

Supplementary Table 1: Inclusion codes for UK Biobank dystonia cohort

Dystonia subtype	ICD-10 Code	Read Code	Read Code Description
Idiopathic torsion dystonia		F136.	Idiopathic torsion dystonia
		F137.	Symptomatic torsion dystonia
		F137y	Symptomatic torsion dystonia OS
		F137z	Symptomatic torsion dystonia NOS
		F138.	Fragment of torsion dystonia
		F138z	Torsion dystonia fragment NOS
Idiopathic nonfamilial dystonia	G24.2		
Idiopathic familial dystonia	G24.1	F1360	Idiopathic familial dystonia
Cervical dystonia	G24.3	F1382	Spasmodic torticollis
		16A3.	Torticollis - symptom
		N135.	Torticollis unspecified
		N1350	Intermittent torticollis
		N135z	Torticollis NOS
Idiopathic Orofacial dystonia	G24.4		
Blepharospasm	G24.5	F1380	Blepharospasm
Writer's cramp		F1383	Organic Writer's cramp
Myoclonic dystonia		F13B.	Myoclonic dystonia
Segawa syndrome		F13C.	Segawa syndrome
Other	G24.8	Fyu24	[X]Other dystonia
Unspecified	G24.9	Fyu2A	[X]Dystonia, unspecified
		F13X.	Dystonia, unspecified
Tremor		1B22.	Has a tremor

Supplementary Table 2: Exclusion codes for UK Biobank cohorts

Clinical Terminology	Read code	ICD-10 code
<i>Dystonia</i>		
Drug induced dystonia	F1312	G24.0
<i>Parkinson's Disease and secondary parkinsonism</i>		
Parkinson's Disease	F12.	G20
Parkinson's disease NOS	F12z.	
O/E Parkinson gait	2994.	
O/E - Parkinson posture	2987.	
O/E - Parkinsonian tremor	297A.	
Dementia in Parkinson's disease	Eu023	
FH: Parkinsonism	129Z.	
Secondary parkinsonism due to other external agents	F12W.	G21.2
Parkinsonism secondary to drugs	F121.	G21.1
Malignant neuroleptic syndrome	F122.	G21.0
Postencephalitic parkinsonism	F123.	G21.3
Vascular parkinsonism	F124.	G21.4
Syphilitic parkinsonism	A94y1	
Secondary parkinsonism, unspecified	F12X.	G21.9
Secondary parkinsonism		G21
Other secondary parkinsonism		G21.8
Parkinsonism in diseases EC		G22
History of Parkinson's disease	147F.	
Cerebral degeneration in Parkinson's disease	F11x9	
<i>Huntington's Disease</i>		G10
Huntington's chorea	F134.	
Dementia in Huntington's disease	Eu022	
FH: Huntington's chorea	1291.	
<i>Chorea</i>		
Other choreas	F135.	G255
Hemiballismus	F1350	
Paroxysmal chorea-athetosis	F1351	
Drug-induced chorea	F1352	G254
Other choreas NOS	F135z	
<i>Myoclonus</i>		
Myoclonus	F132.	G253

<i>Ataxia</i>		
Cerebral ataxia	F11y1	
Cerebellar ataxia NOS	F143.	
Cerebellar ataxia in diseases EC	F144.	
Cerebellar ataxia due to alcoholism	F1440	
Cerebellar ataxia due to myxoedema	F1441	
Cerebellar ataxia due to neoplasia	F1442	
Cerebellar ataxia in disease NOS	F144z	
Congenital nonprogressive ataxia	F145.	
Early onset cerebellar ataxia with hypogonadism	F146.	
Friedreich's ataxia	F140.	
Spinocerebellar disease	F14..	
Spinocerebellar disease NOS	F14z.	
Other spinocerebellar diseases	F14y.	
Hereditary ataxia		G11
<i>Degenerative diseases of the basal ganglia</i>		G23
Other basal ganglia degenerative diseases	F130.	
Dejerine-Thomas syndrome	F1300	
Hallervorden-Spatz disease	F1301	G23.0
Striatonigral degeneration	F1302	G23.2
Parkinsonism with orthostatic hypotension	F1303	
Progressive supranuclear ophthalmoplegia	F1304	G23.1
Shy-Drager syndrome	F1305	
Aicardi Goutieres syndrome	F1306	
Other basal ganliga degenerative diseases NOS	F130z	
Steele-Richardson-Olszewski syndrome	F24y2	
Other specified degenerative diseases of basal ganglia		G23.8
Degenerative disease of basal ganglia, unspecified		G23.9
<i>Extrapyramidal diseases and movement disorders</i>		
Stiff-man syndrome	F13z1	
Restless leg syndrome	F13z2	
Akinetic rigid syndrome	F13z3	
Hyperekplexia	F13z4	
Neuroferritinopathy	F13z6	
Extrapyramidal disease and abnormal movement disorder NOS	F13zz	
Other/unspecified extrapyramidal/abnormal movement disorders	F139.	
Paroxysmal non-kinesigenic dyskinesia	F1390	

Paroxysmal kinesigenic dyskinesia	F1391	
<i>Essential and other specified forms of tremor</i>		
Drug-induced tremor	F1312	G25.1
Benign essential tremor	F1310	
<i>Other cerebral degenerations</i>		
Alzheimer's disease	F110.	
Alzheimer's disease with early onset	F1100	
Alzheimer's disease with late onset	F1101	
Pick's disease	F111.	
Senile degeneration of brain	F112.	
Lewy body disease	F116.	
Frontotemporal degeneration	F118.	
Corticobasal degeneration	F11y2	
<i>Hereditary and degenerative diseases of the CNS OS</i>		
Fragile X associated tremor ataxia syndrome	F1y0.	
Hereditary and degenerative diseases of the central nervous system NOS	F1z..	
<i>Demyelinating diseases of the central nervous system</i>		
Niemann-Pick disease	C3272	
Progressive supranuclear palsy	F24y0	
Wilson's disease	C3510	
Multiple system atrophy	F174.	
Multiple system atrophy, cerebellar variant	F1740	G23.3
Multiple system atrophy, Parkinson variant	F1741	
<i>Tics/tic disorders</i>		
Gilles de la Tourette's disorder	E2723	F95
[X]Combined vocal and multiple motor tic disorder [de la Tourette]	Eu952	
Tic - symptom	1B24.	
O/E - spasm/tic	2974.	
Tic disorder unspecified	E2720	
Transient childhood tic	E2721	
Chronic motor tic disorder	E2722	
Tic NOS	E272z	
[X]Tic disorders	Eu95.	
[X]Transient tic disorder	Eu950	
[X]Chronic motor or vocal tic disorder	Eu951	
[X]Involuntary excessive blinking	Eu953	
[X]Other tic disorders	Eu95y	

[X]Tic disorder, unspecified	Eu95z	
Tics	E272.	
Tics of organic origin	F133.	
<i>Other degenerative diseases of nervous system, NEC</i>		G31
<i>Multiple Sclerosis</i>		G35
<i>Other acute disseminated demyelination</i>		G36
Neuromyelitis optica [Devic]		G36.0
Other specified acute disseminated demyelination		G36.8
Acute disseminated demyelination, unspecified		G36.9
<i>Other demyelinating diseases of central nervous system</i>		G37
<i>Infantile cerebral palsy</i>		G80
Spastic cerebral palsy		G80.0
Spastic diplegia		G80.1
Infantile hemiplegia		G80.2
Dyskinetic cerebral palsy		G80.3
Other infantile cerebral palsy		G80.8
Infantile cerebral palsy, unspecified		G80.9

Key: EC; Elsewhere Classified, FH; Family History, NEC; Not Elsewhere Classified, NOS; Not Otherwise Specified, O/E; On Examination

Table 3: Scores for ICD-10 psychiatric components

	Dystonia		Cervical Dystonia		Blepharospasm		Tremor		Dystonia, Unspecified		Control
		P-value		P-value		P-value		P-value		P-value	
ICD-10 Diagnoses - Mental and Behavioural Disorders											
<i>Schizophrenia, schizotypal and delusional disorders</i>											
Paranoid Schizophrenia	2 (0.1%)	1	0	-	0	-	0	-	2 (1.3%)	0.242	16 (0.06%)
Catatonic Schizophrenia	1 (0.06%)	1	0	-	1 (0.8%)	0.190	0	-	0	-	1 (0.004%)
Schizophrenia Unspecified	5 (0.3%)	1	1 (0.1%)	1	1 (0.8%)	1	0	-	3 (1.9%)	0.037*	27 (0.1%)
Delusional Disorder	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	13 (0.05%)
Schizoaffective Disorder, manic	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.545	1 (0.004%)
Schizoaffective, Unspecified	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	6 (0.02%)
<i>Mood [affective] disorders</i>											
Manic episode, unspecified	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	4 (0.02%)
Bipolar affective disorder, current hypomanic	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	8 (0.03%)
Bipolar Affective Disorder Current, No Psychosis	2 (0.1%)	1	0	-	0	-	0	-	2 (1.3%)	0.089	9 (0.04%)
Bipolar Affective Disorder Current with Mild/Moderate Depression	2 (0.1%)	1	0	-	0	-	1 (0.7%)	1	1 (0.6%)	0.815	2 (0.008%)
Bipolar Affective Current, mixed	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	4 (0.02%)
Bipolar affective disorder, currently in remission	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	12 (0.05%)
Bipolar Affective Disorder, Unspecified	16 (1.0%)	0.002**	2 (0.3%)	1	0	-	10 (7.5%)	1	4 (2.6%)	0.044*	67 (0.3%)
Moderate Depressive episode	5 (0.3%)	0.883	2 (0.3%)	1	0	-	2 (1.5%)	1	0	-	19 (0.08%)
Severe depressive episode	3 (0.2%)	1	2 (0.3%)	1	0	-	0	-	1 (0.6%)	1	23 (0.09%)
Severe Depressive episode, psychotic	2 (0.1%)	1	0	-	0	-	0	-	1 (0.6%)	1	30 (0.1%)
Other Depressive episodes	1 (0.06%)	1	1 (0.1%)	1	0	-	0	-	0	-	2 (0.008%)
Depressive episode, unspecified	2 (0.1%)	1	0	-	0	-	0	-	1 (0.6%)	1	30 (0.1%)
Recurrent depressive disorder, current episode mild	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	5 (0.02%)
Recurrent depressive disorder, current episode moderate	2 (0.1%)	1	0	-	0	-	0	-	1 (0.6%)	1	31 (0.1%)
Recurrent depressive disorder, unspecified	4 (0.3%)	1	0	-	0	-	0	-	4 (2.6%)	0.005**	37 (0.2%)
<i>Neurotic, stress-related and somatoform disorders</i>											
Specific (isolated) phobias	4 (0.3%)	1	3 (0.4%)	1	0	-	1 (0.7%)	1	0	-	55 (0.2%)
Other phobic anxiety disorders	1 (0.06%)	1	0	-	1 (0.8%)	0.284	0	-	0	-	2 (0.008%)
Panic disorder [episodic paroxysmal anxiety]	8 (0.5%)	1	2 (0.3%)	1	1 (0.8%)	1	5 (3.7%)	1	0	-	73 (0.3%)

Generalised anxiety disorder	2 (0.1%)	1	0	-	0	-	1 (0.7%)	1	1 (0.6%)	1	22 (0.09%)
Mixed Anxiety and Depressive Disorder	12 (0.8%)	1	1 (0.1%)	1	2 (1.5%)	1	5 (3.7%)	1	3 (1.9%)	1	149 (0.6%)
Other specified anxiety disorders	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	1 (0.004%)
Anxiety Disorder, unspecified	44 (2.8%)	0.197	11 (1.4%)	1	5 (3.8%)	1	16 (11.9%)	0.870	12 (7.8%)	7.32x10 ⁻⁴ ***	418 (1.7%)
Obsessive-compulsive disorder, unspecified	2 (0.1%)	1	1 (0.1%)	1	0	-	1 (0.7%)	1	0	-	10 (0.04%)
Acute stress reaction	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	10 (0.04%)
Posttraumatic stress disorder	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	12 (0.05%)
Adjustment Disorder	2 (0.1%)	1	0	-	1 (0.8%)	1	1 (0.7%)	1	0	-	13 (0.05%)
Reaction to severe stress, unspecified	2 (0.1%)	1	0	-	0	-	2 (1.5%)	1	0	-	3 (0.01%)
Dissociative Motor Disorder	3 (0.2%)	1	0	-	0	-	0	-	2 (1.3%)	0.074	8 (0.03%)
Dissociative [conversion] disorder, unspecified	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	6 (0.02%)
Hypochondriacal disorder	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.815	2 (0.008%)
Somatoform autonomic dysfunction	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	5 (0.02%)
Other Somatoform Disorder	5 (0.3%)	1	2 (0.3%)	1	0	1	3 (2.2%)	1	0	-	20 (0.08%)
Neurasthenia	1 (0.06%)	1	1 (0.1%)	1	0	-	0	-	0	-	5 (0.02%)
Neurotic disorder, unspecified	1 (0.06%)	1	0	-	1 (0.8%)	0.284	0	-	0	-	2 (0.008%)
<i>Organic, including symptomatic, mental disorders</i>											
Dementia in Alzheimer's disease, unspecified	3 (0.2%)	1	0	-	0	-	1 (0.7%)	1	2 (1.3%)	1	41 (0.2%)
Vascular dementia, unspecified	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	18 (0.07%)
Unspecified dementia	4 (0.3%)	1	0	-	3 (2.3%)	0.124	0	-	1 (0.6%)	1	70 (0.3%)
Delirium, unspecified	4 (0.3%)	1	0	-	1 (0.8%)	1	1 (0.7%)	1	2 (1.3%)	1	120 (0.5%)
Mild cognitive disorder	3 (0.2%)	1	2 (0.3%)	1	0	-	1 (0.7%)	1	0	-	20 (0.08%)
<i>Mental and behavioural disorders due to psychoactive substance use</i>											
Acute intoxication – Alcohol	4 (0.3%)	1	1 (0.1%)	1	0	-	3 (2.2%)	1	0	1	159 (0.6%)
Harmful use - Alcohol	14 (0.9%)	1	4 (0.5%)	1	1 (0.8%)	1	5 (3.7%)	1	4 (2.6%)	1	227 (0.9%)
Dependence syndrome – Alcohol	9 (0.6%)	1	2 (0.3%)	1	1 (0.8%)	1	3 (2.2%)	1	3 (1.9%)	1	118 (0.5%)
Withdrawal state – Alcohol	5 (0.3%)	1	0	-	1 (0.8%)	1	2 (1.5%)	1	2 (1.3%)	1	42 (0.2%)
Withdrawal state with delirium - Alcohol	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	5 (0.02%)
Psychotic disorder due to alcohol use	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	1 (0.004%)
Harmful use - Cannabinoids	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	4 (0.02%)
Dependence syndrome – Hypnotics	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.815	2 (0.008%)
Withdrawal state - Hypnotics	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.815	2 (0.008%)
Withdrawal state with delirium - hypnotics	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.545	1 (0.004%)

Unspecified mental and behavioural disorder due to hypnotics use	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	1 (0.004%)
Acute intoxication - Tobacco	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	1 (0.004%)
Harmful use – Tobacco	79 (5.0%)	0.526	26 (3.4%)	1	9 (6.7%)	1	27 (20.1%)	1	17 (11.0%)	0.003 **	903 (3.7%)
Dependence syndrome - Tobacco	4 (0.3%)	1	1 (0.1%)	1	1 (0.8%)	1	1 (0.7%)	1	1 (0.6%)	1	52 (0.2%)
Unspecified mental and behavioural disorder due to tobacco use	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.545	1 (0.004%)
<i>Behavioural syndromes associated with physiological disturbances and physical factors</i>											
Anorexia nervosa	1 (0.06%)	1	1 (0.1%)	1	0	-	0	-	0	-	6 (0.02%)
Bulimia nervosa	1 (0.06%)	1	0	-	0	-	1 (0.7%)	1	0	-	1 (0.004%)
Failure of genital response	2 (0.1%)	1	0	-	1 (0.8%)	1	1 (0.7%)	1	0	-	20 (0.08%)
Unspecified sexual dysfunction, not caused by organic disorder or disease	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.545	1 (0.004%)
<i>Disorders of adult personality and behaviour</i>											
Emotionally unstable personality disorder	2 (0.1%)	1	0	-	0	-	0	-	2 (1.3%)	0.298	18
Anxious [avoidant] personality disorder	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	0.545	1 (0.004%)
Personality disorder, unspecified	1 (0.06%)	1	0	-	0	-	0	-	1 (0.6%)	1	20 (0.08%)
<i>Disorders of psychological development</i>											
Asperger's syndrome	2 (0.1%)	1	0	-	2 (1.5%)	0.003**	0	-	0	-	2 (0.008%)
<i>Other behavioural and emotional disorders with onset usually occurring in childhood and adolescence</i>											
Stuttering [stammering]	2 (0.1%)	0.725	0	-	0	-	0	-	2 (1.3%)	0.005**	1 (0.004%)
<i>Unspecified mental disorder</i>											
Mental disorder, not otherwise specified	2 (0.1%)	1	0	-	1 (0.8%)	1	0	-	1 (0.6%)	1	10 (0.04%)

Legend: P-values are all vs control and are represented as post Bonferroni correction for multiple comparisons, *p<0.05; **p<0.01; ***p<0.001. ICD-10: International Classification of Diseases.