2.77
Evans	1.80	1.13 to 2.85
Pooled	2.63	2.17 to 3.21

^aAdjusted for age and sex

^bAdjusted for age, sex and education



Effect	Studies	Result
AD v VaD	4	Greater for VaD
Sex	9	Women higher risk in 9 of 16 comparisons
Severity	2	From logistic regression $\chi^2_2 = 7.99$, more severe higher risk
Age	3	From logistic regression $\chi^2_1 = 3.82$, smaller risk for older

Summary of effect modifiers for mortality and dementia and depression

What do we know now?

- Elevated risk which increases with severity.
- Possibly greater for VaD and possibly less for increased age.

What do we not know?

- What they die of
- What happens for other dementias

Death certificate studies

Why have these been undertaken?

A F Jorm, A S Henderson, and P A Jacomb. Regional differences in mortality from dementia in Australia: an analysis of death certificate data. *Acta Psychiatrica Scandinavica*, 79:179–85, 1989 succinctly states 'Some researchers have attempted to circumvent the expense and difficulties of conventional prevalence studies by using mortality data derived from death certificates. Mortality data are readily available in developed countries and provide a potentially economical way of investigating regional differences with a country'

Studies vary as to whether death with or from dementia

Study	Country	Time period	Examined
Newman	Canada	1965-83	Dementia
Martyn	Eng & Wal	1968-78	Dementia
Jordan	U S	1968-73	Dementia
Flaten	Norway	1969-83	Dementia
Chandra	U S	1971, 73-78	Dementia
Forbes	Canada	1974-91	Dementia
Jorm	Australia	1979-85	Dementia, AD
Kirby	Eng & Wal	1979-96	Dementia, AD
Aylin	Eng & Wal	1979-96	Dementia, CJD
Imaizumi	Japan	1979-90	AD
Anon	U S	1979-87	AD
Hoyert	U S	1979-91	AD
Hoyert	U S	1979-96	AD
Tassinari	Italy	1980-89	Dementia
Lanska	U S	1986	Dementia
Wilkins	Canada	1990-1993	Dementia

Studies of dementia recorded on death certificates in chronological order of commencement of study period

What do they find?

- Secular change - rise (offset by decrease in deaths from senility)
- Age - rise
- Region - variation
- Sex - ?
- Race - white > black (US studies only)

Study	Age-specific rate for 70+ group ^a		
	Both	Men	Women
Imaizumi		0.28	0.30
Hoyert (96)		2.6	1.8
Chandra		2.45	1.81
Anonymous	White	2.7	
	Black	1.0	
Jordan ^b	1		
Newman		10.52	9.33
Flaten ^b		100	70
Jorm ^b	3		
		0.4 % of deaths	
Forbes		0.34 % of deaths	
Wilkins		2.4 % of deaths from	
		5.8 % of deaths with	

^aPer 100000 of population, for year nearest to 1979, and for age group which includes 70-74 years

^bInterpolated from graph in paper

Studies which examined the relationship with age, listed in order of rate

D J Lanska. Dementia mortality in the United States. Results of the 1986 National Mortality Followback Survey. *Neurology*, 50:362–7, 1998

US excluding Oregon, 89% response rate
12275/18733 with at least one facility record

	Men	Women
Facility	151.7	111.9
From dementia	19.1	16.0
With dementia	47.1	44.5
Informant	299.2	248.0
All sources	374.2	302.1

Dementia deaths per 100000

	Certs		
	From	With	Facility
Creutzfeld-Jakob	0.0	0.5	0.0
Vascular	1.9	6.0	0.1
Alcoholic	0.3	0.1	5.3
Alzheimer's	71.3	54.3	69.7
Pick's	1.4	0.5	0.0
Mixed	0.0	0.0	2.9
Other and unspecified	25.1	38.6	22.0

Percent of deaths from each source with specified diagnosis

595000 with dementia. Compare 531000 with cancer, 490000 with ischaemic heart disease, 150000 with stroke

M Ganguli and E G Rodriguez. Reporting of dementia on death certificates: a community study. *Journal of the American Geriatrics Society*, 47(7):842–9, 1999

8 year followup of community cohort aged 65 and over 527/1422 deaths and death certificates

	Study diag	
	Dementia	No dementia
Dementia	41	4
Other CNS	54	54
Other	77	297
Total	172	355

	95% ci		
Sensitivity	24	18	31
Specificity	99	97	99
Pos pred val	91	79	98
Neg pred val	92	89	94

More likely to have mention of dementia if more severe, Probable AD (Possible no increased risk) and living in a long term care institution.

Nottingham data 1995-1998 all deaths aged 15+

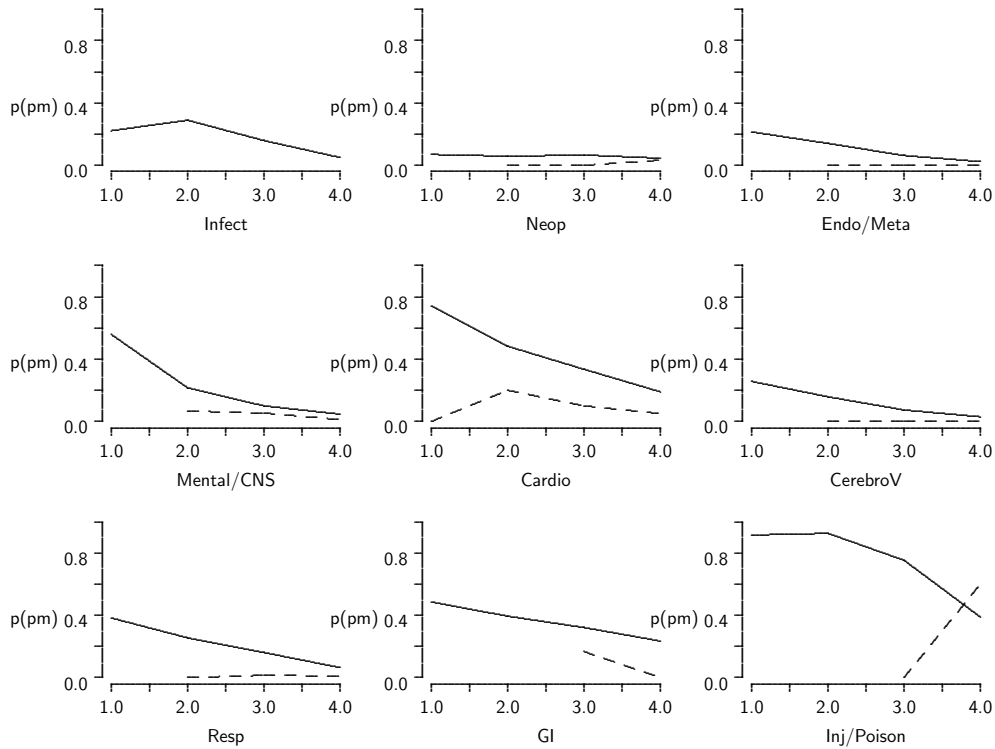
Mention of dementia (ICD 290) on death certificates

	Nott	Wilkins	
		Can	US
65-74	92/6744 = 1.4	1.8	1.3
75-84	389/9158 = 4.3	6.1	4.4
85+	532/6967 = 7.6	9.2	7.7

How many dementias would we have expected?

65-69	1.7
70-74	2.3
75-79	7.2
80-84	17.6
85+	27.3

Prevalence of dementia in Nottingham



Probability of having a post mortem for with dementia (dashed line) and without (solid line) for each of nine diagnostic categories for four age groups (1=15-50, 2=50-69, 3=70-79, 4=80 and over)

Association with causes

K Wilkins, G F Parsons, J F Gentleman, and W F Forbes. Deaths due to dementia: an analysis of multiple-cause-of-death data. *Chronic Diseases in Canada*, 20(1):26–35, 1999

Death certificate study in Canada

Mention of dementia positively associated with
Pneumonia and influenza
Conditions symptomatic of dementia

- Depression
- Parkinson's disease

Arising from effects of dementia

- Malnutrition, electrolyte imbalance, pneumonitis due to ingestion of solids/liquids, symptoms involving digestive system, inhalation or ingestion of object causing obstruction of respiratory tract or suffocation
- Skin ulcer
- Fractured neck of femur, fracture cause unspecified

Vascular disease

- Atherosclerosis
- Transient cerebral ischaemia

Other

- Epilepsy
- Osteoarthritis

Mention of dementia negatively associated with

Cancer

- Lung, digestive system, other

Heart disease

- Acute MI
- Other chronic IHD
- Cardiac dysrhythmias
- Heart failure
- Symptoms involving cardiovascular system

Respiratory

- Emphysema
- Chronic airways obstruction
- Other disease of lung

Other

- Essential hypertension
- Intracerebral haemorrhage
- Aortic aneurysm
- Chronic renal failure, renal failure unspecified
- Surgical operation as a cause of abnormal reaction or later complication

What causes are associated in Nottingham?

Positively

- Respiratory
- Cerebrovascular
- Endocrine/metabolic

Negatively

- Neoplasms

CJD in the UK

Year	Spor	Iatr	Fam	GSS ^a	vCJD	Total
1990	28	5	0	0	-	33
1991	32	1	3	0	-	36
1992	44	2	5	1	-	52
1993	38	4	2	2	-	46
1994	51	1	4	3	-	59
1995	35	4	2	3	3	47
1996	40	4	2	4	10	60
1997	59	6	4	1	10	80
1998	63	3	4	1	18	89
1999	61	6	2	0	15	84
2000	48	1	2	1	28	80

^aGerstmann-Straussler-Scheinker

It is assumed that ingestion of infected material occurred between 1980 and 1989

Age distribution of onsets

Age	N
5-9	0
10-14	3
15-19	16
20-24	23
25-29	23
30-34	13
35-39	10
40-44	3
45-49	1
50-54	4
55-59	0
60-64	0
65-69	0
70-74	1

Mean age 28 years, only 6 out of 90 deaths older than 50 compared with 93% of sporadic CJD

What are the problems in surveillance?

0 out of Upper 95%
 confidence limit

100	0.0362167
1000	0.0036821
10000	0.0003688
100000	0.0000369
10^n	$\simeq 3.0 \times 10^{-n}$

The prevalence of sporadic CJD is approximately 0.5×10^{-6} to 1.0×10^{-6}

Various studies have given us substantial information about:

- The relationship between dementia and mortality
- The value of death certificate studies
- The correlates of death from and with dementia

Despite all this it seems difficult to see how a surveillance operation in older people can be mounted just using routine data because

- Few deaths come to post mortem
- Dementia deaths seem less likely to have a post mortem