Research shows huge spike in MND risk among former international players

By Mitch Phillips

REUTERS®

Rugby authorities urged to cut out contact training to reduce the risk of Motor Neurone Disease

Irish Examiner

Study found that ex-rugby players had more than twice the risk of a neuro-degenerative disease, and a 15-times higher risk of a motor neurone disease diagnosis.

Mail Online

Rugby players are up to 15 TIMES more likely to get deadly brain diseases like dementia, warns landmark study into 'sport's silent scandal'

NewScientist

International rugby union players face higher risk of dementia

Men who played rugby union for Scotland are much more likely to develop dementia, Parkinson's disease and motor neurone disease than the rest of the population

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BBC Breakfast ✔
@BBCBreakfast · Follow

A leading expert has called for "immediate research" after a study suggested that elite rugby union players could be at increased risk of brain conditions like motor neurone disease.
Professor Willie Stewart led the research and spoke to #BBCBreakfast
bbc.co.uk/news/uk-scotla...

Watch on Twitter

06:19

6:30 AM · Oct 5, 2022

The Guardian
News website of the year

Rugby urged to cut matches as study finds players' risk of MND is 15 times higher

Rugby union

- Study also finds increased risks of dementia and Parkinson's
- Consultant says contact training 'should be a thing of the past'

sky sports

Study finds higher neurodegenerative disease risk for international rugby players; Dementia, motor neurone disease more likely

Retired Pro Rugby Players Face More Than Double the Odds for Brain Illnesses

U.S. News WORLD REPORT

'Fantasy' Study:

50 YEARS

-Counterfactual outcomes or RCT
-Time travel
-Switch-on/off head impacts
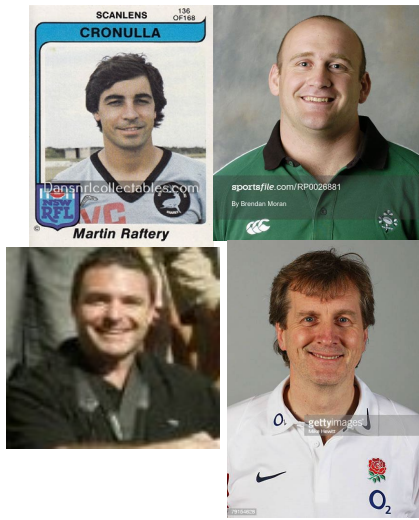
'Best possible' Study:
Internally valid retrospective cohort

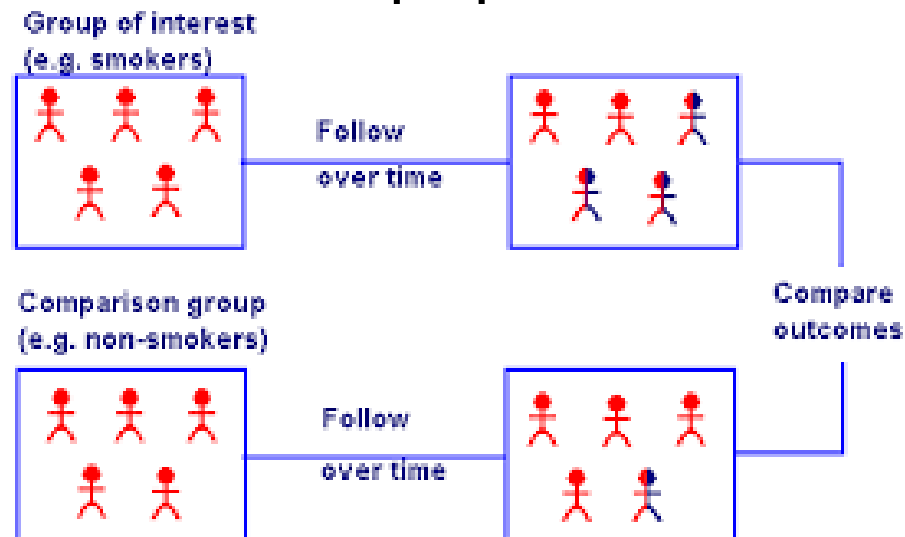**All rugby players:**
-Accurately identify all rugby players
-Accurately measure head impacts
-Accurately measure all confounders
-Accurately measure outcomes

Controls:
-Accurately identify representative controls
-Accurately measure head impacts
-Accurately measure all confounders
-Accurately measure outcomes

Group of interest
(e.g. smokers)

Follow over time

Comparison group
(e.g. non-smokers)

Follow over time

Compare outcomes

-Control group is identical to rugby group, except for head impacts
-Causal graphs
-Matching, restriction
-Regression, propensity scores, etc

Critical Appraisal

Carefully and systematically examining research to judge its trustworthiness, its value and relevance

1 What was done?

2 What were the results?

3 Can we believe the results?

4 Do the results apply to us?

5 What does this study add to what is known already?

6 What's the bottom line?

What was done?

Retrospective Cohort Study

EXPOSED
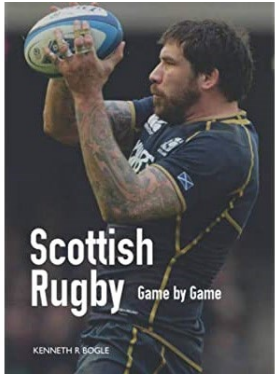
Male Scottish internationals aged 30+ @2020.

CONTROLS

-3:1 population controls
-Matched on age, sex, year of birth, socioeconomic status

Median 32 years follow up to Dec 2020

-Mortality:
- Death certificates

-Neurodegenerative disease (ICD 9-10):
- Hospitalisations [Scottish Morbidity Record]
- Dispensed prescriptions [Prescribing Information System]
- Death certificates
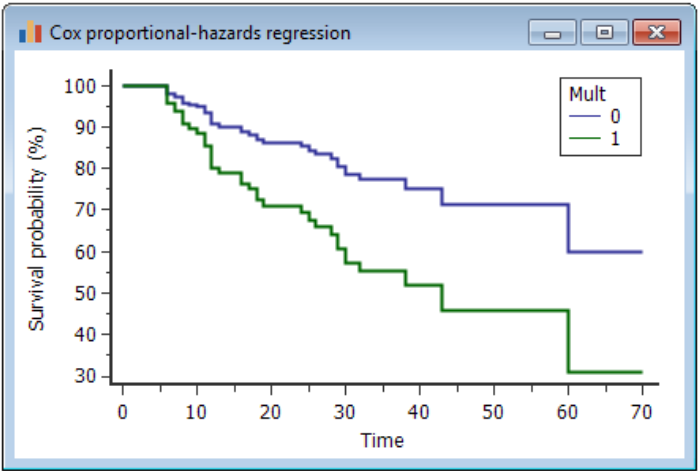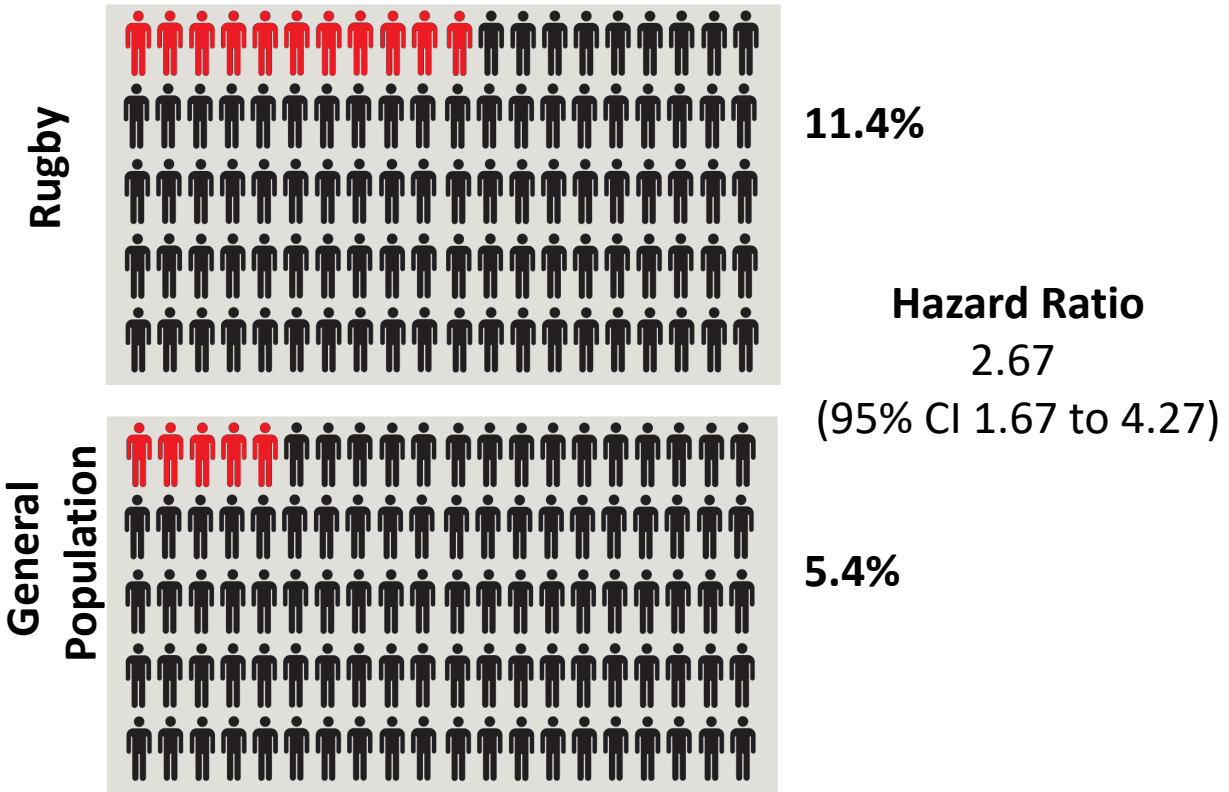
Neurodegenerative disease

Rugby — 11.4%

General Population — 5.4%

Hazard Ratio
2.67
(95% CI 1.67 to 4.27)

Neurodegenerative disease	HR/OR (95% CI)
Dementia (NOS)	2.17 (1.26 to 3.72)
Parkinson's disease	3.04 (1.51 to 6.10)
MND/ALS‡	15.17 (2.10 to 178.96)

3 Can we believe the results?

'Systematic errors that result in an incorrect estimate of the association between exposure and the health outcome'

SELECTION BIAS

INFORMATION BIAS

CONFOUNDING

- Which biases DISTORSIONI?
- How likely?
- Direction?
- Magnitude?

3 Can we believe the results?

Analysed subjects systematically differ from the intended study population
- *'37% of our potential cohort of former international rugby players could not be matched CORRISPONDONO to their health records'*
- Migration/loss to follow up (informative right censoring)?

Utility of Scottish morbidity and mortality data for epidemiological studies of motor neuron disease

A M Chancellor [1], R J Swingler, H Fraser, J A Clarke, C P Warlow

Conclusions: Coded hospital discharge data are an inaccurate record of a diagnosis of MND and cannot, in their present form, be used as a reliable measure of disease incidence in Scotland.

Study measurements (exposure, confounders, outcomes) differs systematically from the truth
- Inaccurate outcomes - Death certificates, Scottish Morbidity Record, ICD 9/10 codes

-Likelihood – Probable
-Magnitude – Uncertain, but possibly small
-Direction – Uncertain, likely to underestimate risk?

CONFOUNDING

Bias of the estimated effect of an exposure on an outcome due to the presence of a common cause of the exposure and the outcome

Confounding Variable
Heat Wave

Independent Variable
Ice Cream Sales

Dependent Variable
Shark Attacks

sciencenotes.org

Confounding Variable
Alcohol

Independent Variable
Playing rugby

Dependent Variable
Dementia

-Age, socioeconomic status controlled for by matching.
-Other confounders not controlled

-Likelihood – Very likely
-Magnitude – Uncertain, but possibly large
-Direction – Uncertain, but likely to exaggerate risk
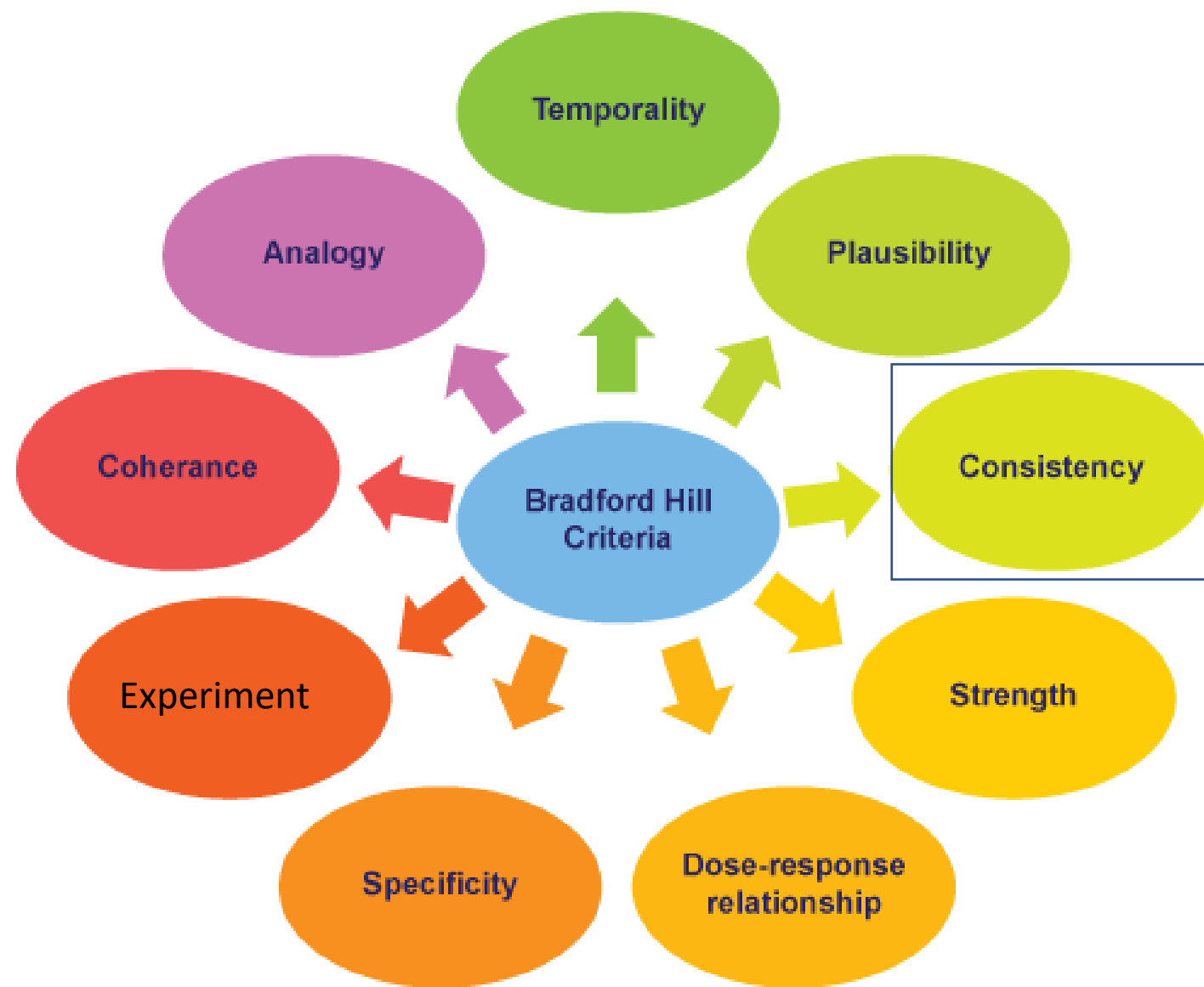
- Many previous studies
- Similar study designs
- Similar results in elite athletes
- No association in amateus

Bradford-Hill Criteria: Viewpoints to determine if causation CAUSALITA' can be deduce

What's the bottom line?

THE BOTTOM LINE

What we want to know:
- Do head impacts in rugby cause neurogenerative disease?
- If so, what is the absolute increase in risk due to head impacts?

What we can say from this study:
- Do head impacts in rugby cause neurodegenerative disease? **We don't know**
- If so, what is the absolute increase in risk due to head impacts? **We don't know**

However:
- (Some) NDD is (probably?) possibly more common in Rugby internationals compared to general population controls
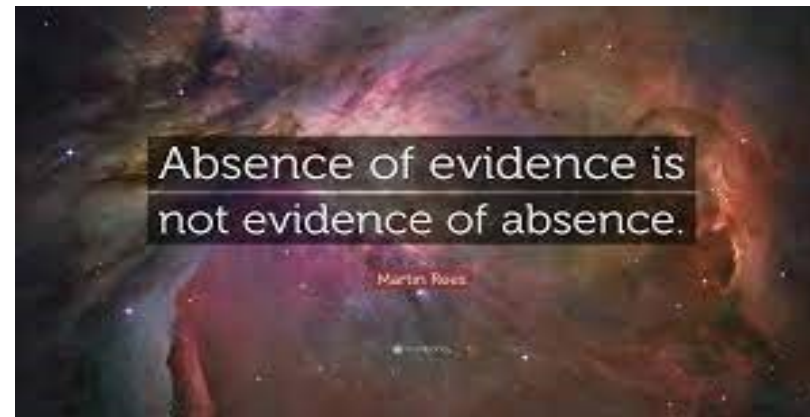- Cannot say if this is due to head impacts/concussions, or another reason e.g. alcohol

CORRELATION **DOES NOT** IMPLY CAUSATION

Correlation

Causality

Vs

Absence of evidence is not evidence of absence.

Martin Rees

Table 1 Cohort demographic information

	Former international rugby players (n=412)	Matched population comparison group (n=1236)
	Number (%)	
SIMD quintile		
1	11 (2.7)	33 (2.7)
2	41 (10.0)	123 (10.0)
3	66 (16.0)	198 (16.0)
4	127 (30.8)	381 (30.8)
5	167 (40.5)	501 (40.5)
Player position		
Forward	222 (53.9)	N/A
Front row	96 (23.3)	N/A
Lock	40 (9.7)	N/A
Back row	86 (20.9)	N/A
Backs	190 (46.1)	N/A
Half backs	58 (14.1)	N/A
Three quarters	111 (26.9)	N/A
Fullback	21 (5.1)	N/A
Year of birth		
1900–1919	47 (11.5)	141 (11.5)
1920–1939	91 (22.1)	273 (22.1)
1940–1959	89 (21.6)	267 (21.6)
1960–1979	109 (26.4)	327 (26.4)
1980–1990	76 (18.5)	228 (18.5)

N/A, not applicable; SIMD, Scottish Index of Multiple Deprivation.
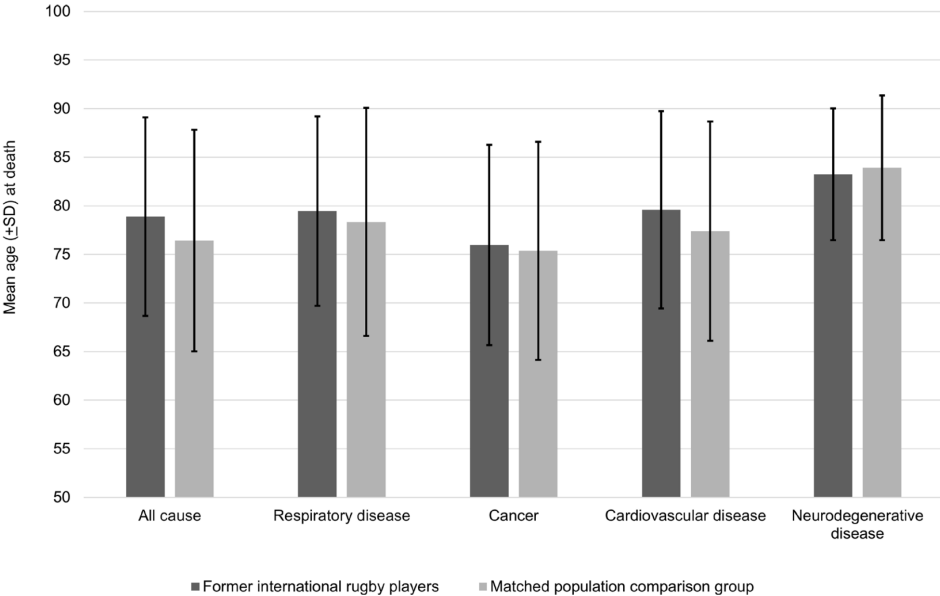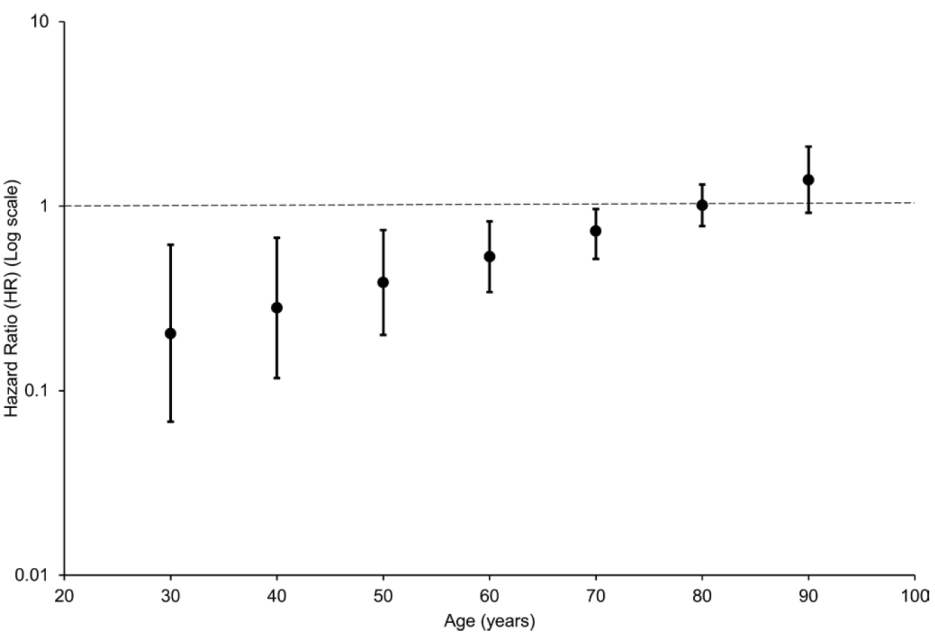
2 What were the results?

Mortality

Primary cause of death	Former international rugby players (n=412)	Matched population comparison group (n=1236)	HR (95% CI)
Any cause†	121 (29.4%)	381 (30.8%)	0.86 (0.68 to 1.08)
Cardiovascular disease	54 (13.1%)	155 (12.5%)	0.89 (0.63 to 1.28)
Cancer	30 (7.3%)	108 (8.7%)	0.77 (0.50 to 1.19)
Neurodegenerative disease	11 (2.7%)	18 (1.5%)	2.43 (0.92 to 6.42)
Respiratory disease	11 (2.7%)	43 (3.5%)	0.62 (0.28 to 1.39)

Neurodegenerative disease

	Former international rugby players (n=412)	Matched population comparison group (n=1236)	HR (95% CI)
All NDD	47 (11.4%)	67 (5.4%)	2.67 (1.67 to 4.27)
Deaths	32 (7.8%)	39 (3.2%)	2.60 (1.44 to 4.70)
Hospitalisation	21 (5.1%)	37 (3.0%)	2.29 (1.19 to 4.41)
Prescribing NDD	24 (5.8%)	28 (2.3%)	4.59 (2.14 to 9.82)

Neurodegenerative disease	HR/OR (95% CI)
Dementia (NOS)	2.17 (1.26 to 3.72)
Parkinson's disease	3.04 (1.51 to 6.10)
MND/ALS‡	15.17 (2.10 to 178.96)

Supplementary Table 1: ICD-9 and ICD-10 codes for outcomes assessed.

	ICD-9	ICD-10
Neurodegenerative disease	290.0 to .4; 294.1 & .2; 331.0 to .2 & .6 to .9; 332; 335.2	F01 to F03; G12.2; G20; G21; G23.1 to .3, .8 & .9; G30; G31
Dementia, not otherwise specified	290.0 to .4; 294.1 & .2; 331.0 to .2 & .6 to .9;	F01 to F03; G23.1 to .3; G30; G31
Motor neuron disease/ Amyotrophic lateral sclerosis	335.2	G12.2
Parkinson's disease	332	G20; G21; G23.8 & .9
Cardiovascular disease	390 to 459	I00 to I99
Respiratory disease	460 to 519	J00 to J99
Cancer	140 to 239	C00 to D49

BNF section	Drugs
4.9.1	Apomorphine hydrochloride Apomorphine hydrochloride hemihydrate Carbidopa Co-beneldopa (Benserazide/levodopa) Co-careldopa (Carbidopa/levodopa) Entacapone Levodopa Levodopa/carbidopa/entacapone Opicapone Rasagiline mesylate Safinamide Selegiline hydrochloride Tolcapone
4.9.2	Orphenadrine hydrochloride Trihexyphenidyl hydrochloride
4.9.3	Riluzole
4.11	Donepezil hydrochloride Galantamine Idebenone Memantine hydrochloride Rivastigmine