

Physical Disability Trajectories after Chronic Conditions: a Retrospective Cohort Study in Taiwan



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Background

- Disability is one of the chronic disease's complication and also accounts for vast majority of healthcare expenditure.
- Previous studies have explored the effect of chronic conditions on physical disability, but little is known for the levels and rates of change in physical disability after chronic condition diagnosis in middle-aged and older adults in Asian population.

Objectives

- To ascertain the average levels of and rates of change in development of disability after the diagnosis of different chronic conditions in Taiwanese cohort, and examine the roles of socio-demographic and health-related correlates in different chronic conditions.

Materials and Methods

- We used datasets in the 1996, 1999, 2003, 2007 and 2011 interview waves from the Taiwan Longitudinal Study on Aging (TLSA), which representing Taiwanese cohort aged over 50 (n=5131).
- Self-reported chronic conditions in 1996 and newly diagnosed chronic conditions during follow-ups were included for final analysis, yielding sampling of 1,435 participants with hypertension, 570 with diabetes mellitus, 915 with heart diseases, 277 with stroke, 192 with cancer, 614 with lung diseases and 1,193 with arthritis.
- Covariates: age at initial diagnosis, gender and education level, number of comorbidity and depression status.
- Physical disability scores: sum of 17 dichotomous scores for the ADL, IADL and strength and mobility activities.
- Multilevel modeling (MLM) was used for depicting physical disability trajectories due to its flexibility for managing missing data and capacity to control for time-varying covariates.
- Analytical model :
 - Model 0 : Disease duration and (disease duration)²
 - Model 1 : Model 0 + age at diagnosis, gender, education level
 - Model 2 : Model 1 + number of comorbidities over time
 - Model 3 : Model 2 + depression status over time

Results

- Among the seven chronic conditions we examined, the result showed that (1) physical disability score is highest in stroke ($\beta_{\text{stroke}} = 8.104$), followed by cancer ($\beta_{\text{cancer}} = 3.693$) and diabetes ($\beta_{\text{diabetes}} = 2.887$) at initial disease diagnosis. (2) the linear rate of change of physical disability after disease diagnosis is highest in stroke ($\beta_{\text{stroke*time}} = 0.203$), followed by lung disease ($\beta_{\text{lung disease*time}} = 0.200$) and heart disease ($\beta_{\text{heart disease*time}} = 0.155$). (3) the quadratic rate of change of physical disability after disease diagnosis is highest in diabetes ($\beta_{\text{diabetes*time}^2} = 0.014$), followed by cancer ($\beta_{\text{cancer*time}^2} = 0.013$) and hypertension ($\beta_{\text{hypertension*time}^2} = 0.010$).
- After controlling for socio-demographic and comorbidity, depression status accounts for 39.9-73.6% and 37.9-100% of the variances in physical disability intercept and change and over time.

Table 1. Sample socio-demographics of adults with and without the selected seven chronic conditions, TLSA 1996

	Hypertension		Heart disease		Stroke		Diabetes		Cancer		Lung disease		Arthritis	
	No n=3,787	Yes n=1,344	No n=4,388	Yes n=743	No n=4,898	Yes n=233	No n=4,572	Yes n=559	No n=5,063	Yes n=68	No n=4,634	Yes n=497	No n=4,207	Yes n=924
Age (years) (Mean/SD)	65.50 (9.60)	68.0 (8.77)	65.60 (9.55)	69.58 (8.10)	65.97 (9.47)	70.44 (7.96)	66.07 (9.59)	67.05 (8.24)	66.17 (9.45)	66.94 (9.59)	65.82 (9.45)	69.55 (8.84)	65.74 (9.51)	68.19 (8.93)
Age (%)														
50-64	45.8	32.2	45.3	24.2	43.2	21.5	42.9	37.0	42.3	36.8	44.1	25.4	44.6	31.6
65-74	35.9	45.9	36.5	50.5	38.0	49.8	37.7	45.6	38.5	44.1	37.8	45.3	36.9	46.1
≥75	18.3	21.9	18.2	25.3	18.7	28.8	19.4	17.4	19.2	19.1	18.1	29.4	18.5	22.3
Gender (%)														
Men	55.5	49.1	55.1	46.0	53.2	66.1	54.6	47.4	53.8	55.9	52.5	65.79	56.8	40.3
Women	44.6	50.9	44.9	54.0	46.8	33.9	45.4	52.6	46.2	44.1	47.5	34.21	43.2	59.7
Education status (%)														
Without education	32.3	33.6	31.5	39.0	32.6	33.5	32.1	36.7	32.6	30.9	32.8	30.8	31.0	39.8
With education	67.7	66.4	68.5	61.0	67.4	66.5	67.9	63.3	67.4	69.1	67.2	69.2	69.0	60.2
Number of comorbidity (Mean/SD)	0.46 (0.71)	0.96 (0.98)	0.60 (0.78)	1.33 (1.13)	0.77 (0.95)	1.55 (1.15)	0.70 (0.90)	1.10 (1.11)	0.83 (1.01)	1.22 (1.23)	0.71 (0.91)	1.13 (1.15)	0.61 (0.85)	0.95 (1.03)
Depression status (%)														
Without depression	79.5	73.1	80.0	64.9	78.6	57.1	78.9	69.0	78.0	61.0	79.5	61.3	80.6	65.7
With depression	20.5	26.9	20.0	35.1	21.4	42.9	21.1	31.1	22.0	39.0	20.5	38.7	19.5	34.3
Physical disability score (Mean/SD)	1.81 (3.47)	3.28 (4.55)	1.93 (3.66)	3.77 (4.45)	1.85 (3.28)	9.44 (6.56)	2.01 (3.66)	3.69 (4.82)	2.16 (3.80)	4.72 (5.50)	2.03 (3.70)	3.70 (4.68)	1.91 (3.71)	3.50 (4.14)
Disease duration (years) (Mean/SD)		7.50 (7.41)		7.65 (8.11)		5.81 (5.63)		7.86 (7.20)		5.85 (8.27)		10.02 (11.8)		8.61 (8.92)

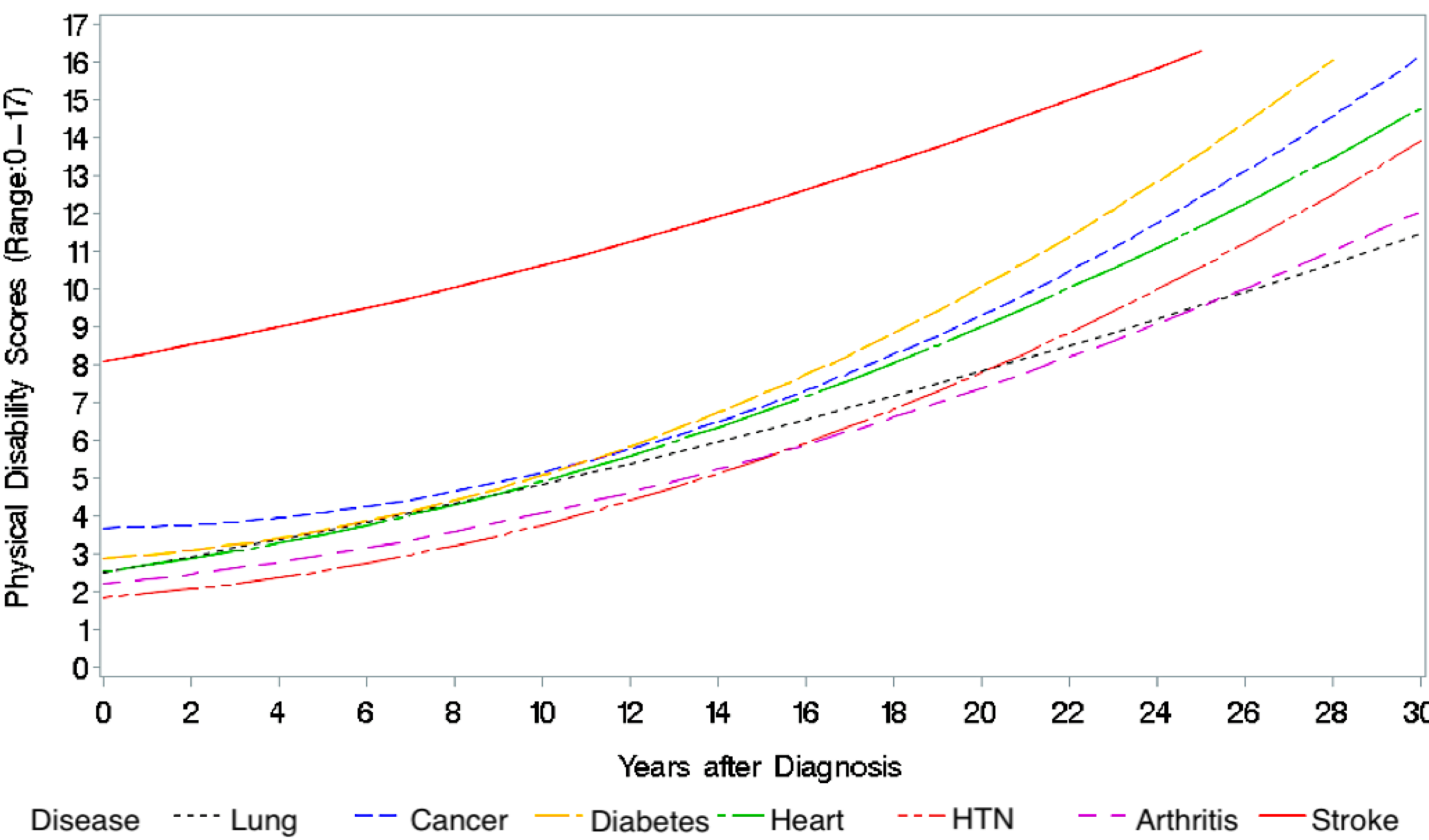
Bold numbers indicates statistical significance (p<0.05).

Table 2. Levels and rates of change of physical disability trajectory (ADL+IADL+mobility,0-17) after diagnosis for each chronic condition

		Fixed effect			Goodness of fit		
		Intercept	Linear change	Quadratic change	-2LL	Parameters	LR test $\Delta\chi^2$ (Adf)
Hypertension	Model 0	1.858(1.615-2.101)	0.087(0.046-0.129)	0.010(0.009-0.012)	25401.7	7	
	Model 1	1.028(0.735-1.320)	0.174(0.132-0.216)	0.007(0.005-0.008)	24851.0	12	550.7(5)***
	Model 2	0.441(0.150-0.731)	0.154(0.113-0.196)	0.006(0.005-0.008)	24591.9	13	259.1(1)***
	Model 3	0.271(0.030-0.512)	0.120(0.085-0.156)	0.004(0.003-0.006)	21169.2	15	3422.7(2)***
Heart disease	Model 0	2.538(2.223-2.853)	0.155(0.102-0.207)	0.008(0.006-0.010)	16068.7	7	
	Model 1	1.358(0.959-1.756)	0.235(0.183-0.288)	0.004(0.002-0.007)	15684.4	12	384.3(5)***
	Model 2	0.425(0.009-0.841)	0.222(0.170-0.274)	0.004(0.002-0.006)	15563.0	13	121.4(1)***
	Model 3	0.558(0.208-0.908)	0.161(0.117-0.205)	0.003(0.001-0.004)	13317.3	15	2245.7(2)***
Stroke	Model 0	8.104(7.203-9.004)	0.203(0.041-0.364)	0.005(-0.004-0.014)	3632.9	7	
	Model 1	5.104(4.040-6.169)	0.288(0.129-0.447)	0.001(-0.007-0.010)	3510.6	12	122.3(5)***
	Model 2	4.509(3.293-5.724)	0.289(0.130-0.449)	0.001(-0.008-0.009)	3506.7	13	3.9(1)*
	Model 3	3.018(1.861-4.175)	0.215(0.054-0.376)	0.002(-0.007-0.010)	2495.0	15	1011.7(2)***
Diabetes	Model 0	2.887(2.442-3.332)	0.080(-0.001-0.161)	0.014(0.010-0.017)	9469.6	7	
	Model 1	2.209(1.676-2.742)	0.173(0.091-0.255)	0.009(0.005-0.012)	9207.5	12	262.1(5)***
	Model 2	1.080(0.517-1.643)	0.166(0.086-0.247)	0.008(0.004-0.011)	9102.6	13	104.9(1)***
	Model 3	0.805(0.331-1.278)	0.105(0.037-0.172)	0.006(0.003-0.009)	7680.5	15	1422.1(2)***
Cancer	Model 0	3.693(2.880-4.506)	0.013(-0.137-0.163)	0.013(0.007-0.020)	2554.0	7	
	Model 1	2.053(1.079-3.027)	0.133(-0.015-0.282)	0.009(0.002-0.016)	2467.9	12	86.1(5)***
	Model 2	1.156(0.172-2.141)	0.088(-0.063-0.238)	0.009(0.003-0.016)	2442.1	13	25.8(1)***
	Model 3	0.542(-0.184-1.268)	0.079(-0.041-0.198)	0.007(0.001-0.012)	2011.6	15	430.5(2)***
Lung disease	Model 0	2.526(2.100-2.953)	0.200(0.144-0.257)	0.003(0.002-0.005)	10865.3	7	
	Model 1	1.336(0.863-1.810)	0.305(0.251-0.360)	-0.0004(-0.002-0.001)	10486.0	12	379.3(5)***
	Model 2	0.681(0.192-1.170)	0.291(0.236-0.345)	-0.001(-0.003-0.001)	10427.1	13	58.9(1)***
	Model 3	0.366(-0.017-0.750)	0.213(0.175-0.250)	-0.001(-0.002 to -0.0003)	8713.5	15	1713.6(2)***
Arthritis	Model 0	2.205(1.942-2.468)	0.119(0.077-0.161)	0.007(0.005-0.008)	22100.0	7	
	Model 1	1.466(1.132-1.800)	0.226(0.184-0.268)	0.003(0.002-0.005)	21496.9	12	603.1(5)***
	Model 2	0.833(0.492-1.174)	0.204(0.162-0.245)	0.003(0.001-0.004)	21353.7	13	143.2(1)***
	Model 3	0.613(0.322-0.903)	0.183(0.146-0.219)	0.001(-0.001-0.002)	18683.7	15	2670.0(2)***

Bold numbers indicate statistical significance (p<0.05).

Figure 1. Physical disability trajectories after diagnosis for each chronic condition in adult aged over 50 (TLSA 1996-2011)



Conclusions

- Findings from this study depicted the physical disability at initial disease diagnosis and changing over time among different chronic condition.
- Minimizing depression status may have protection effect for preventing the trend of increased physical disability.