

NMRC Research Symposium 2015 - Health Services
Research (18 March 2015)

Observational Cohort and Interventional Studies

Health and Service Needs of the Elderly in Singapore

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Aims and Outline

1. Highlight major areas of research on health and service needs and interventions for the elderly in Singapore
2. Present findings of observational and interventional studies in the Gerontology Research Programme
 - Physical Disability and Frailty
 - Cognitive Impairment and Dementia
 - Depression
3. Indicate future areas and directions of health service research

Observational Cohort and Interventional Studies



- A programme of research that aims to:
 - To increase current understanding of aging and health transition
 - providing the scientific information needed for formulating strategies of disease prevention and health promotion in the elderly



Research

Translation

Dissemination



Collaborations and Partnerships

Council for the Third Age (C3A), Geylang East Home for the Aged, Presbyterian Community Services, Thye Hua Kwan Moral Society, NTUC Eldercare Co-op Ltd

Singapore Longitudinal Ageing Studies (2004 - 2015)

SLAS-3: N=2,000
Island wide
Aged 80+

Commencing 2015

SLAS-1: N=2808
South East Region
Aged 55+

Baseline: 2003-4
Follow ups: 2007-2008;
2010-2011
Mortality follow-up till 2010:
mean 6 years

SLAS-2: N=3,200
South Central Region
South West Region
Aged 55+

Baseline: 2009-2010
Follow-up: 2012-ongoing

Domains	Measurements
Psychosocial	Biodata, social network & support, work and retirement
Lifestyle and behavior	Lifestyle and behaviour: smoking, alcohol, coffee, tea, curry, mobile phone, computer use, Leisure-time activities,
Medical, biological, physiological	Medical history, medications, adherence, supplements, health service use (doctor visits, hospitalization)
	BP, ECG, COPD Questionnaire, BORG dyspnea scale, Spirometry (pre- and post-bronchodilator), Logmar, Retinal Photography
	Blood: fasting glucose, lipids, homocysteine, haematological, eGFR, albumin, hsCRP, TNF-a, IL-6
Diet and nutrition	Nutrition screening (modified NSI), food frequency intake, 24-hour food record, serum Hb, albumin, homocysteine, folate, B12,
Physical function	Instrumental and basic ADL, Handgrip, knee extension strength, POMA-Balance, POMA-Gait, Repeated Chair Rise, TUG, Fast Gait Speed Test; Total Energy Expenditure, LASA Physical Activity Questionnaire
Health status	Quality of Life (SF-12, EQ5D), 4-item Life Satisfaction scale, Successful ageing
Psychological	Geriatric Depression Scale (15 items), SCID diagnoses of psychiatric disorders; Sleep problems
	Resilience, optimism, ageing perceptions, mortality salience
Neurocognitive	Subjective Memory and Cognitive Complaint, IQCODE, Mini Mental State Examination (MMSE), NPI, MOCA, RBANS, Comprehensive Neurocognitive Test Battery: RAVLT, VR, Digit Span, CRT, SDMT, CTT, BD, BNT, story recall), Clinical Dementia Rating (CDR), Hatchinski, panel consensus diagnosis of dementia
Biobank	Genetic, inflammatory and immune and other ad hoc studies

Follow up

- Cognition
- Dementia
- Depression
- Physical functioning
- Frailty
- IADL
- BADL
- Quality of life,
- Health service use
- Mortality



Major Health Needs of the Elderly

Problems

- Physical Disability
- Frailty, Sarcopenia,
- Malnutrition
- Multi-morbidities
- Dementia and Cognitive Decline
- Depression
- Psychosocial
- Others

Solutions

- Medical Care Interventions
- Health System Organization
- Preventive Programmes
- Geronto-engineering



Gerontology Research Programme

Problems

- Physical Disability
- Frailty, Sarcopenia,
- Malnutrition
- Multi-morbidities
- Dementia and Cognitive Decline
- Depression
- Psychosocial
- Others

Studies

Observational Cohort Studies

- Singapore Longitudinal Ageing Studies (SLAS)
- Collaborative Projects

Interventional Studies

- Community-Based Early Psychiatric Interventional Strategies Studies (CEPIS)
- Frailty Intervention Trial (FIT)
- Diabetes and Mild Cognitive Impairment RCT
- COPD Psychological Intervention Trial (COPD-PSY)

Gerontology Research Programme

Themes

Ageing Biology

- Ageing biomarkers

Cognition and Dementia

- Dementia epidemiology
- Risk and Protective Factors
- Nutritional Factors
- Insulin resistance

Depression

- Physical comorbidity
- Community Interventions

Frailty and Sarcopenia

- Frailty phenotypes
- Immune ageing
- Nutrition, physical and cognitive interventions

Successful ageing

- Models and phenotypes
- Work, Retirement and Living Alone

Studies

Observational Cohort Studies

- Singapore Longitudinal Ageing Studies (SLAS)
- Collaborative Projects

Interventional Studies

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Physical Function and Disability



ADL Functional Disability

- Rising prevalence in recent decades
- Contrast declining prevalence in West

Source	Kua	MCYS	Yadav	SLAS	MCYS
Year	1985	1995	1997	2003	2005
Age 55+		4.1		7.4	7.8
Age 60+			3.4	5.2	
Age 75+	14.4			26.3	

- Arthritis and cognitive impairment are the leading modifiable causes of physical functional disability

	Population attributable risk
Arthritis	14.0%
Cognitive impairment	19.0%

J Am Ger Soc 2006; 54:21-29.

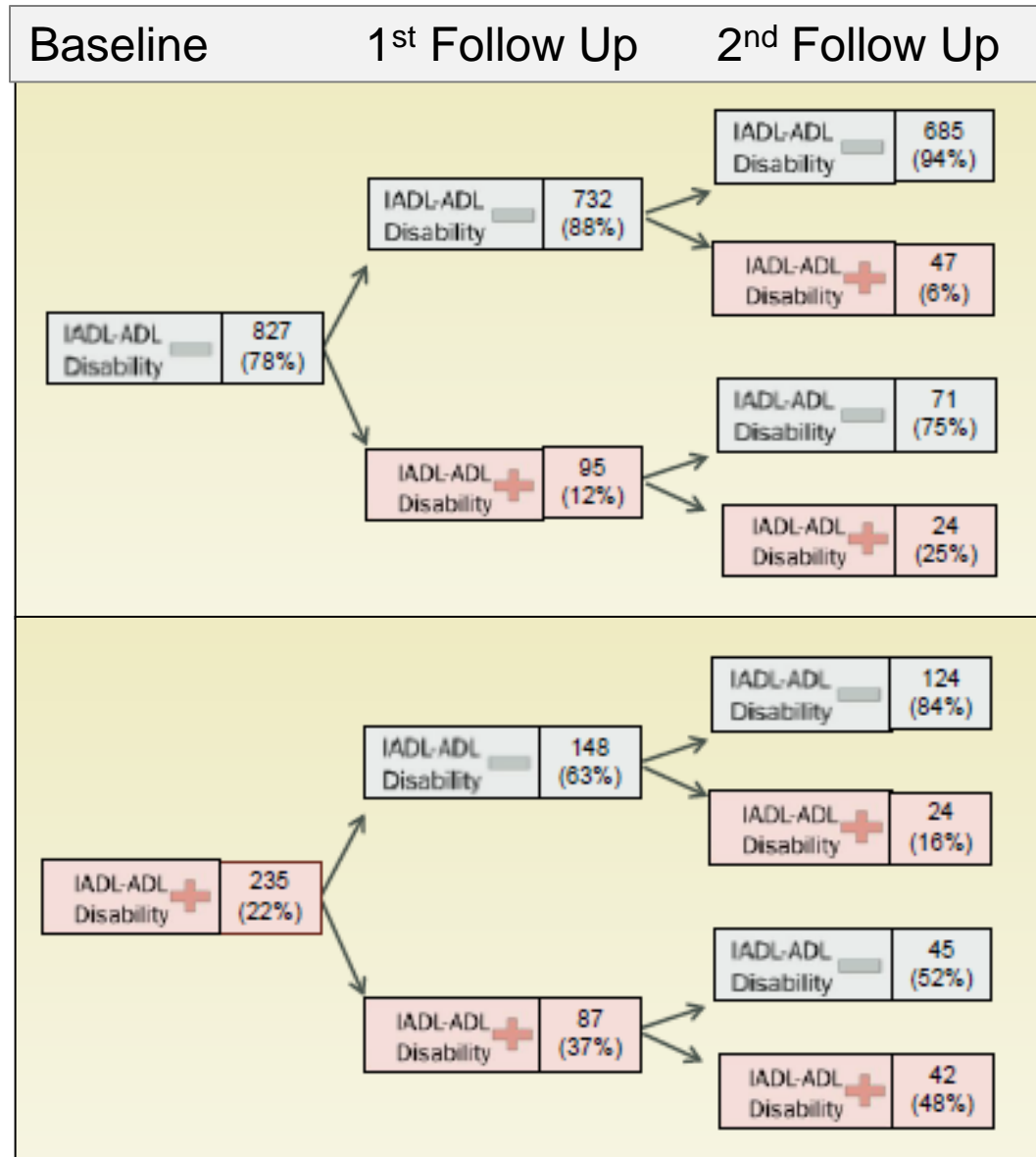


ADL Functional Disability

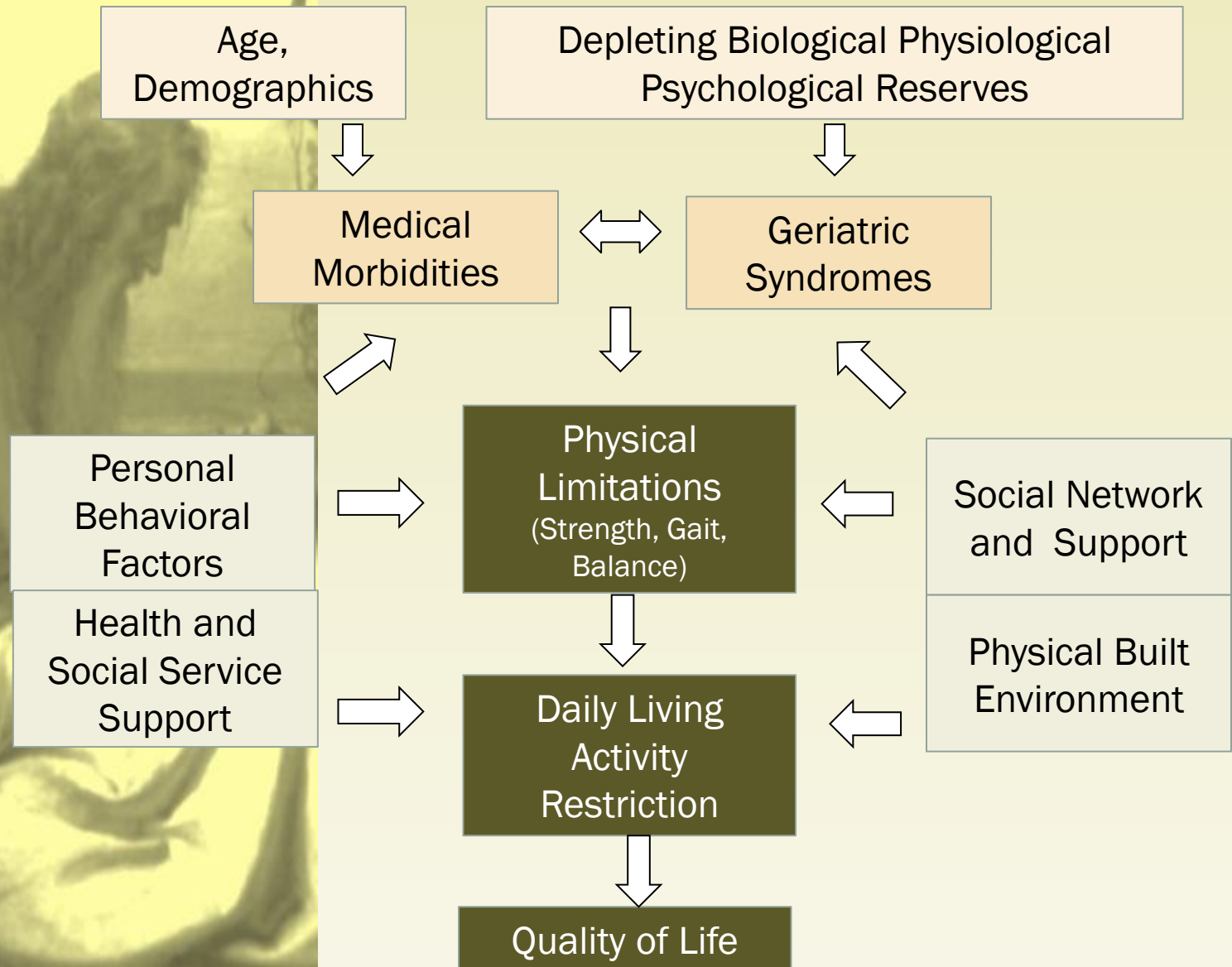
Risk Factors and Correlates	OR P<0.05
Age (vs 60-69)	
70-79	4.4
80+	13.6
Female gender	2.9
Indian ethnicity	2.1
Living with others	5.7
Poor-Fair self-rated health	3.5
Self-reported chronic condition	
Arthritis	2.2
Urinary problems	4.6
Stroke	6.9
Asthma/ COPD	7.6
Hip fracture	34.9
Kidney failure	24.2
Cognitive functioning	
MMSE 24+	1.0
MMSE 19-23	4.7
MMSE ≤18	10.5
Hearing impairment	3.1
Visual impairment	2.5



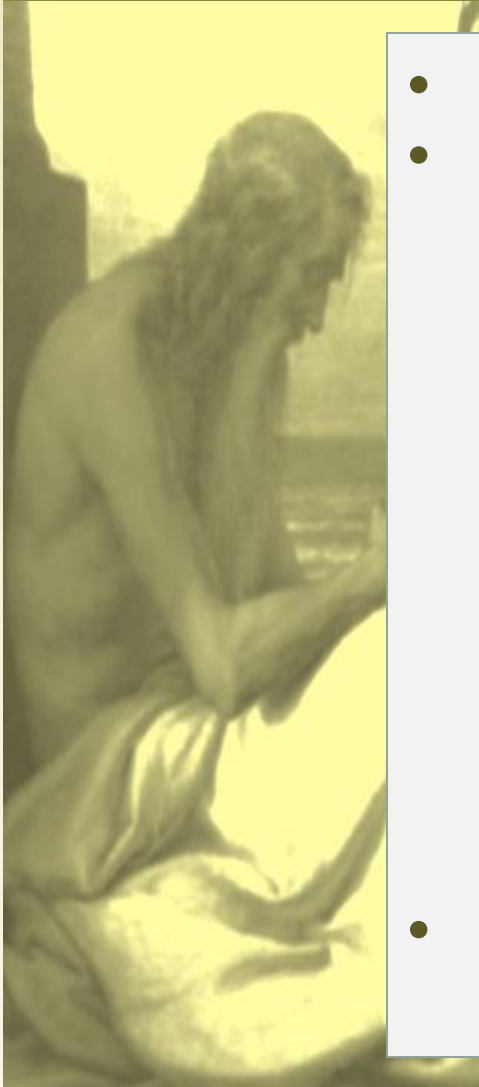
Functional Disability Individual Trajectory



Levels of Investigations of Physical Functional Needs



Malnutrition in the elderly



- Common worldwide
- Factors:
 - Loss of appetite
 - Loss of taste
 - Poor dentition
 - Difficulty swallowing
 - Poor absorption
 - Chronic diseases
 - Increased drugs use
 - Reduced mobility
 - Financial and physical inability to consume fresh food
- Marginal or biochemical ('subclinical') deficiencies may have significant health effects

Nutritional Status of SLAS Older Persons

DETERMINE Your Nutritional Health Checklist

Risk Factors	N=2611
Have illness that change the kind/amount of food consumed	40.3%
Take 3 or more drugs a day	25.0%
Eat alone most of the time	14.5%
Eat few fruits/vegetable/milk products (less than once a day)	9.0%
Have tooth or mouth problems that make it hard to eat	5.2%
Without wanting, have lost or gained 4 kg in last 6 months	3.5%
Have 3 or more drinks of beer/liquor/wine almost every day	3.1%
Not always physically able to shop, cook and/or feed by self	2.6%
Eat fewer than 2 meals per day	2.3%
Not always having enough money to buy the food needed	2.1%

Weighted score:

0-2: Good nutritional status and Low risk

3-5: Moderate risk of poor nutrition

6+: High risk of poor nutrition

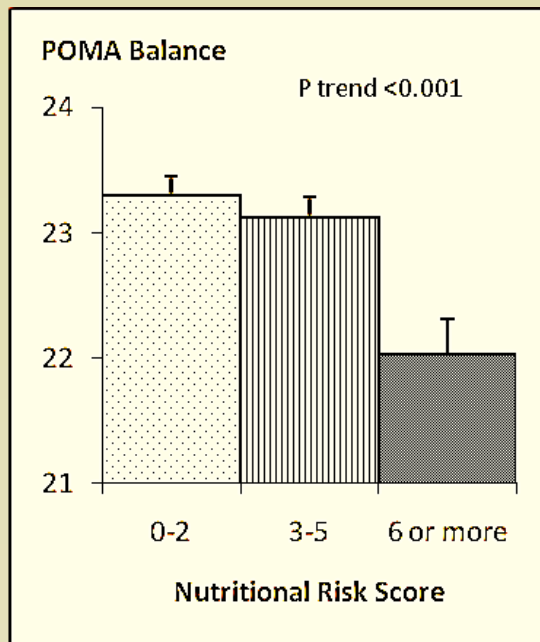
At risk of poor nutrition (score of 3 or more): 30%

Nutritional Markers in SLAS Older Persons

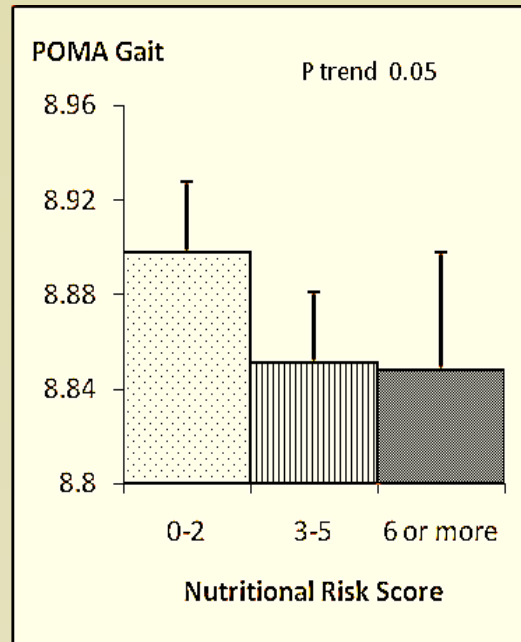
	%
Anemia (Hb <11 in women or Hb <12 in men)	4.7
Low lymphocyte counts (<1500/mL)	17.3
Low Albumin (<38 g/L)	1.9
Low B12 (<180 pmol/L)	5.1
Low folate (<7 in men or <9.5 nmol/L in women)	5.3
High total cholesterol (≥ 6.5 mmol/L)	13.9
High triglyceride (> 2.2 mmol/L)	11.4
High LDL-cholesterol (> 4.0 mmol/L)	19.3
Low HDL-cholesterol (<1.0mmol/L)	10.7
Metabolic syndrome#	30.9

Malnutrition and Physical Functioning

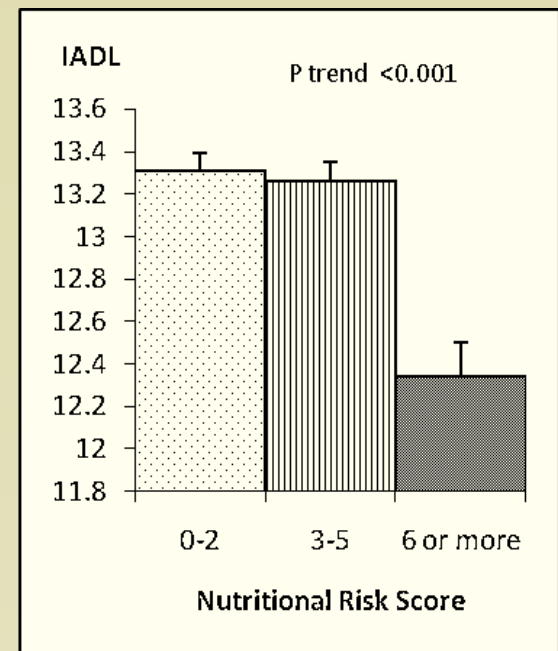
Balance



Gait



IADL Independence

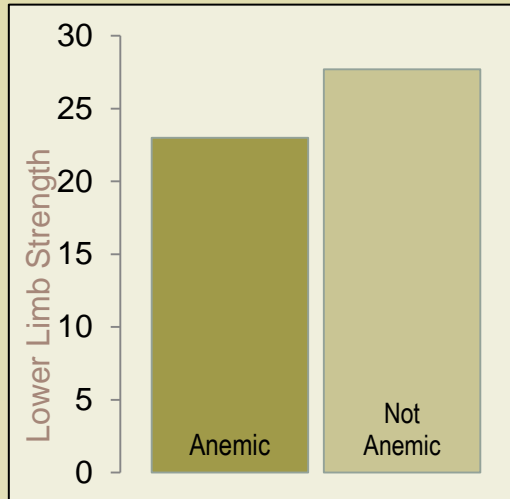


Nutritional Risk

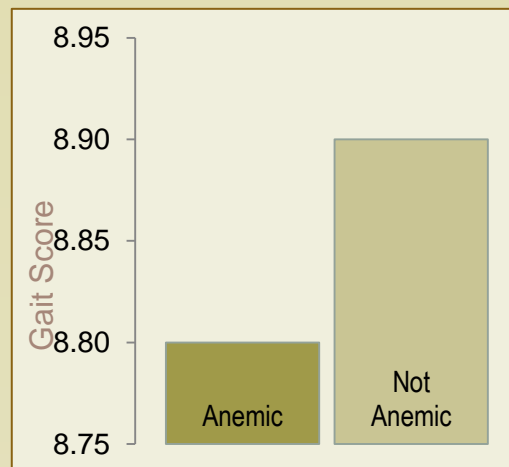
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Malnutrition-Inflammation and Physical Functioning

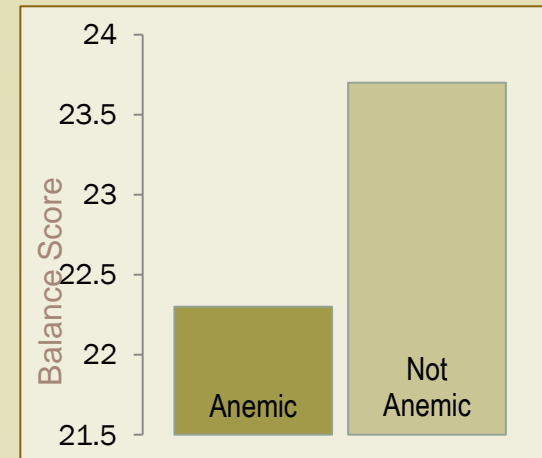
Lower Limb Strength



Gait



Balance



Under-nutrition
Chronic diseases
Multi-morbidity
Chronic inflammation

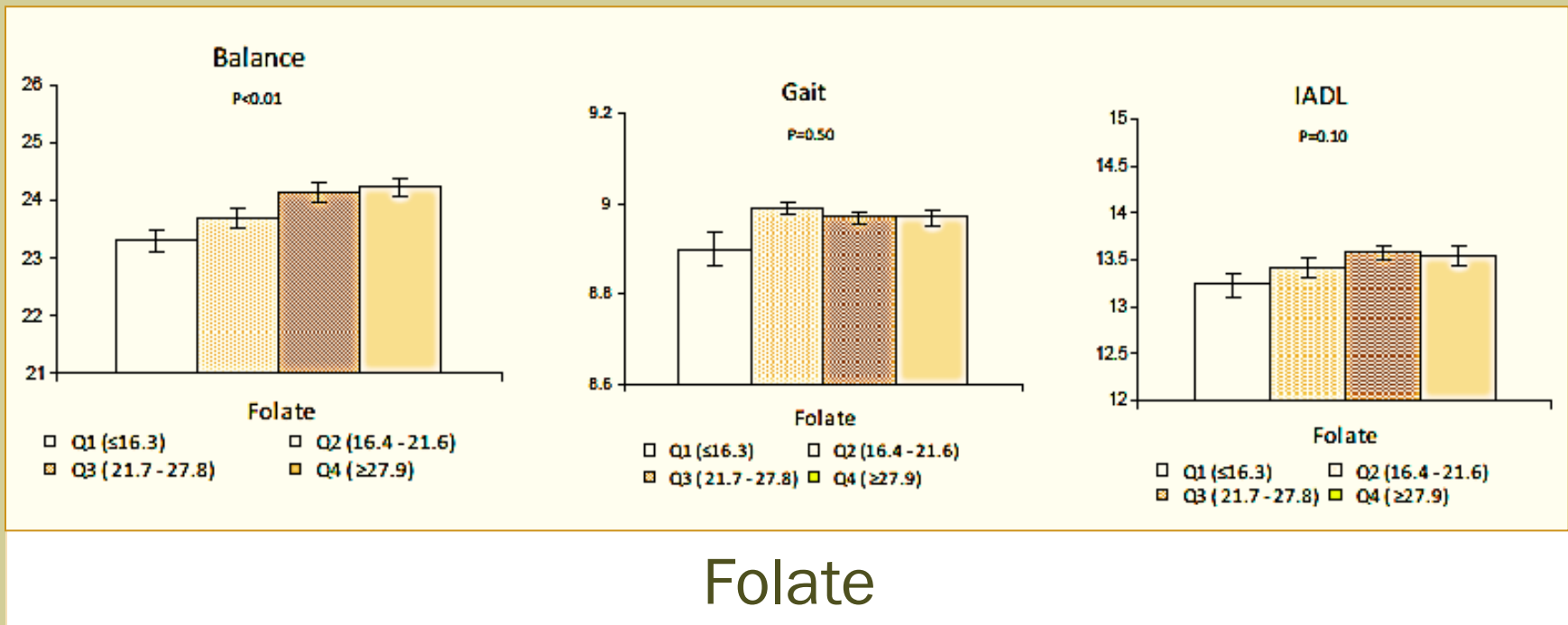
Anemia

Micronutrient Deficiency and Physical Functioning

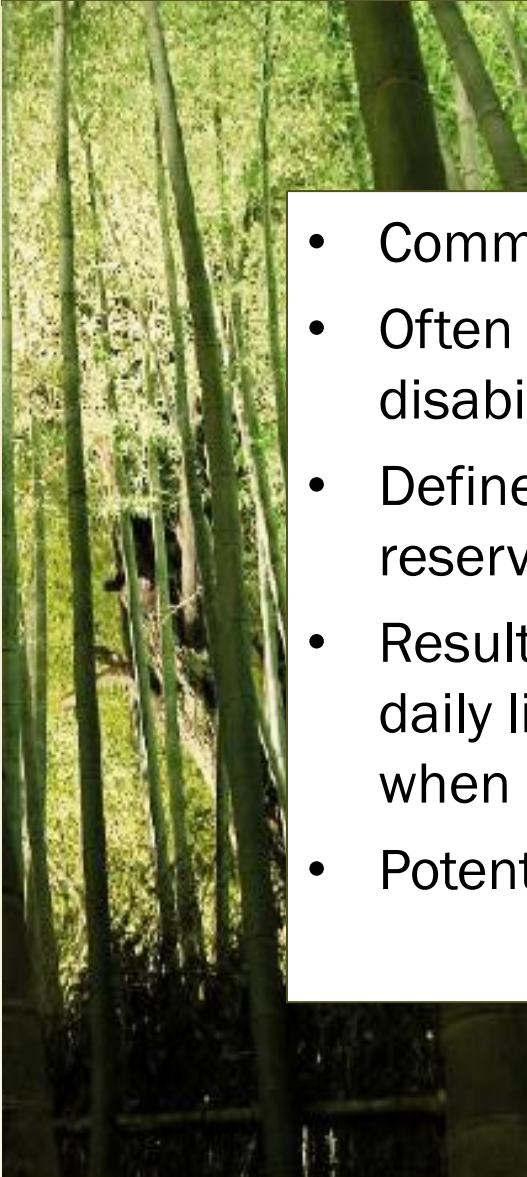
Balance

Gait

Functional Independence



Physical Frailty



- Common geriatric syndrome
- Often congruent with multi-morbidity, functional disability and institutionalization
- Defined as multisystem declines in physiological reserves
- Resulting in increased risk of dependency in activities of daily living, hospitalization, institutionalization and dying when exposed to stress
- Potentially reversible

Physical Frailty


Cardiovascular Health Study (CHS) criteria

1. Unintentional shrinking: BMI of <18.5 kg/m² and/or unintentional weight loss ≥ 10 pounds (4.5Kg) in the last 6 months.
2. Slowness: 6-meter fast gait speed test, lowest quintile by gender and height
3. Weakness: leg muscle strength in kilograms, lowest quintile by gender and BMI strata
4. Exhaustion: vitality questions in SF-12: “Did you feel worn out?”, “Did you feel tired?”, “Did you have a lot of energy?”, (total scores 3 to 15), score of <10
5. Low activity: self-reported time (in hours) spent doing moderate and vigorous activities per week, lowest quintile by gender

Categories:


- Robust: No components
- Pre-frail: 1 to 2 components
- Frail: 3 -5 components

Physical Frailty, Multi-morbidity and Adverse Outcomes



Adverse Outcomes		Robust n=883	Pre-frail N=712	Frail N=90	P
Depressive symptoms	%	0.8	2.8	10.0	<0.001
Cognitive impairment	%	4.1	8.4	22.2	<0.001
Multi-morbidity (>5)	%	17.8	27.4	52.2	<0.001
IADL disability	%	5.0	11.0	26.7	<0.001
ADL Disability	%	0.2	3.2	7.8	<0.001
Hospital admission	%	4.5	5.9	10.0	0.033

Physical Frailty Factors




Factors		Robust n=883	Pre- frail N=712	Frail N=90	P value
Age 75+	%	7.9	20.2	36.7	<0.001
Female	%	64.1	64.2	67.8	0.66
No formal education	%	15.1	26.1	34.4	<0.001
1-2 room public housing	%	16.7	25.6	41.1	<0.001
Non-Chinese ethnicity	%	9.0	12.6	14.4	0.010
Single, divorced, widowed	%	29.0	39.3	52.2	<0.001
Living alone	%	12.9	18.7	26.7	<0.001
Current smoking	%	19.7	25.5	27.3	0.004
Daily alcohol drinking	%	3.4	2.4	1.1	0.114

Physical Frailty Factors

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Daily alcohol drinking	%	3.4	2.4	1.1	0.114

Factors		Robust n=883	Pre- frail N=712	Frail N=90	P value
Cardiovascular disease	%	5.7	10.5	15.6	<0.001
Hypertension	%	58.1	63.8	80.0	<0.001
Diabetes	%	17.1	23.9	31.1	<0.001
Stroke	%	1.6	4.1	12.2	<0.001
Coronary heart disease	%	3.2	4.5	7.8	0.028
Atrial Fibrillation	%	2.2	4.4	4.4	0.016
Heart failure	%	0.7	2.3	3.3	0.003
Cataracts/ glaucoma	%	26.3	32.9	51.1	<0.001
Asthma/COPD	%	3.2	6.2	11.1	<0.001
Arthritis	%	13.5	15.7	20.0	0.063
Osteoporosis	%	4.6	6.7	12.2	0.003
Gastrointestinal problems	%	5.9	7.9	15.6	0.002
Chronic Kidney disease	%	4.5	10.8	18.9	<0.001
Cancer	%	2.6	2.3	6.7	0.29
Thyroid disease	%	4.6	5.8	1.1	0.86

Physical Frailty Factors



Factors	Robust n=883	Pre-frail N=712	Frail N=90	P
Poly-pharmacy(>5 drugs)	10.0	20.1	28.9	<0.001
Poor self-rated health	0.3	1.3	6.7	<0.001
Visual impairment	20.7	31.7	45.6	<0.001
Hearing impairment	1.7	4.1	3.3	0.012
FEV1/FVC <0.7	15.5	21.8	31.1	<0.001

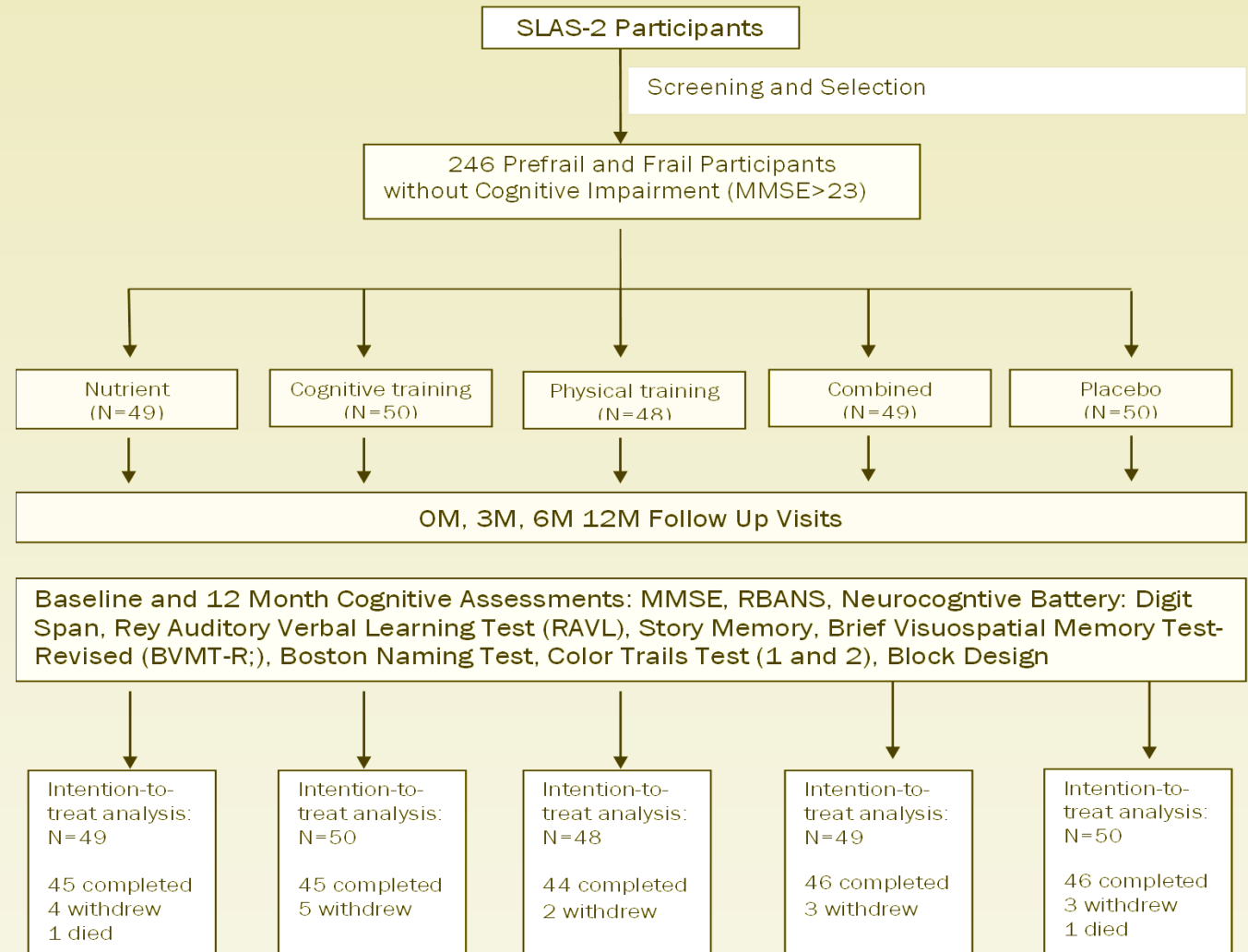
Physical Frailty Factors

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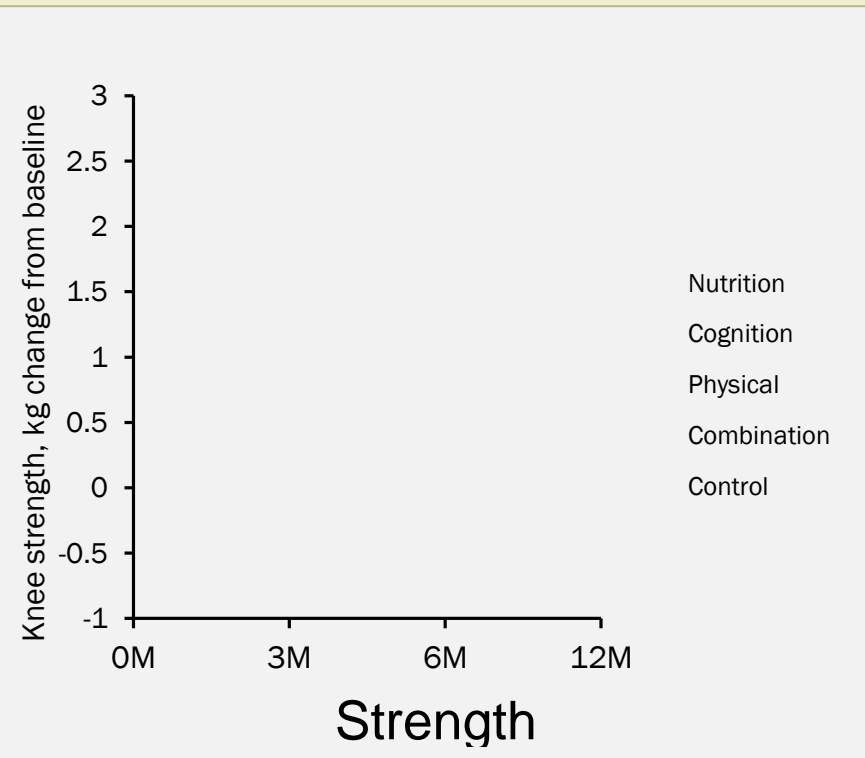
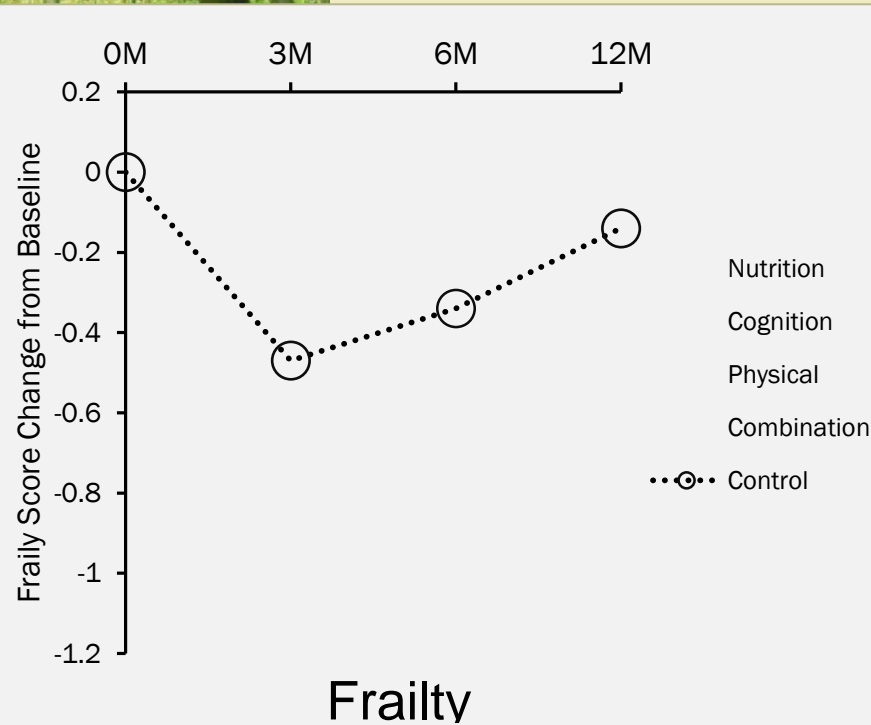
Nutritional	Robust n=883	Pre-frail N=712	Frail N=90	P
Obesity (BMI \geq 30)	5.1	7.4	13.3	0.002
High nutritional risk (NNS score \geq 3)	21.9	37.5	53.3	<0.001
Low albumin (<40 g/L)	8.8	13.2	18.9	<0.001
Low haemoglobin	34.9	41.0	47.8	0.002
Low total cholesterol 0~5.19mmol/L)	47.0	52.3	55.1	0.022

Lifestyle Intervention in Frail Elderly

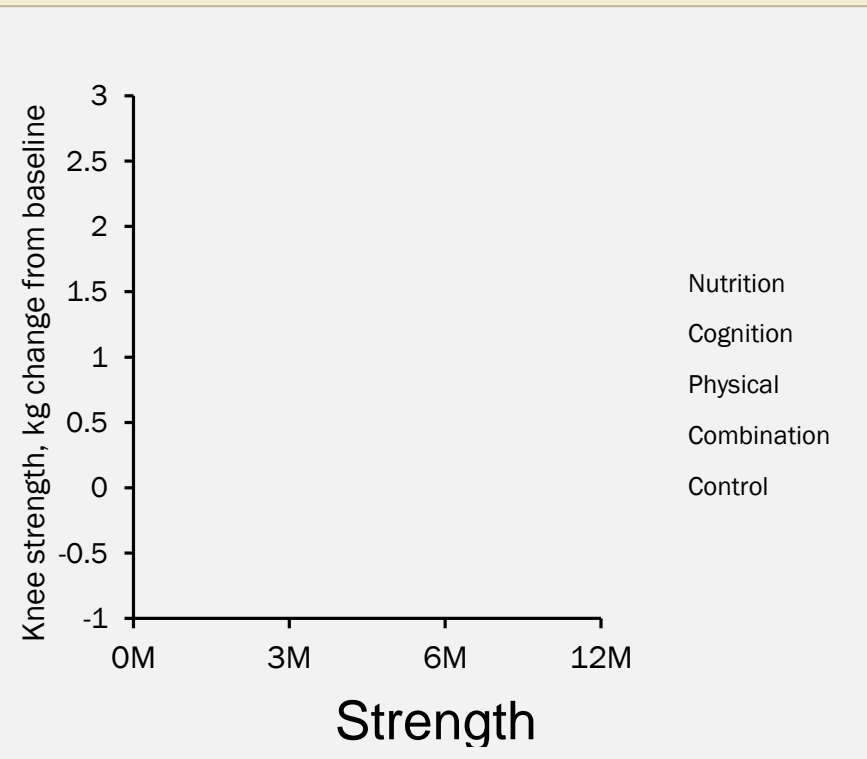
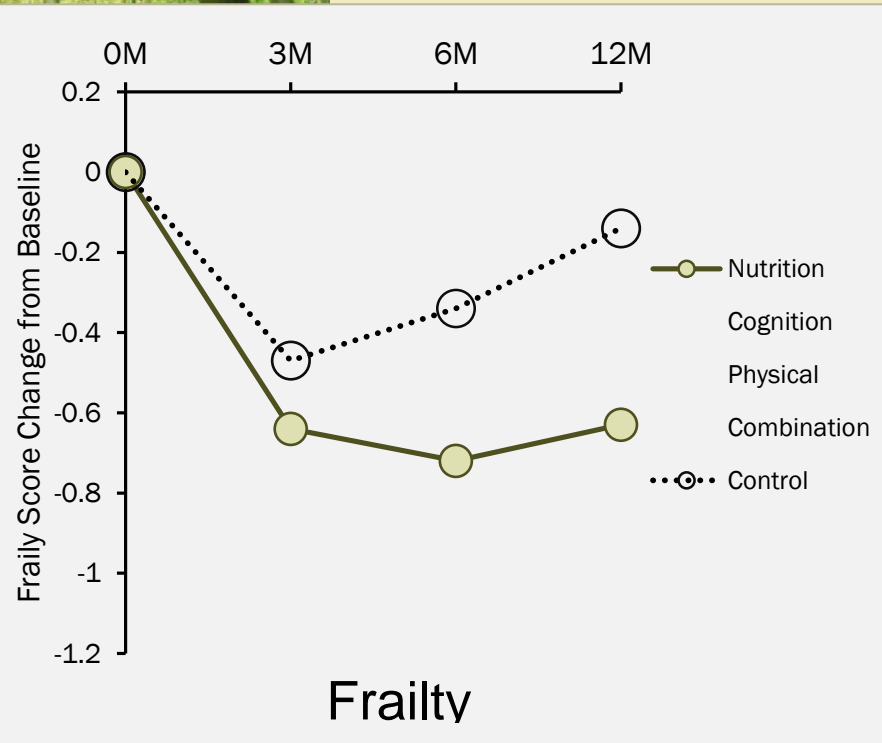
Singapore Frailty Intervention Trial (FIT)



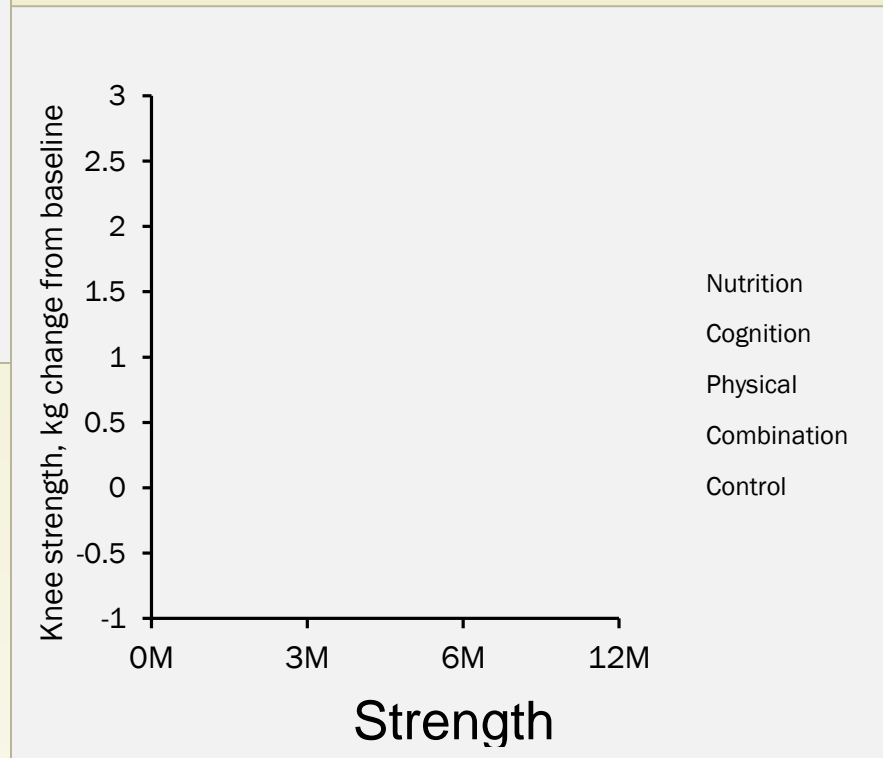
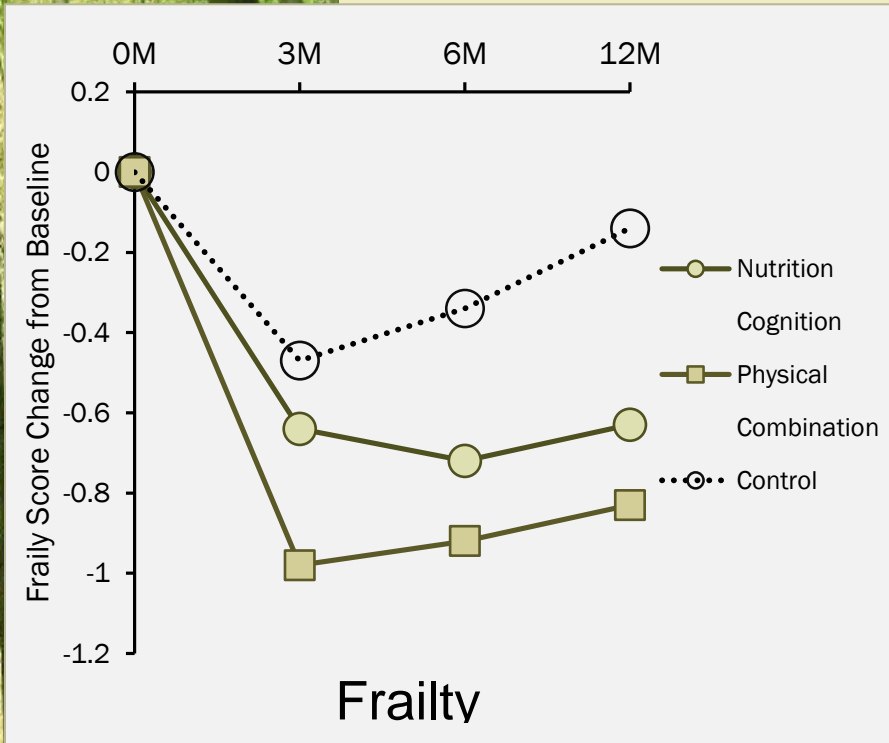
Frailty is reversible



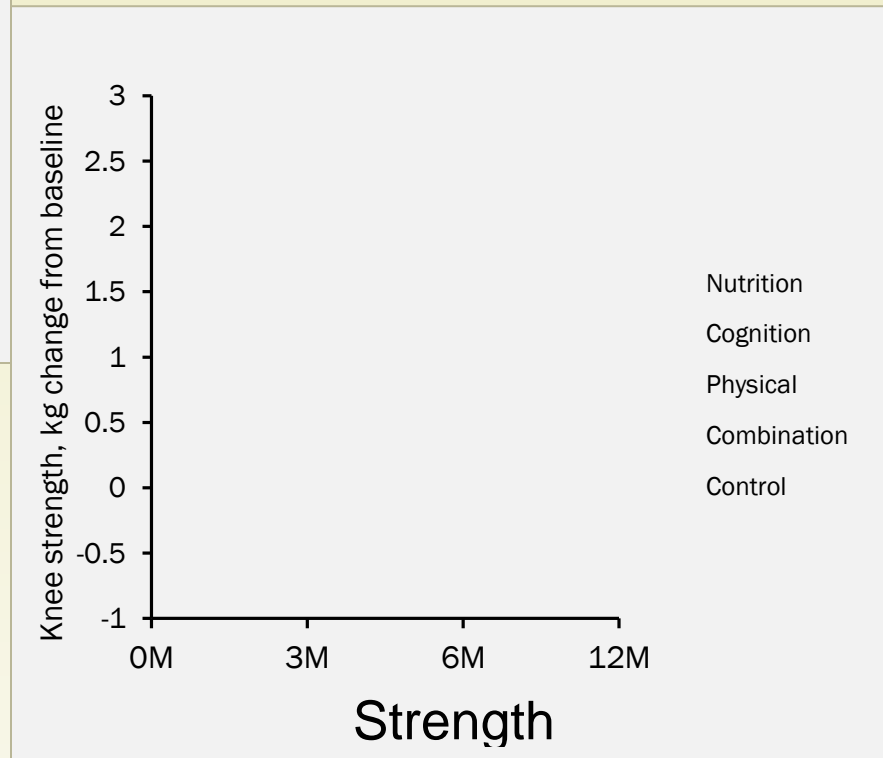
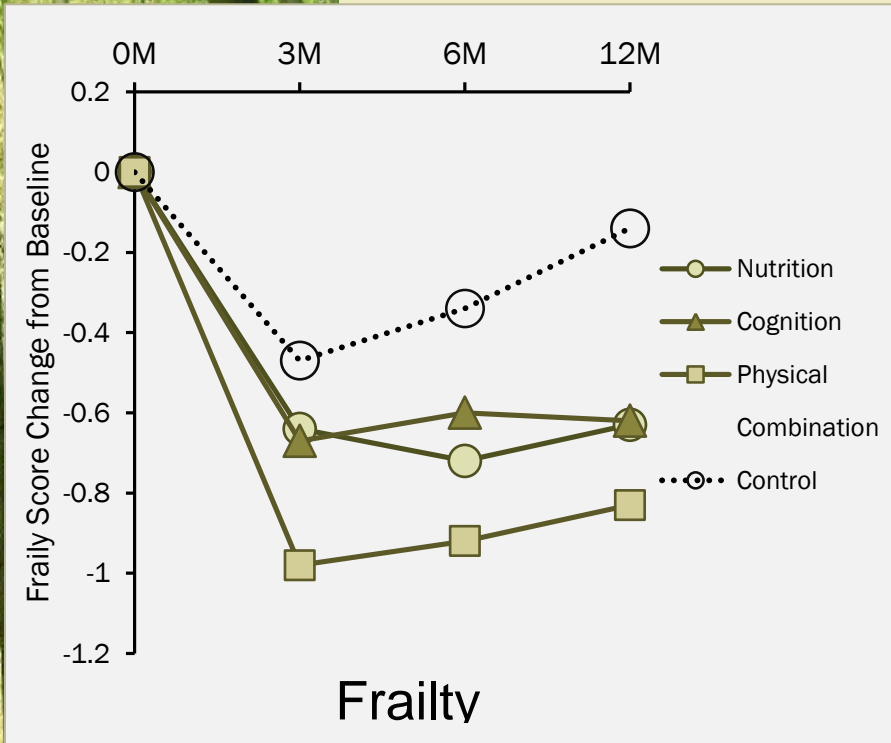
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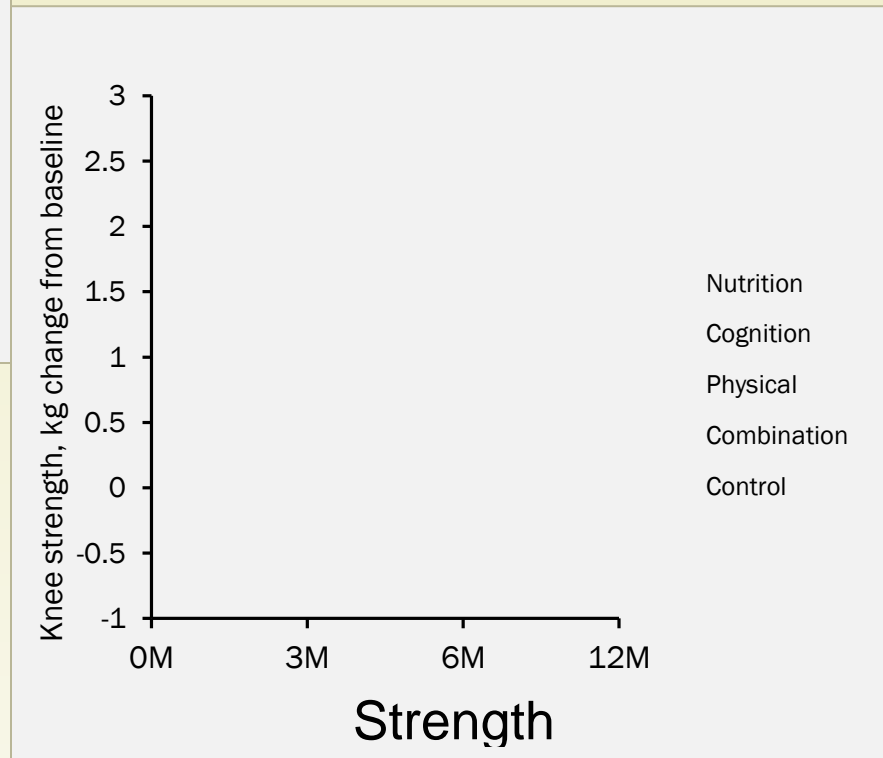
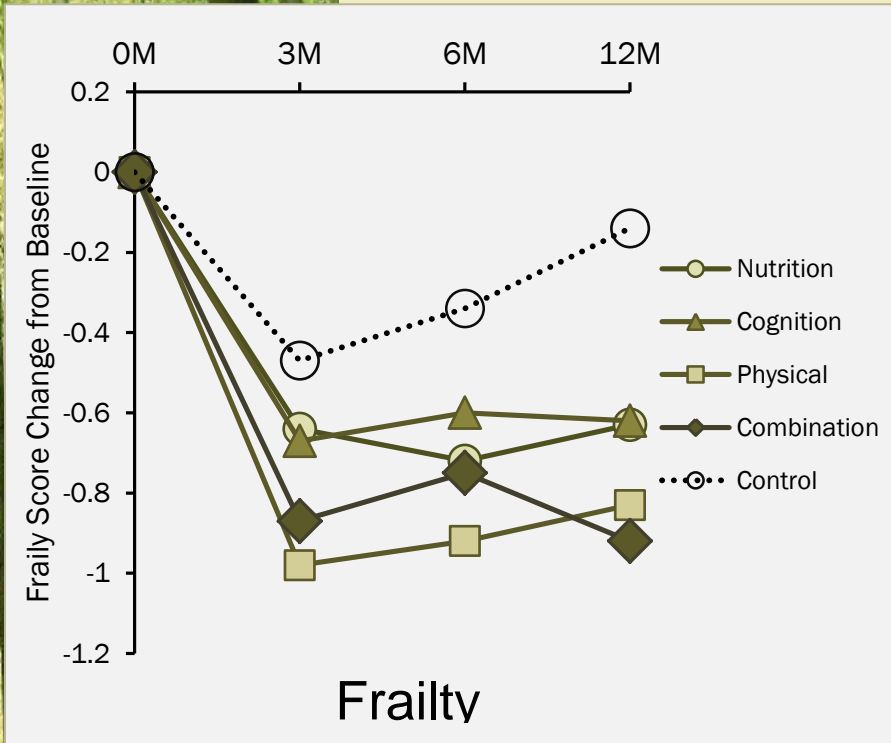
Frailty is reversible



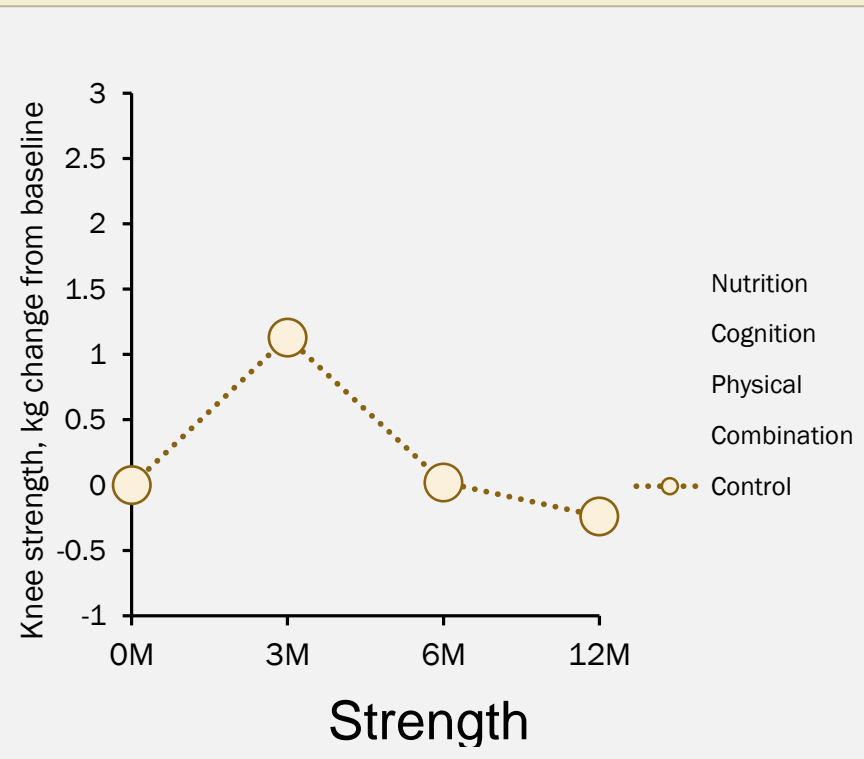
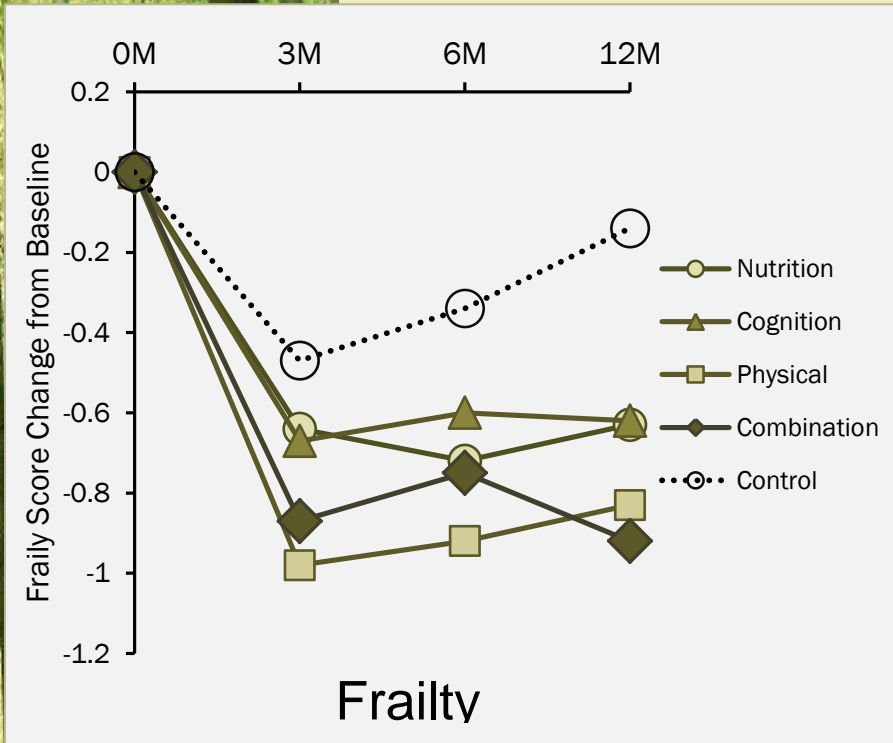
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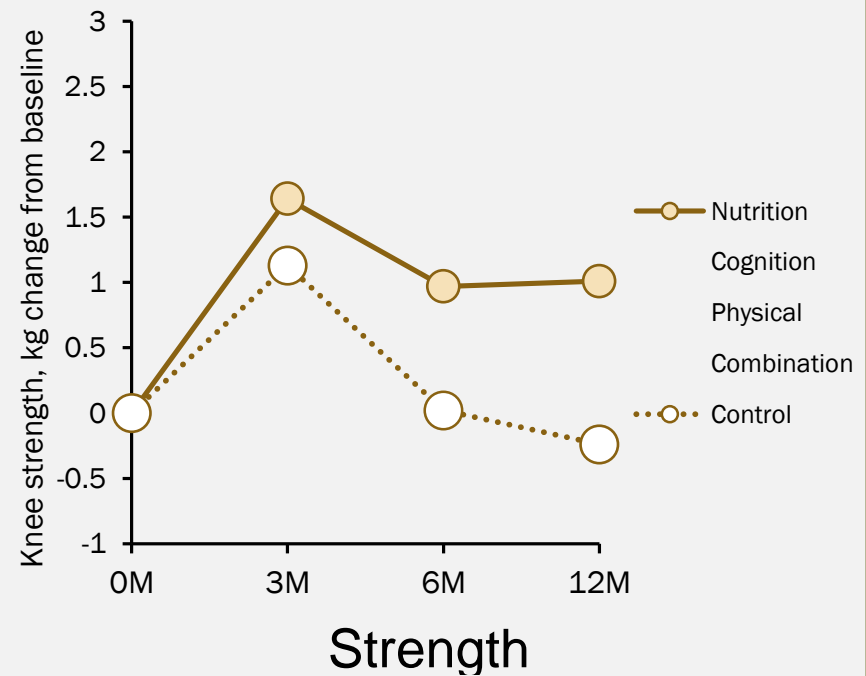
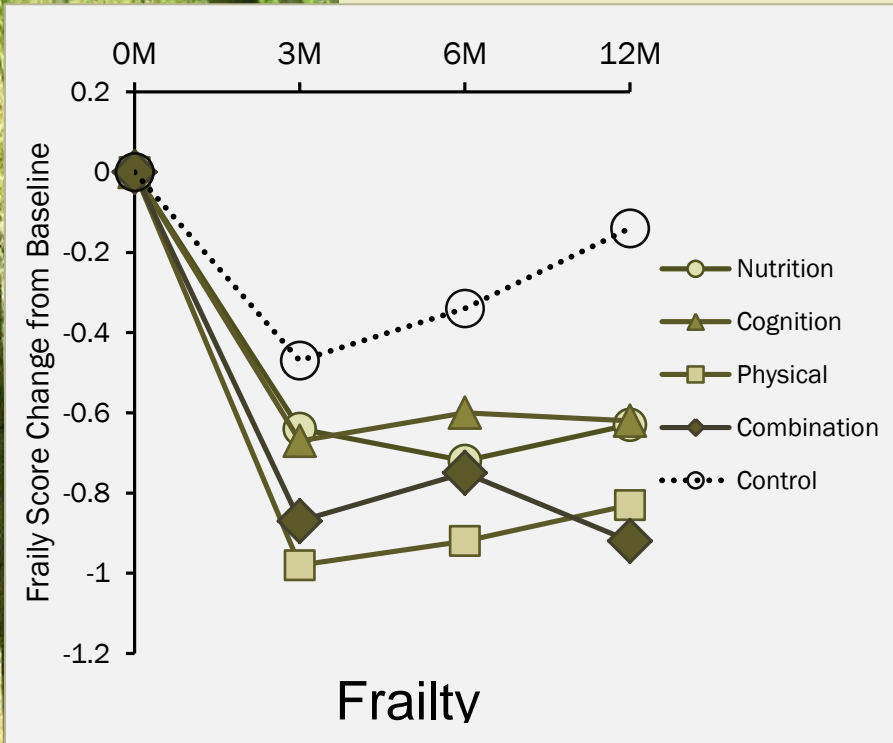
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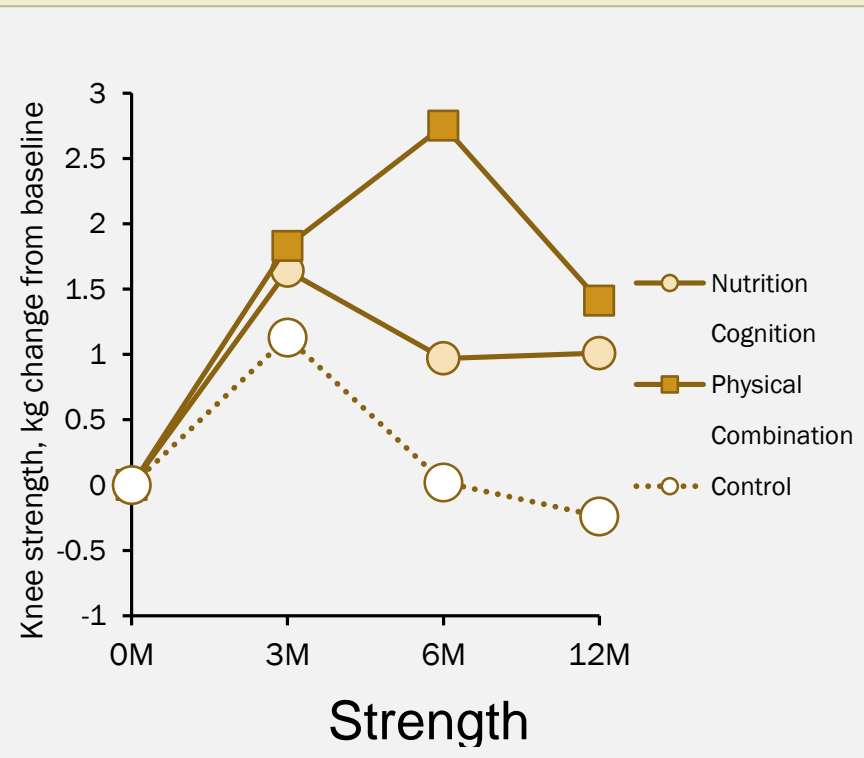
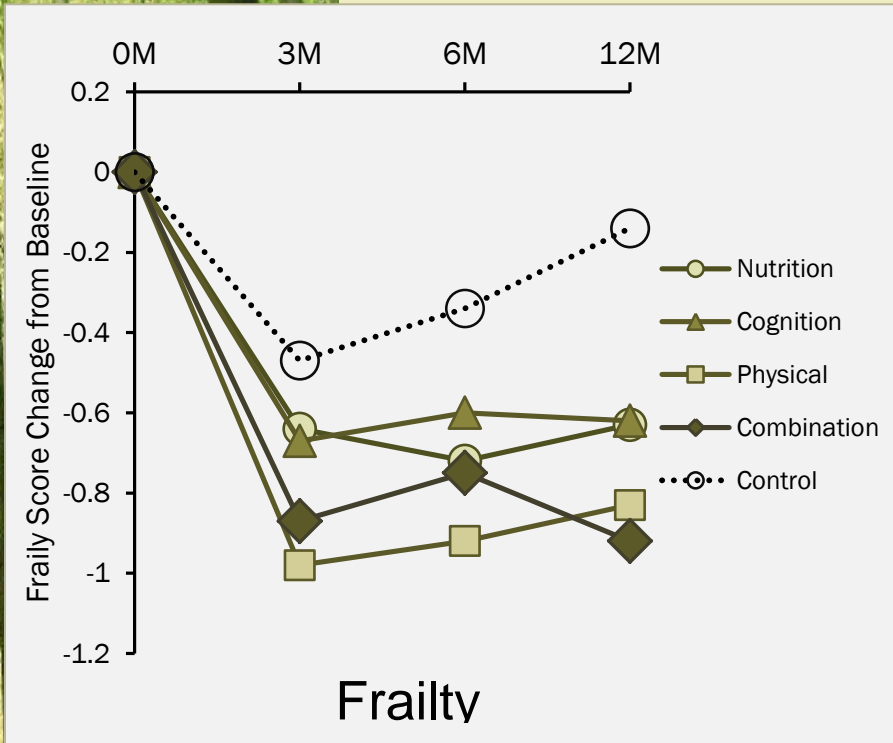
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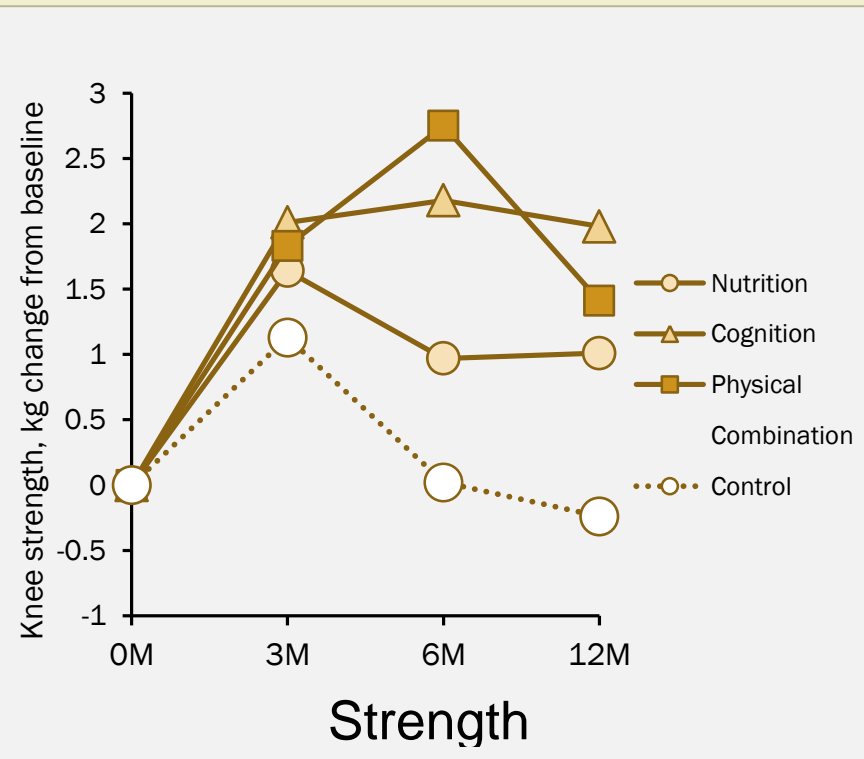
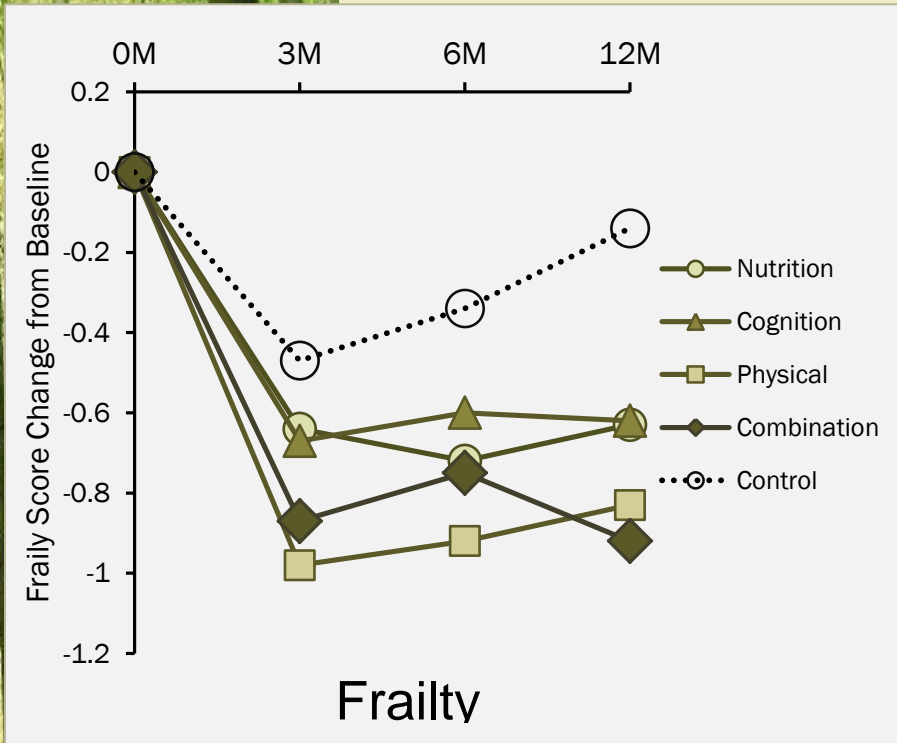
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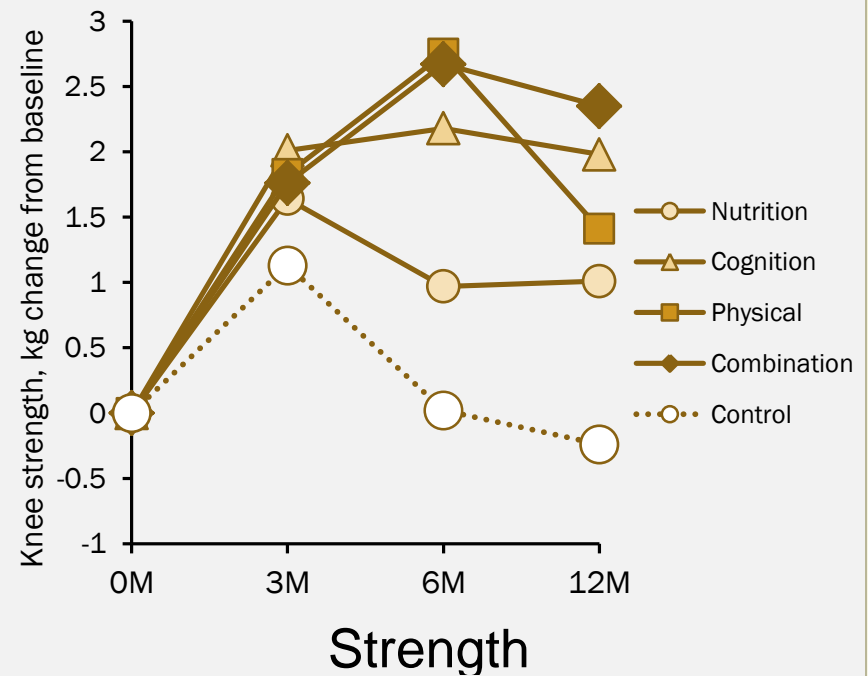
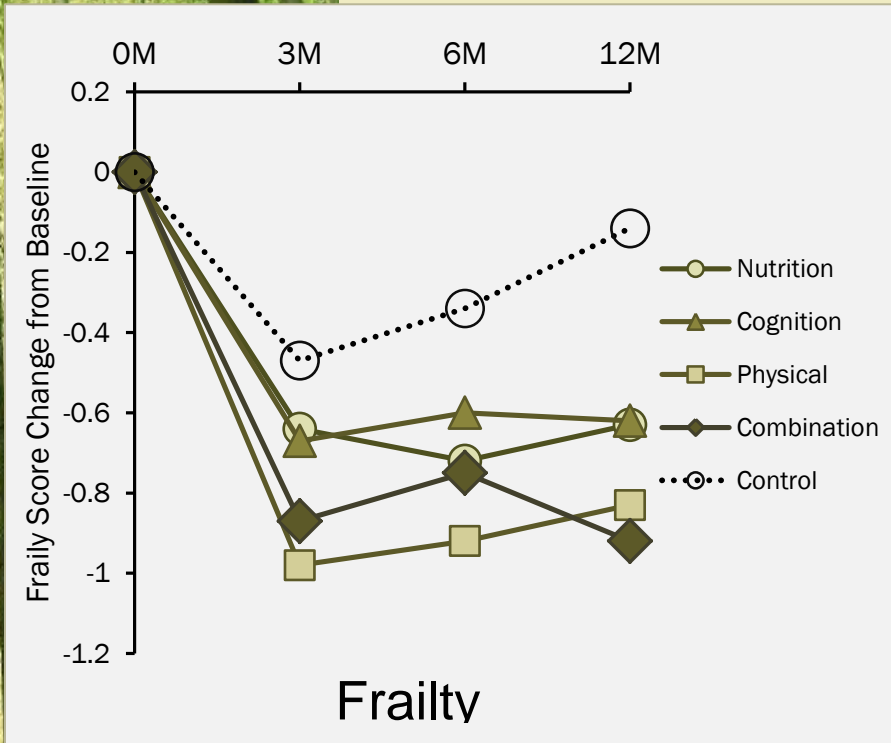
Frailty is reversible



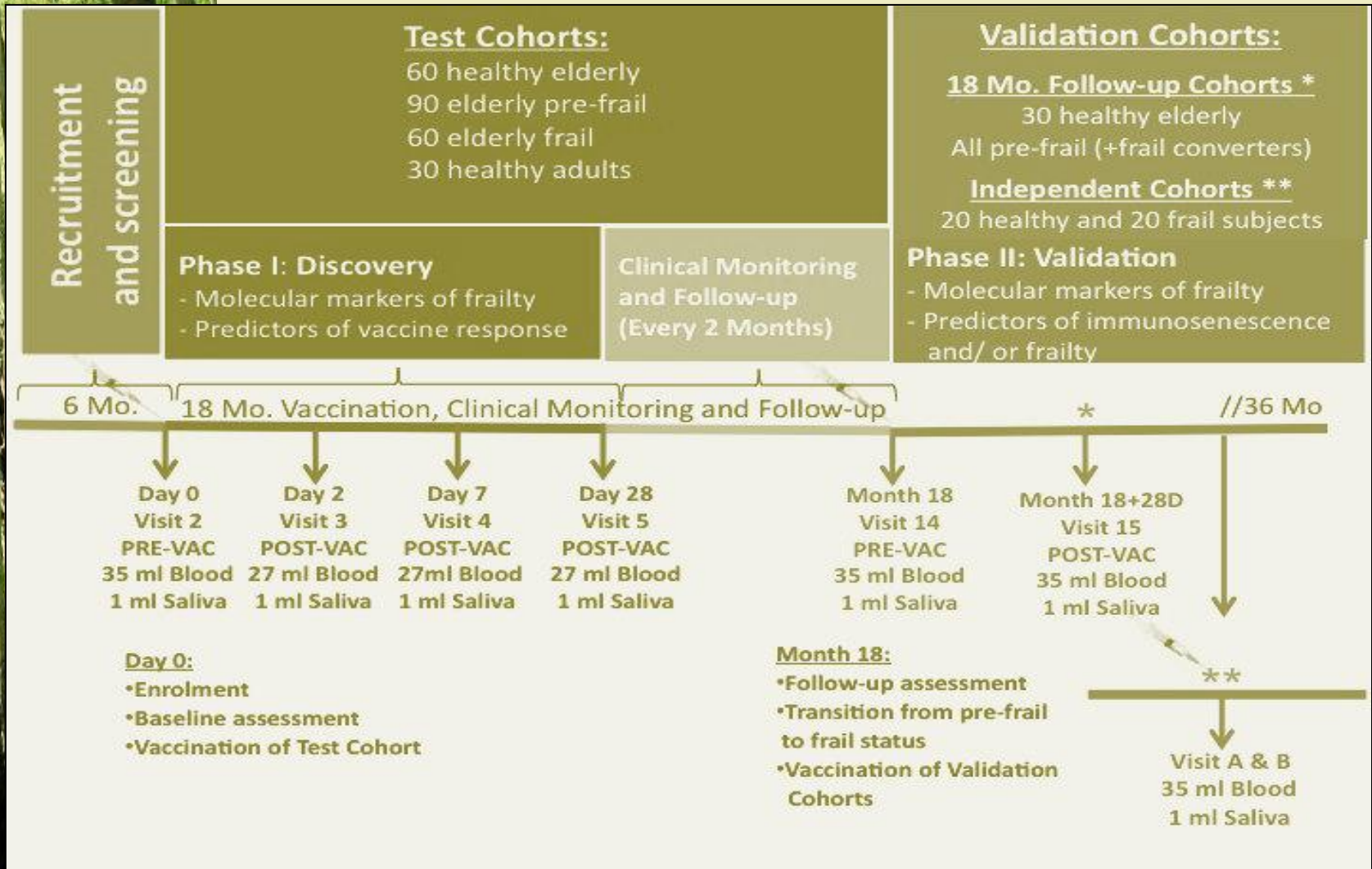
Frailty is reversible



Frailty is reversible



Ongoing SLAS Vaccination Study in Frail Older Persons



Cognitive Impairment and Dementia



Prevalence in 2004

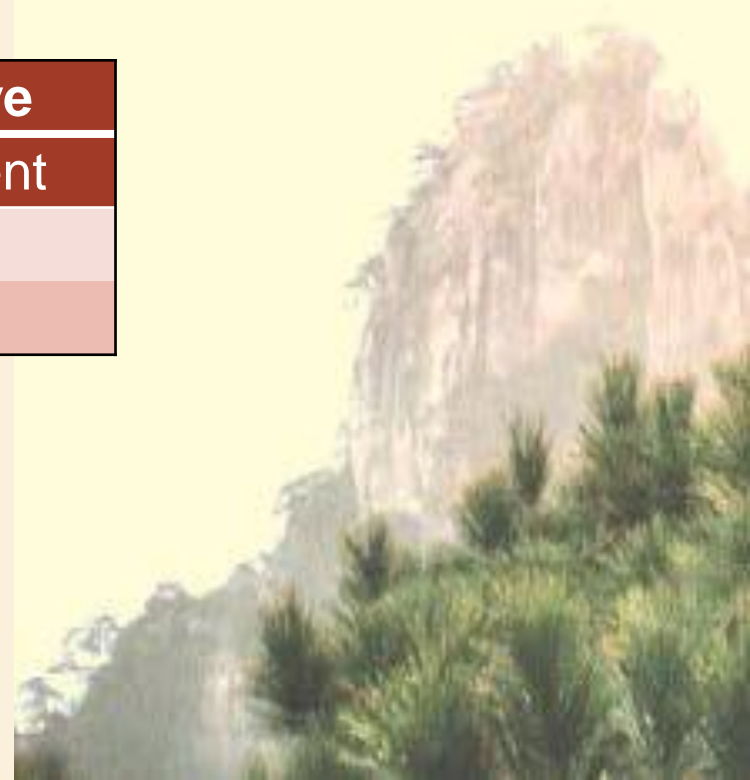
Aged 55 and above	
	per cent
Dementia	2.2
MCI	19.9



Prevalence in 2004

Aged 55 and above	
	per cent
Dementia	2.2
MCI	19.9

Aged 65 and above	
	per cent
Dementia	3.6
MCI	25.2



Prevalence in 2004

Aged 55 and above

	per cent
Dementia	2.2
MCI	19.9

Aged 65 and above

	per cent
Dementia	3.6
MCI	25.2

Aged 75 and above

	per cent
Dementia	8.3
MCI	31.6

Incidence Rates 2004 - 2010

Aged 55 and above	
	per 100 p-y
Dementia	1.5
MCI	7.2

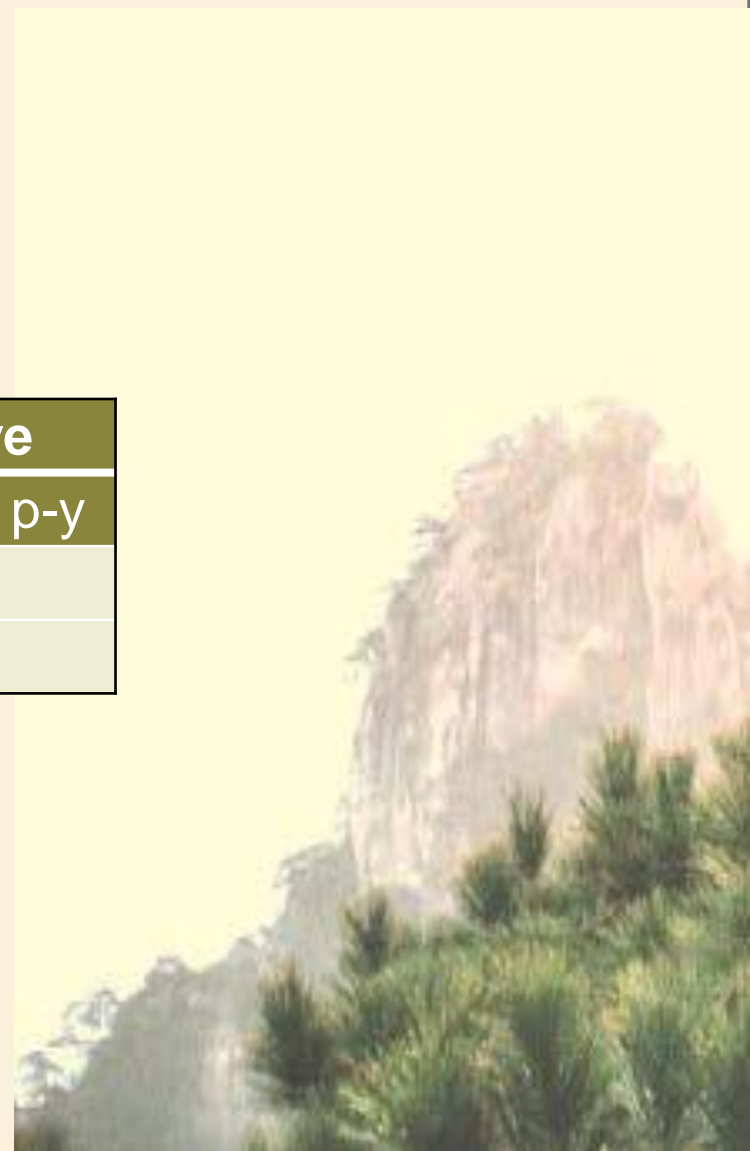
Unpublished



Incidence Rates 2004 - 2010

Aged 55 and above	
	per 100 p-y
Dementia	1.5
MCI	7.2

Aged 65 and above	
	per 100 p-y
Dementia	2.5
MCI	9.6



Incidence Rates 2004 - 2010

Aged 55 and above	
	per 100 p-y
Dementia	1.5
MCI	7.2

Aged 65 and above	
	per 100 p-y
Dementia	2.5
MCI	9.6

Aged 75 and above	
	per 100 p-y
Dementia	5.9
MCI	13.2

MCI Conversion to Dementia, 2004 - 2010

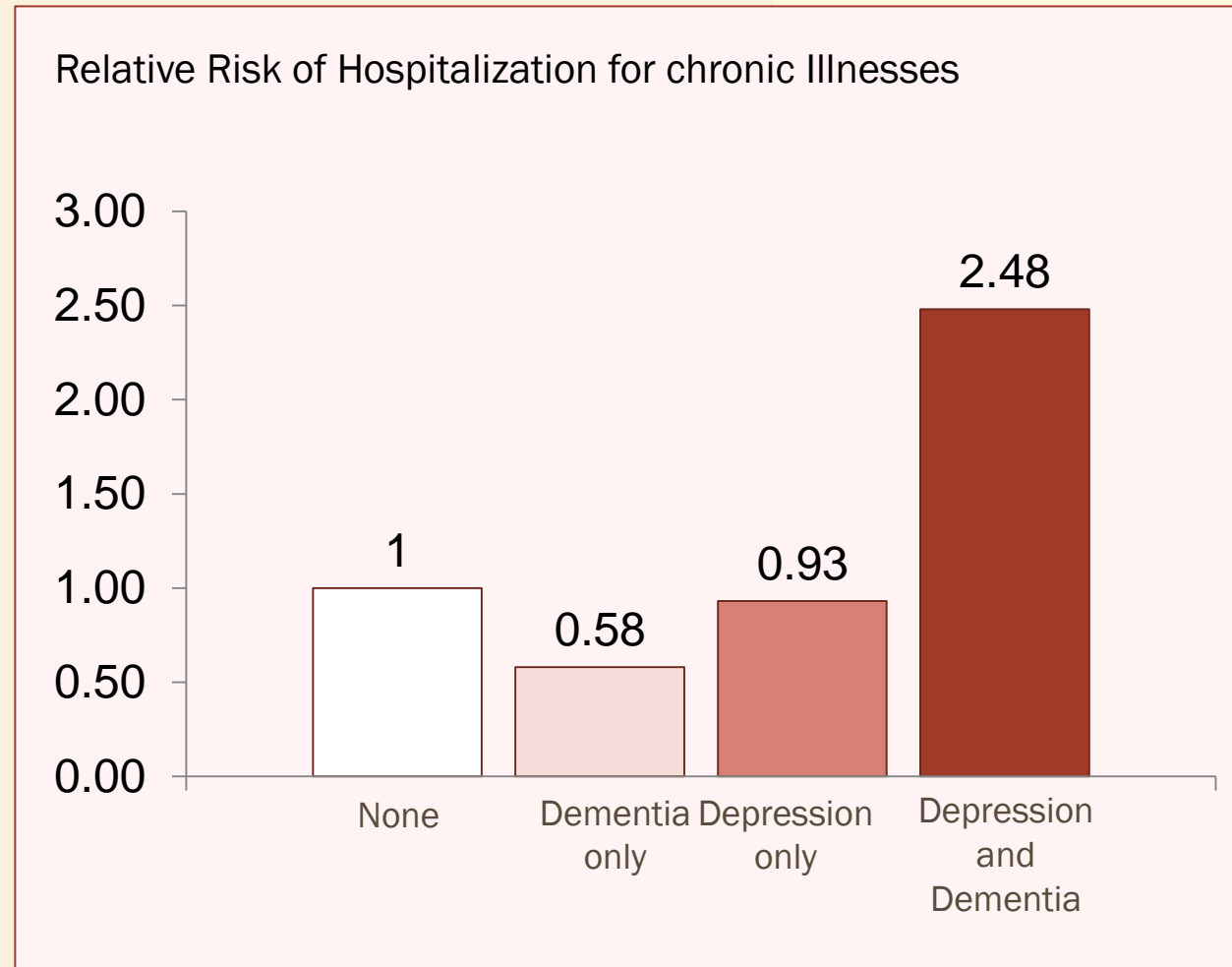
Conversion Rates	
	per 100 p-y
55+	1.35
65+	1.79
75+	3.12

Cognitive Impairment

- Leading cause of functional disability

	Population attributable risk %
Cognitive impairment	19.0%
Arthritis	14.0%

Neuropsychiatric morbidity is associated with increased hospitalization risk



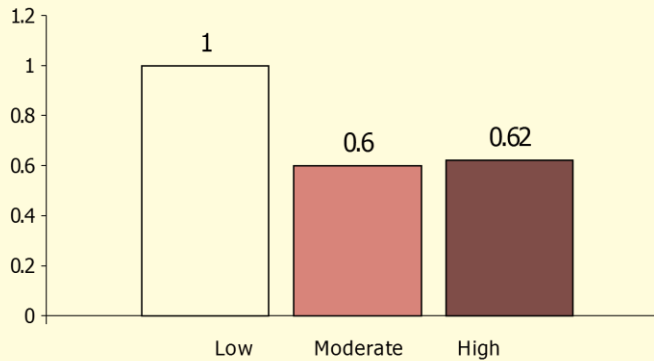
Risk and Protective Factors

- **Genetics:** APOE-e4, TOMM40, CLU, PICALM, etc
- **Demographic:** Increasing age, female sex, ethnicity, low education
- **Lifestyle behavior:** physical activity
- **Social:** isolation/engagement, marital status, active work employment
- **Cognitive:** mental activities
- **Psychological:** depression
- **Medical:** head injury, medical conditions and drugs
- **Vascular:** smoking, obesity, hypertension, diabetes, insulin resistance, metabolic syndrome
- **Nutritional:** folate, B12, omega-3 PUFA, anti-oxidants

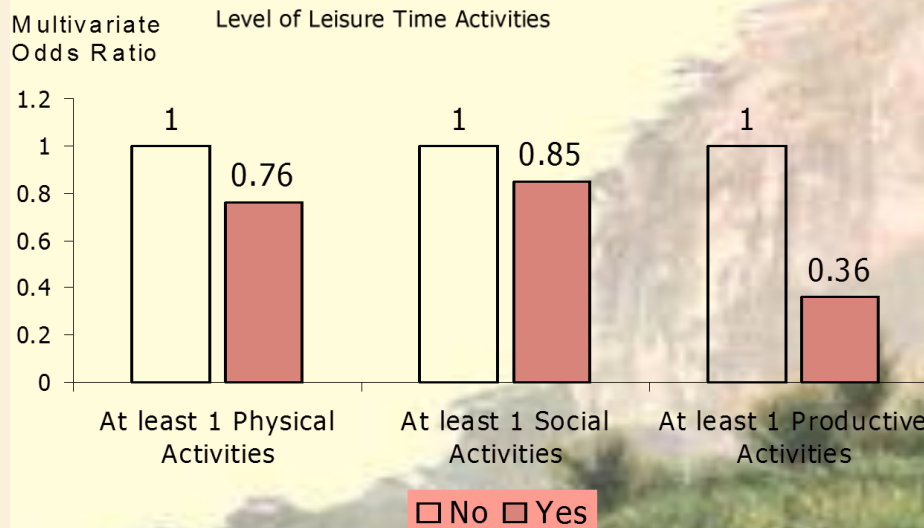
Physical, Social and Productive Activity



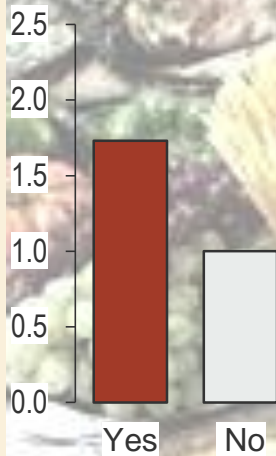
Relative Risk of Cognitive Decline



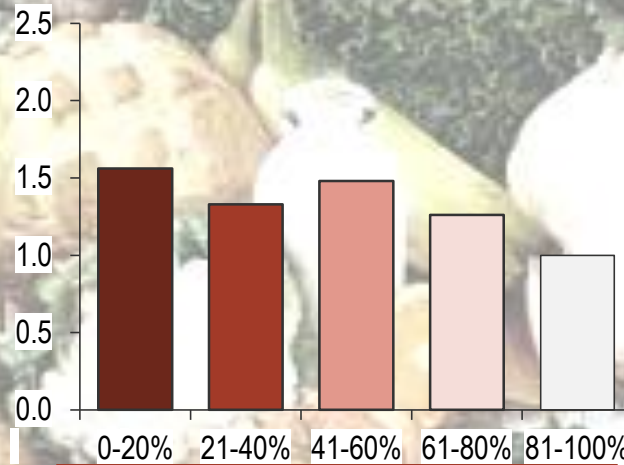
Multivariate Odds Ratio



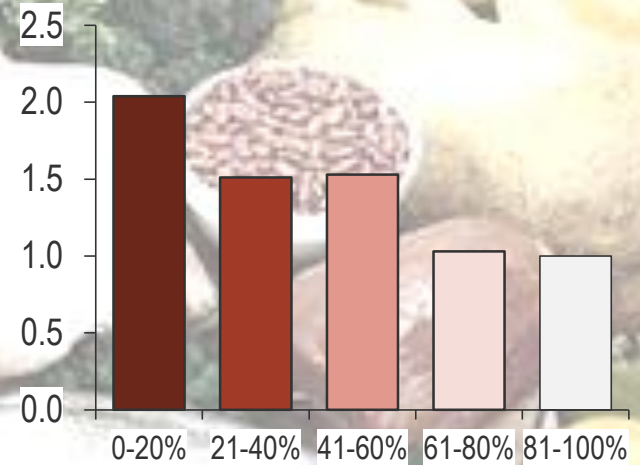
Nutrition



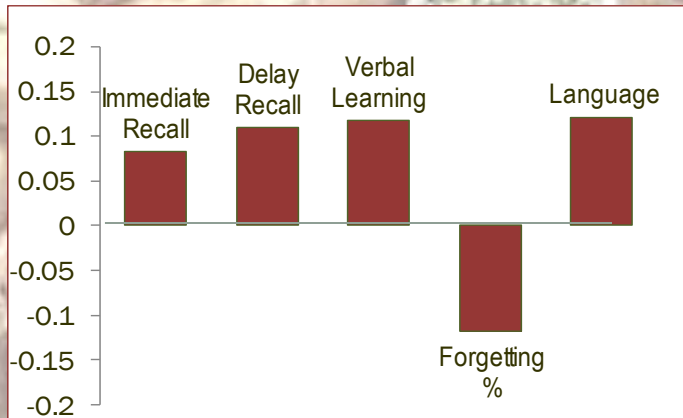
Low BMI with chronic disease



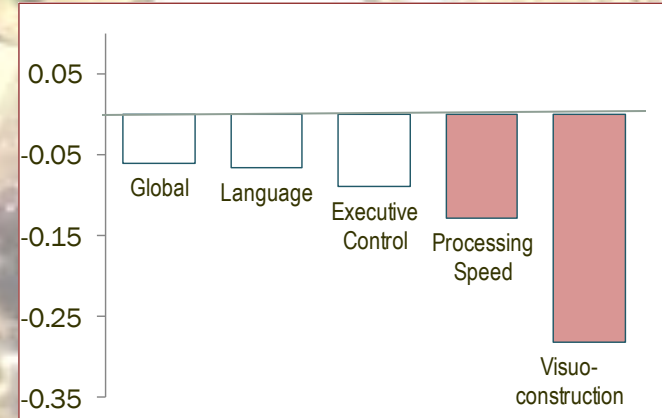
Anemia



Low albumin,

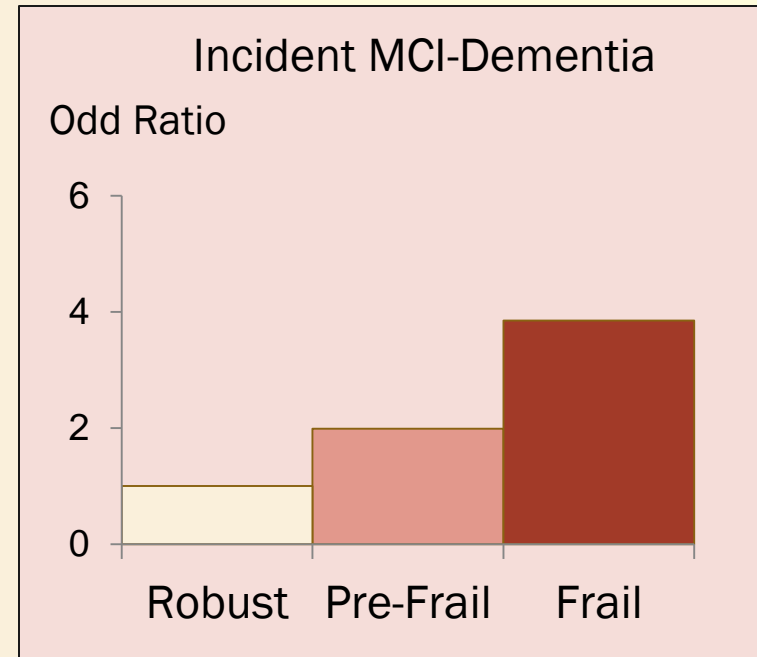
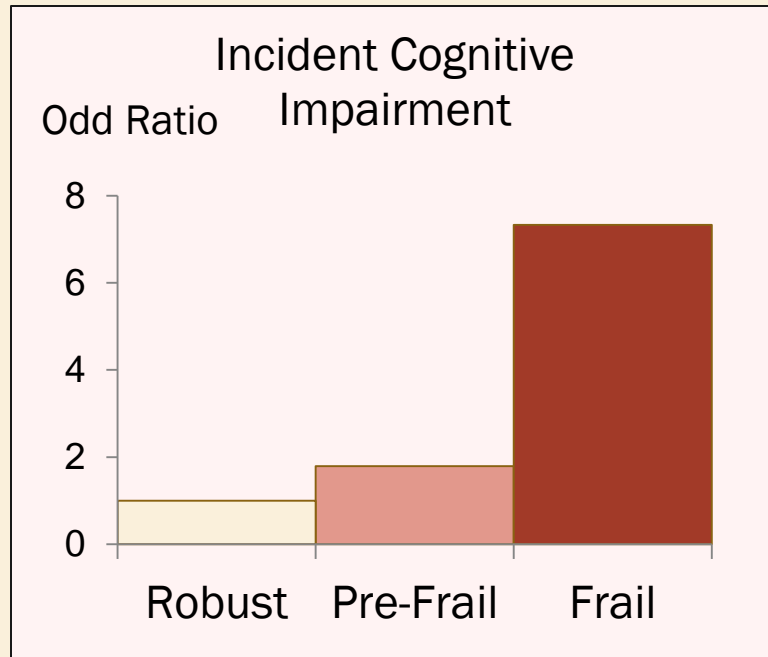


Folate



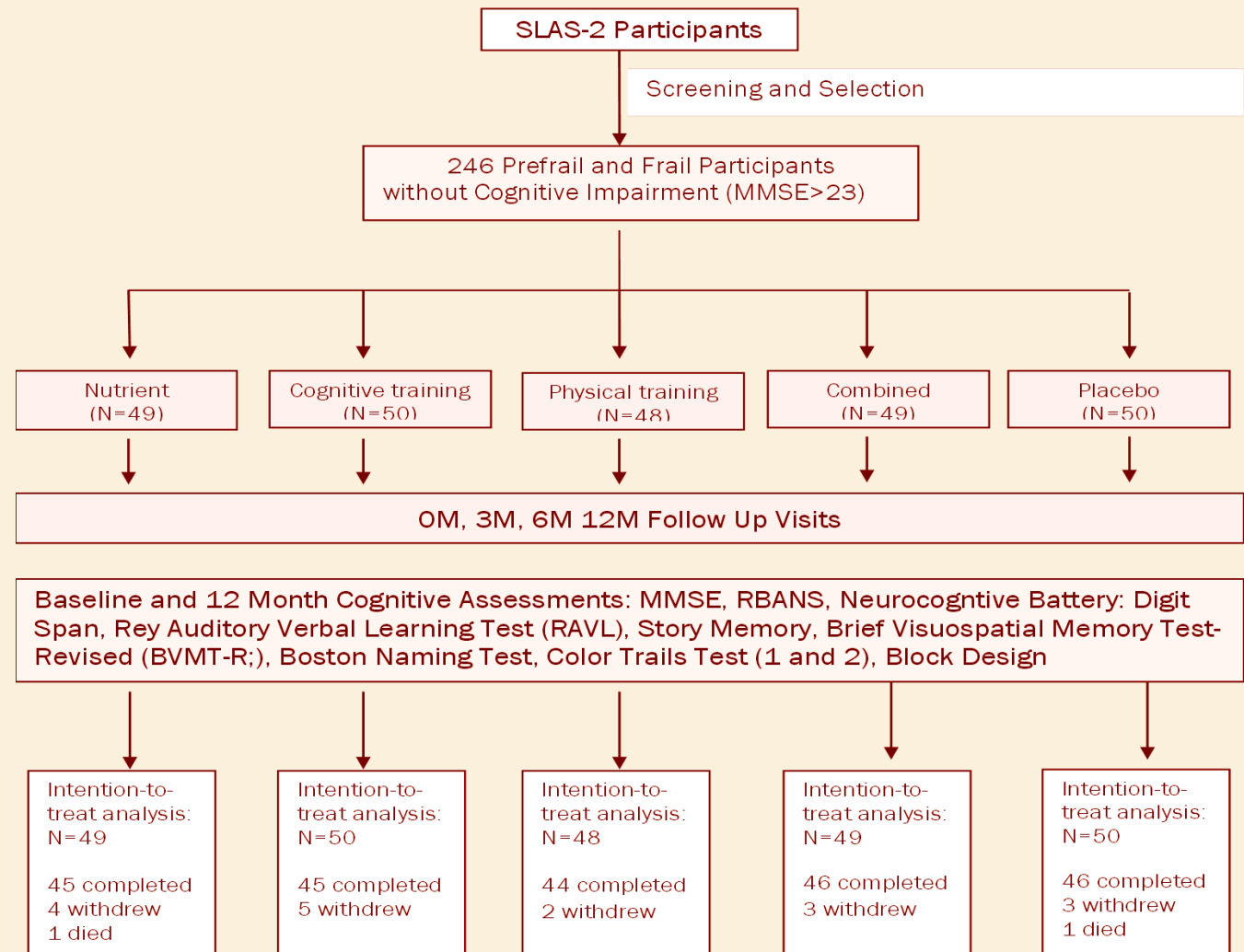
Homocysteine

Physical Frailty is associated with Increased Risk of Cognitive Impairment and Dementia



Lifestyle Intervention in Frail Elderly

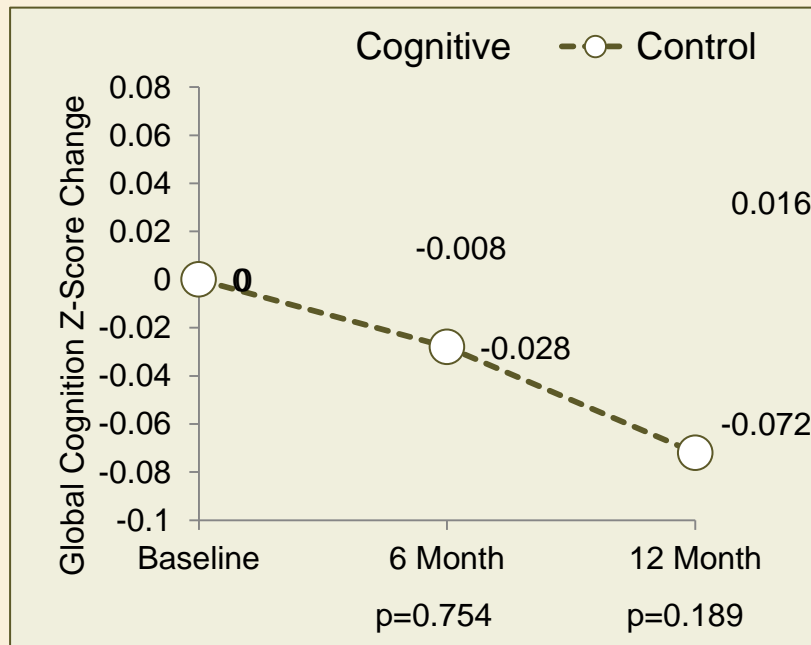
Singapore Frailty Intervention Trial (FIT)



Lifestyle Interventions in Frail Elderly

- Cognitive and Combination Interventions Improves Cognitive Functioning

Cognitive Training



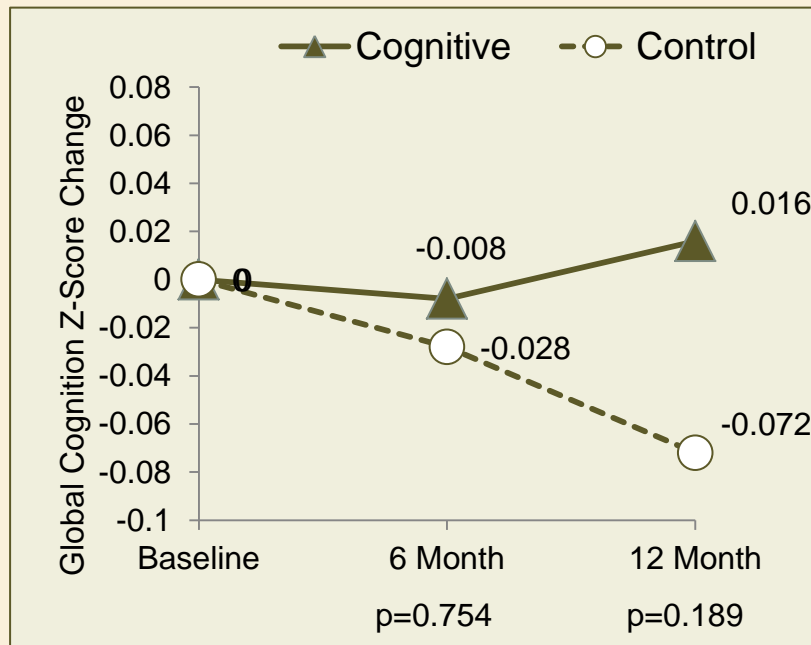
Manuscript in review



Lifestyle Interventions in Frail Elderly

- Cognitive and Combination Interventions Improves Cognitive Functioning

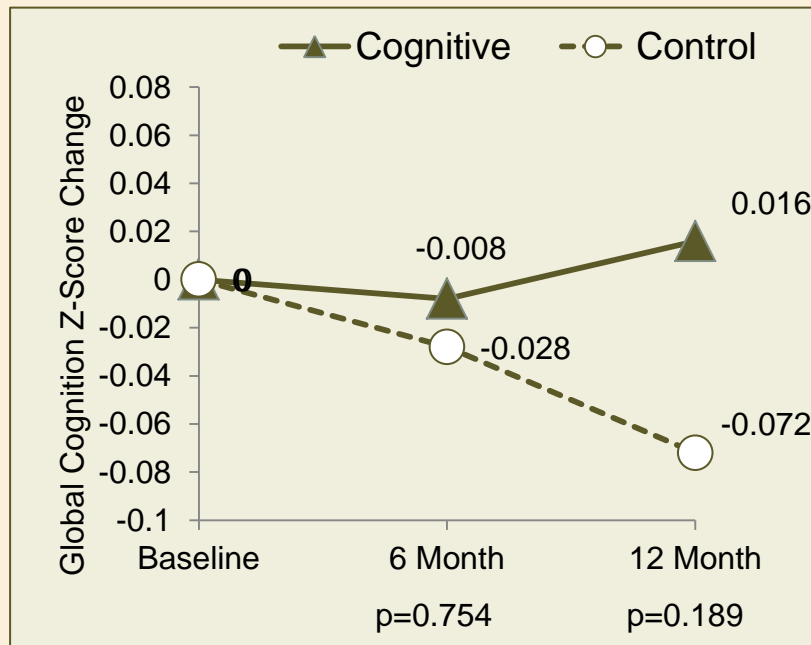
Cognitive Training



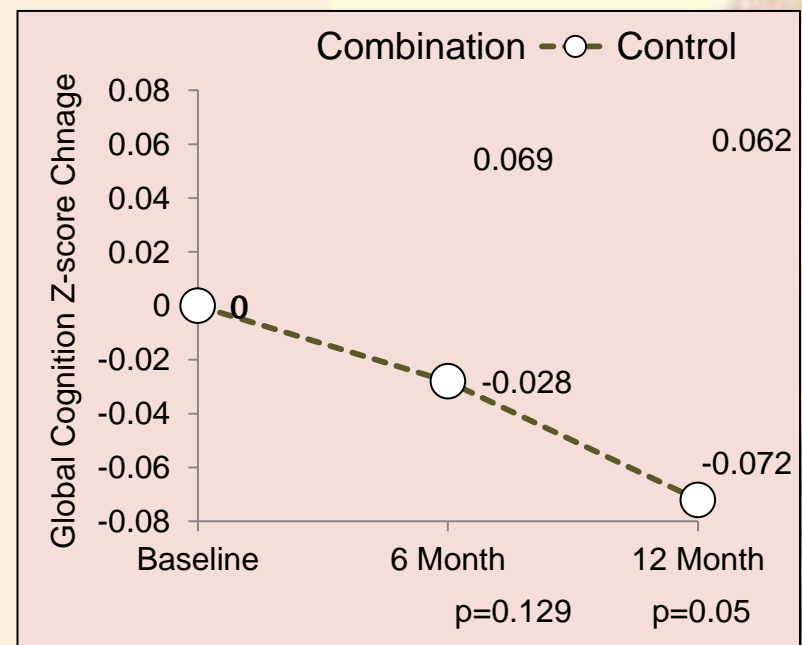
Lifestyle Interventions in Frail Elderly

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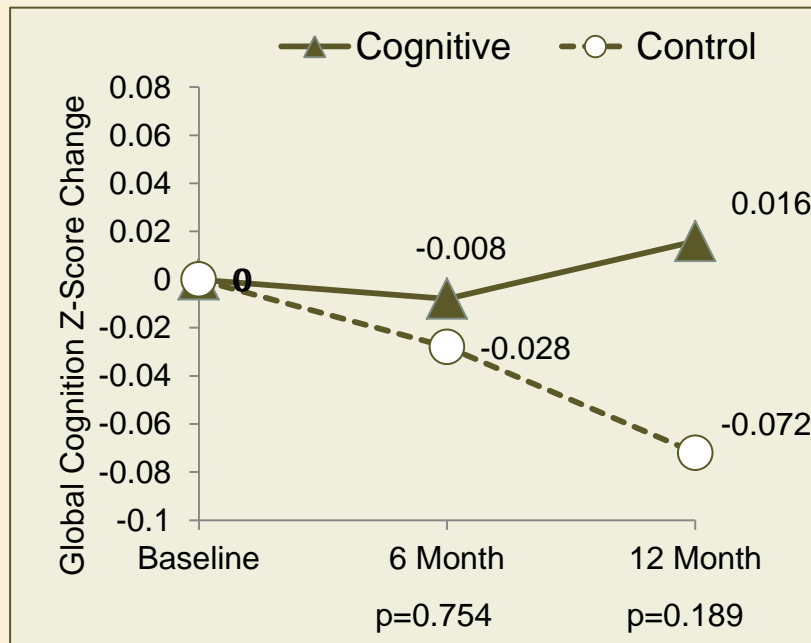
Combination



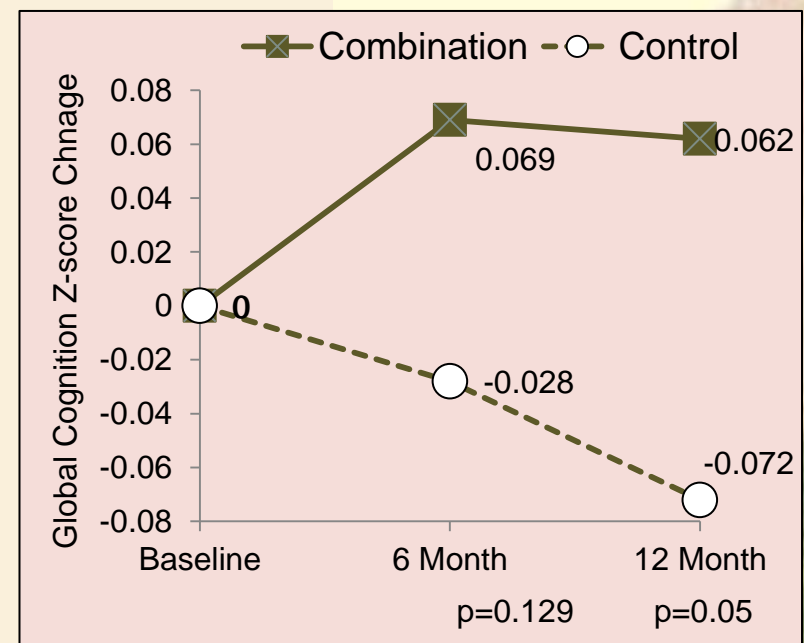
Lifestyle Interventions in Frail Elderly

- Cognitive and Combination Interventions Improves Cognitive Functioning

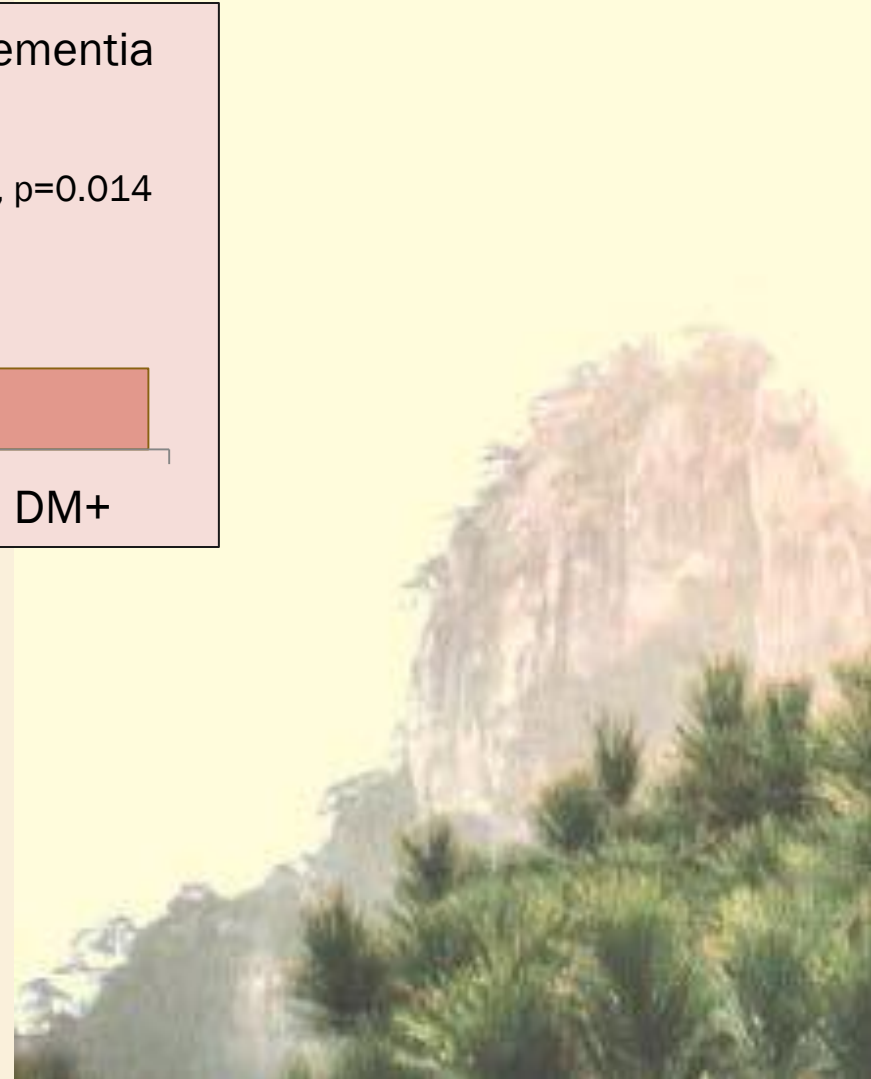
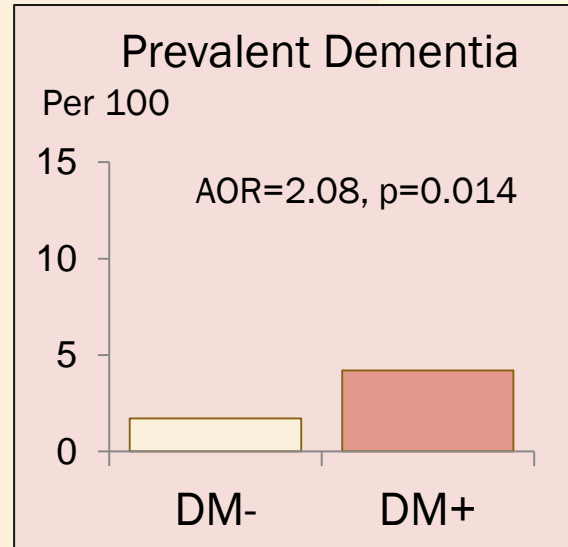
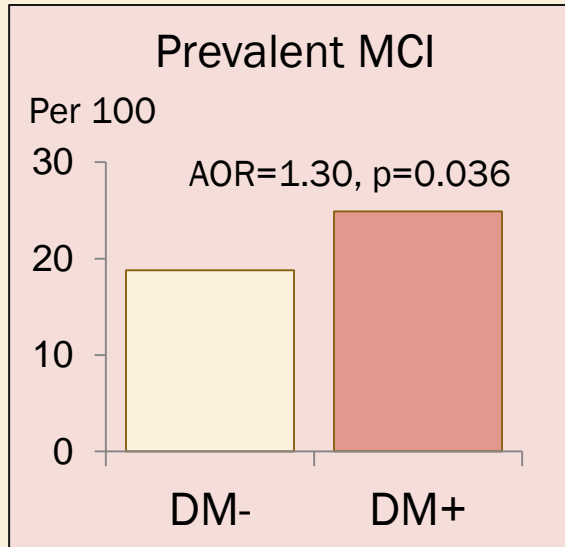
Cognitive Training



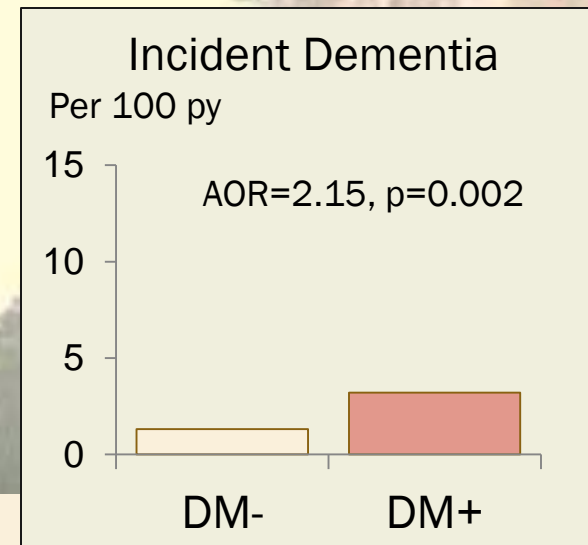
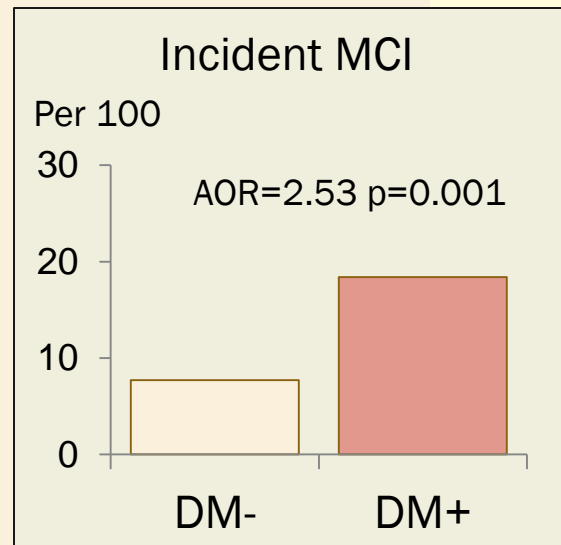
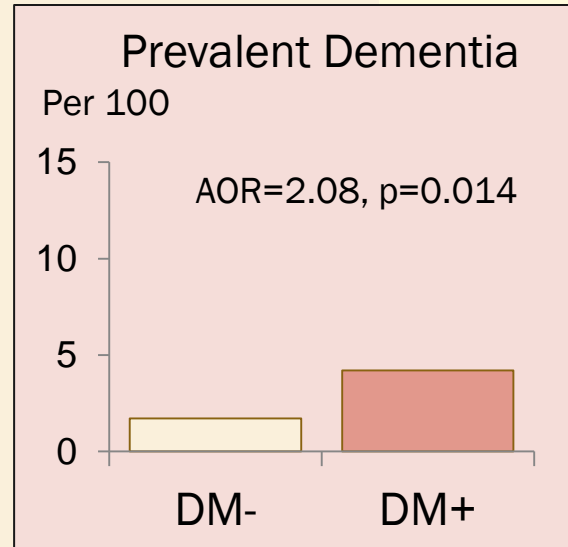
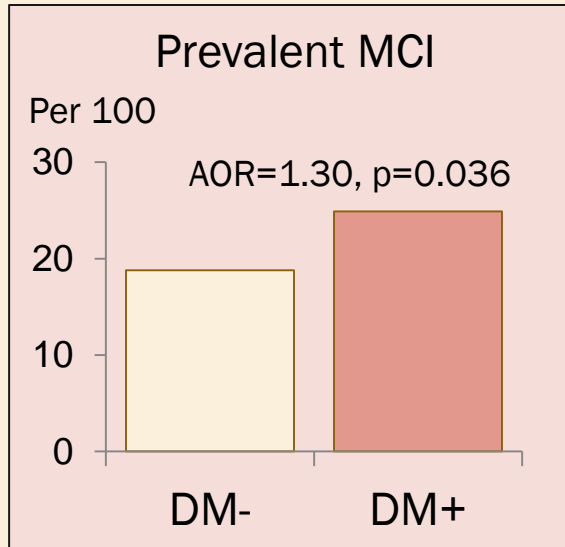
Combination



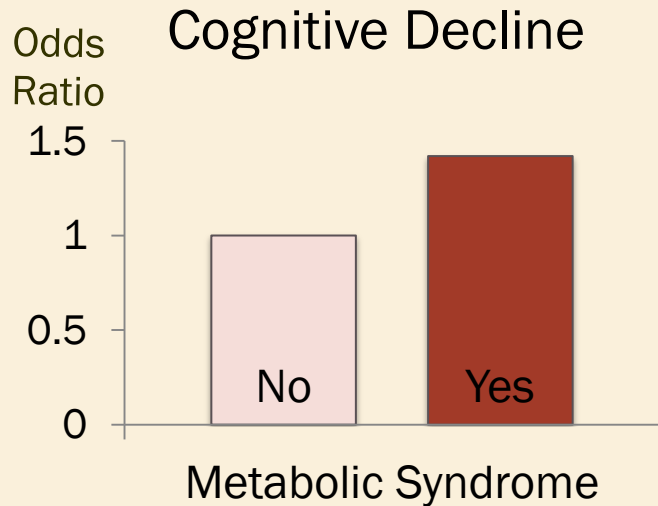
DIABETES is associated with Increased Risk of Cognitive Impairment and Dementia



DIABETES is associated with Increased Risk of Cognitive Impairment and Dementia



METABOLIC SYNDROME is associated with Increased Risk of Cognitive Decline and MCI

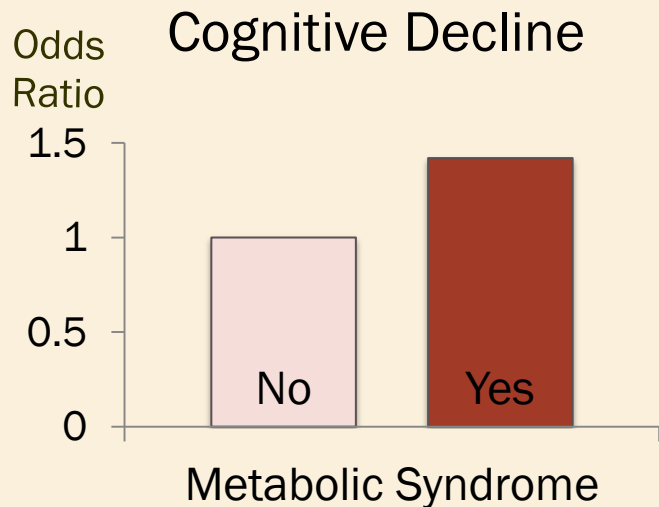


¶ Adjusted for age, gender, education, baseline depressive symptoms (for whole sample), hypertension, cardiovascular illness or stroke, other medical co-morbidity, other anti-diabetic use, APOE-ε4 carrier status, fasting blood glucose, BMI and duration of diabetes.

Am J Geriatr Psychiatr (2008)



METABOLIC SYNDROME is associated with Increased Risk of Cognitive Decline and MCI



¶ Adjusted for age, gender, education, baseline depressive symptoms (for whole sample), hypertension, cardiovascular illness or stroke, other medical co-morbidity, other anti-diabetic use, APOE-ε4 carrier status, fasting blood glucose, BMI and duration of diabetes.

Am J Geriatr Psychiatr (2008)

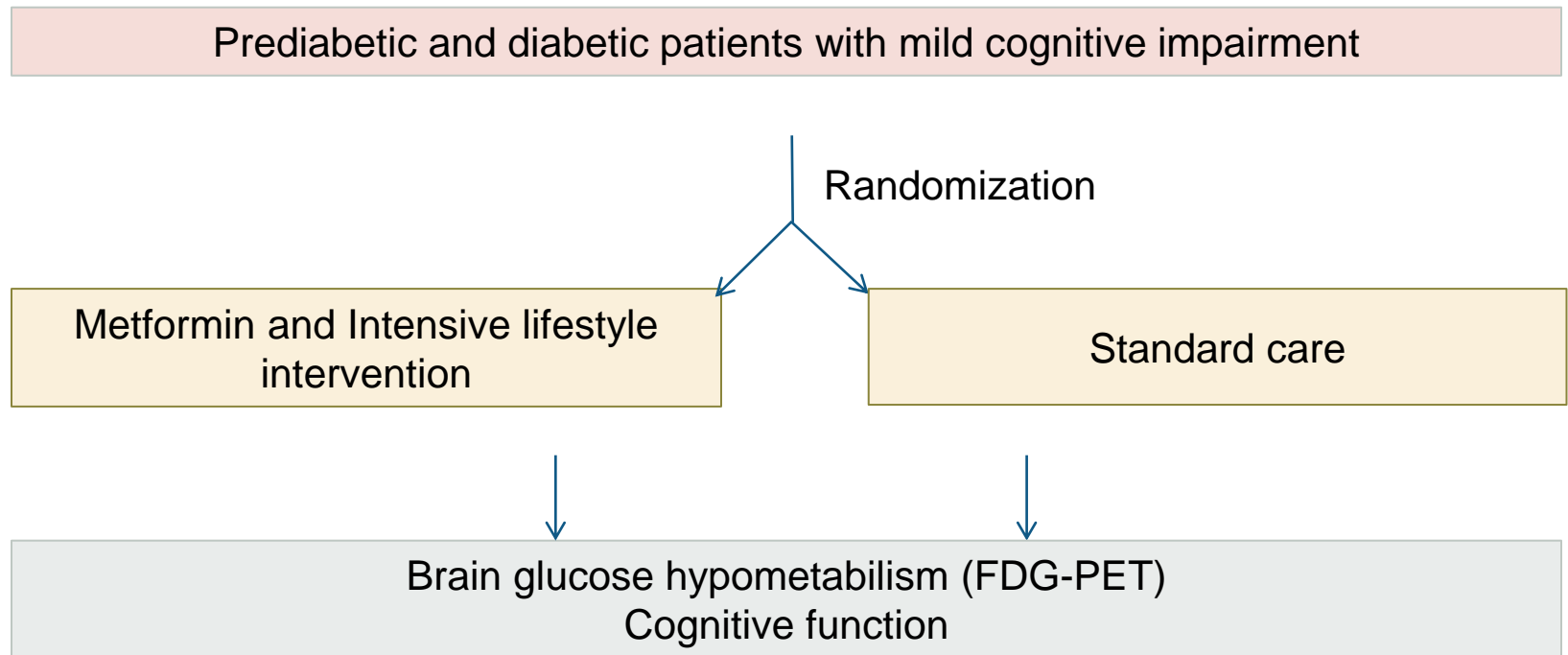
Association of MetS with Amnestic MCI		
Subgroups	OR(95%CI)	P
APOE-ε4 Carrier	3.35 (1.03-10.8)	0.044
Non-APOE-ε4 carrier	1.54 (0.94-2.50)	0.084
APOE-ε4 Carrier and Age≥65	2.82 (0.60-13.3)	0.19
APOE-ε4 Carrier and Age<65	6.57 (1.03-41.7)	0.046
Non-APOE-ε4 Carrier and Age≥65	1.60 (0.86-2.97)	0.14
Non-APOE-ε4 Carrier and Age<65	1.48 (0.63-3.47)	0.36

Adjusted for age, gender, education, current smoking, alcohol drink, physical activity score, heart disease or stroke, GDS score, APOE-ε4 allele carrying status

J Alzheim Dis 2013

Insulin Resistance and Mild Cognitive Impairment (MCI) in Older Adults with Pre-Diabetes and Diabetes: Cognitive Effects of Lifestyle Intervention and Metformin Treatment

National Medical Research Council NMRC CIRG12may033



Randomized controlled trial

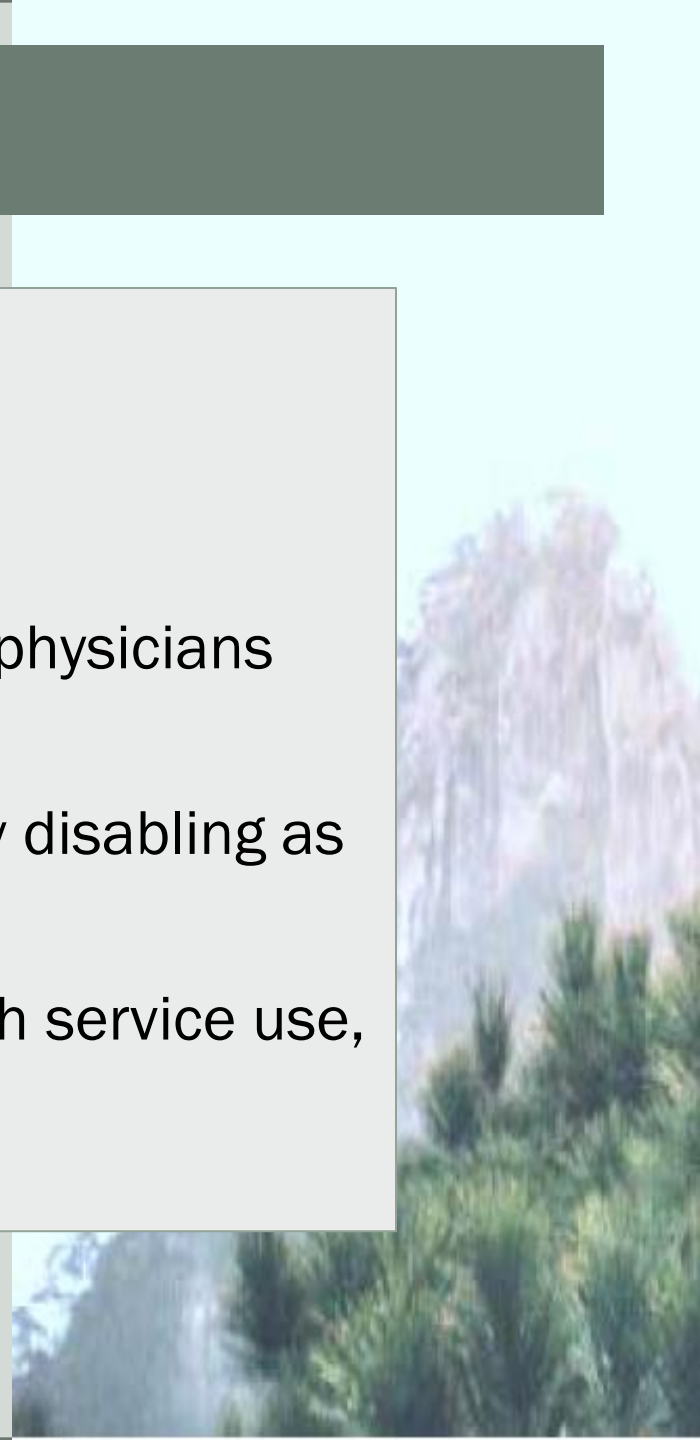
Depression



Depression in the Elderly

Critical Facts and Health Service Needs

- Under-diagnosed and under-treated
- The majority present to primary care physicians instead of psychiatrist
- Sub-syndromal symptoms are equally disabling as syndromic symptoms
- Powerfully impact on morbidity, health service use, quality of life and mortality

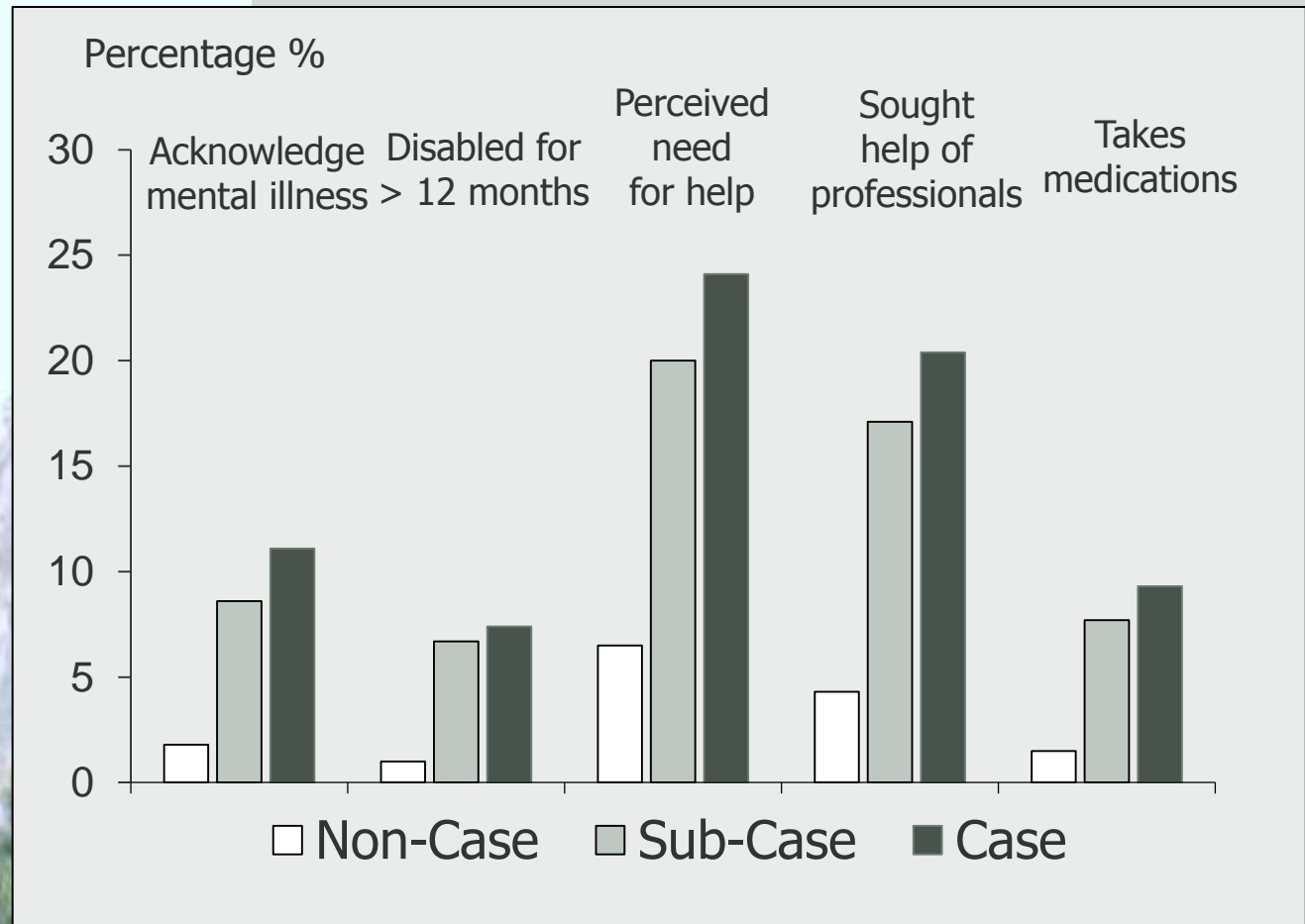


Depression prevalence

- Depressive symptoms (GDS \geq 5).....12.9%
- Case level depression4.9%
- Subcase level depression9.6%
- Case and subcase depression14.5%



Subsyndromal Depression

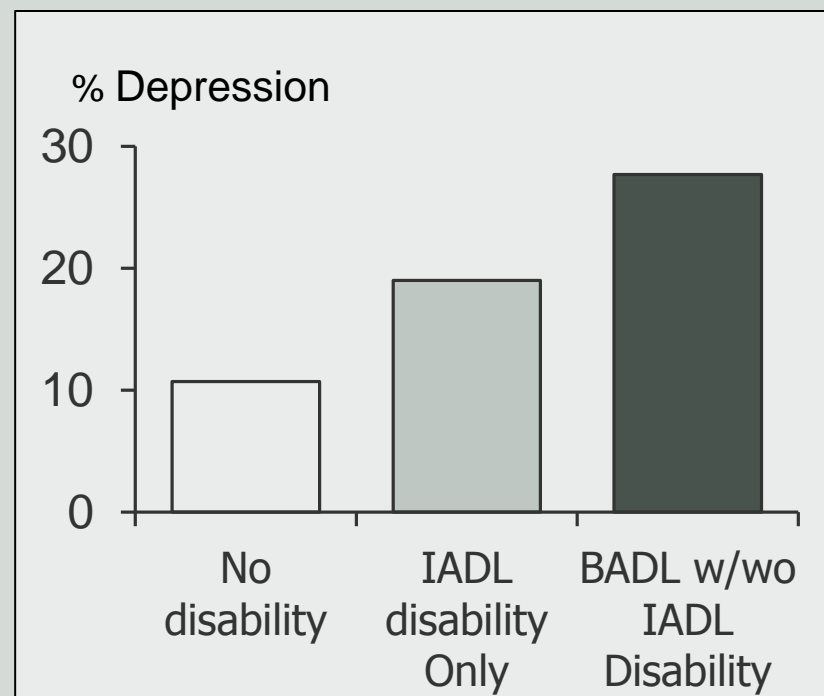
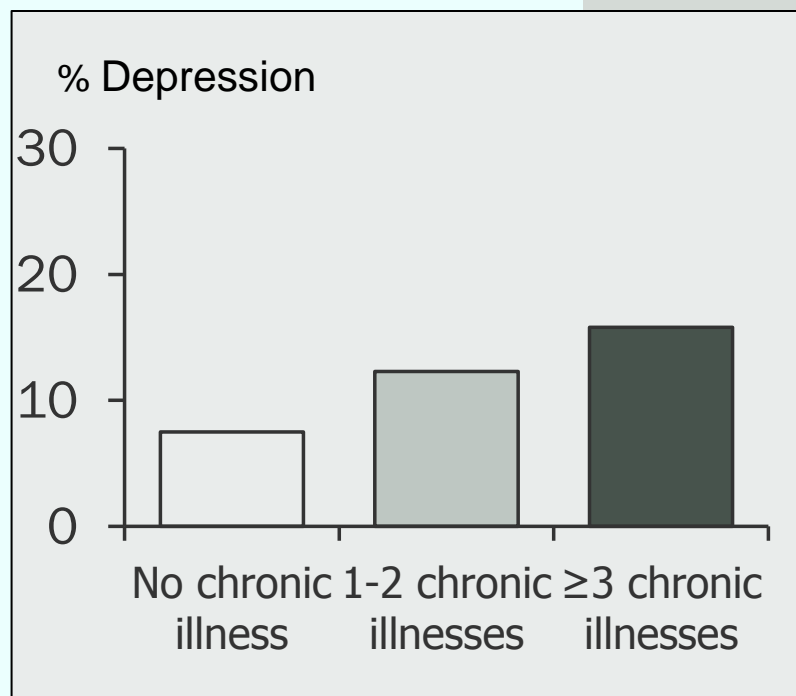


Soh KC, Kumar R, Niti M, Kua EH, Ng TP. Subsyndromal depression in old age: clinical significance and impact. *International Psychogeriatrics* (In Press).

Health service use and depression

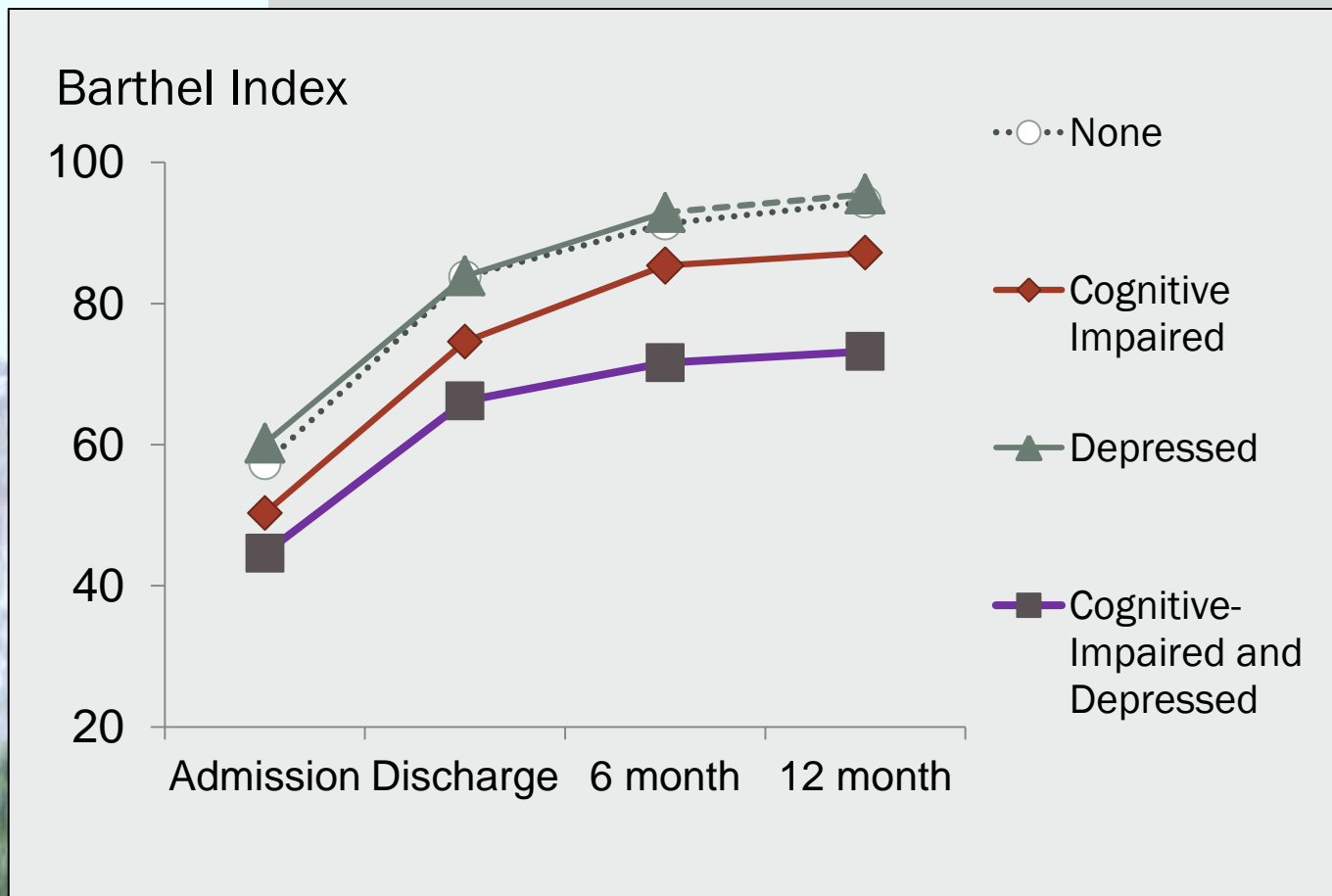
Non-depressed at baseline	Depressive symptoms at 1 year follow up			
	%	p	Adjusted OR (95% C.I.)	p
Hospitalized in past year				
No (N=857)	1.6		1	
Yes (N=68)	11.8	<0.001	10.2 (3.36 - 31.1)	0.0001
Physician visits in past year				
≤5 visits (N=605)	0.8	<0.001	1	
>5 visits (N=320)	5.3		7.37 (2.23 - 24.4)	0.0011

Depression increases with Multi-morbidity and Disability



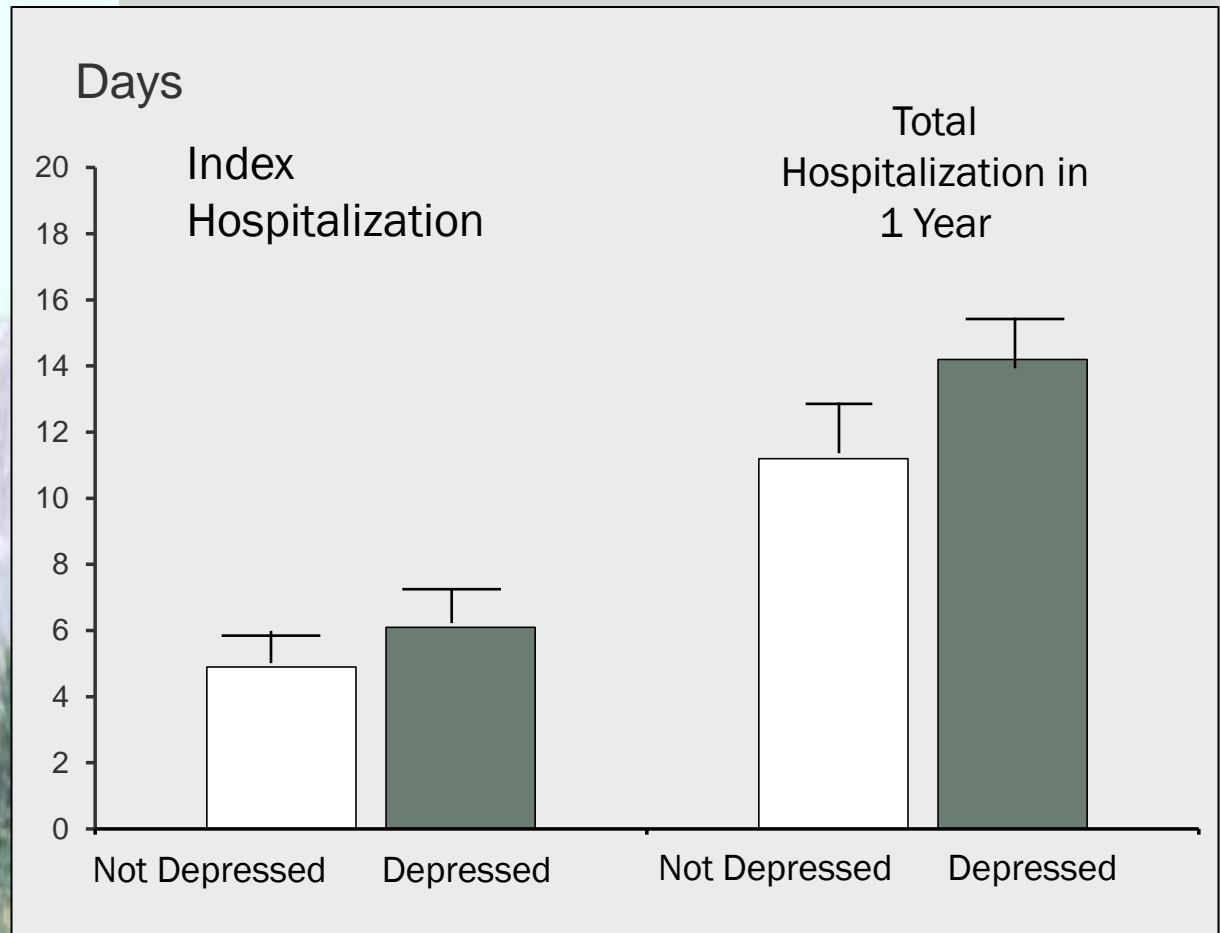
Depression and Cognitive Impairment among Hip Fracture Rehabilitation Inpatients

- Adversely Impact on Functional Recovery



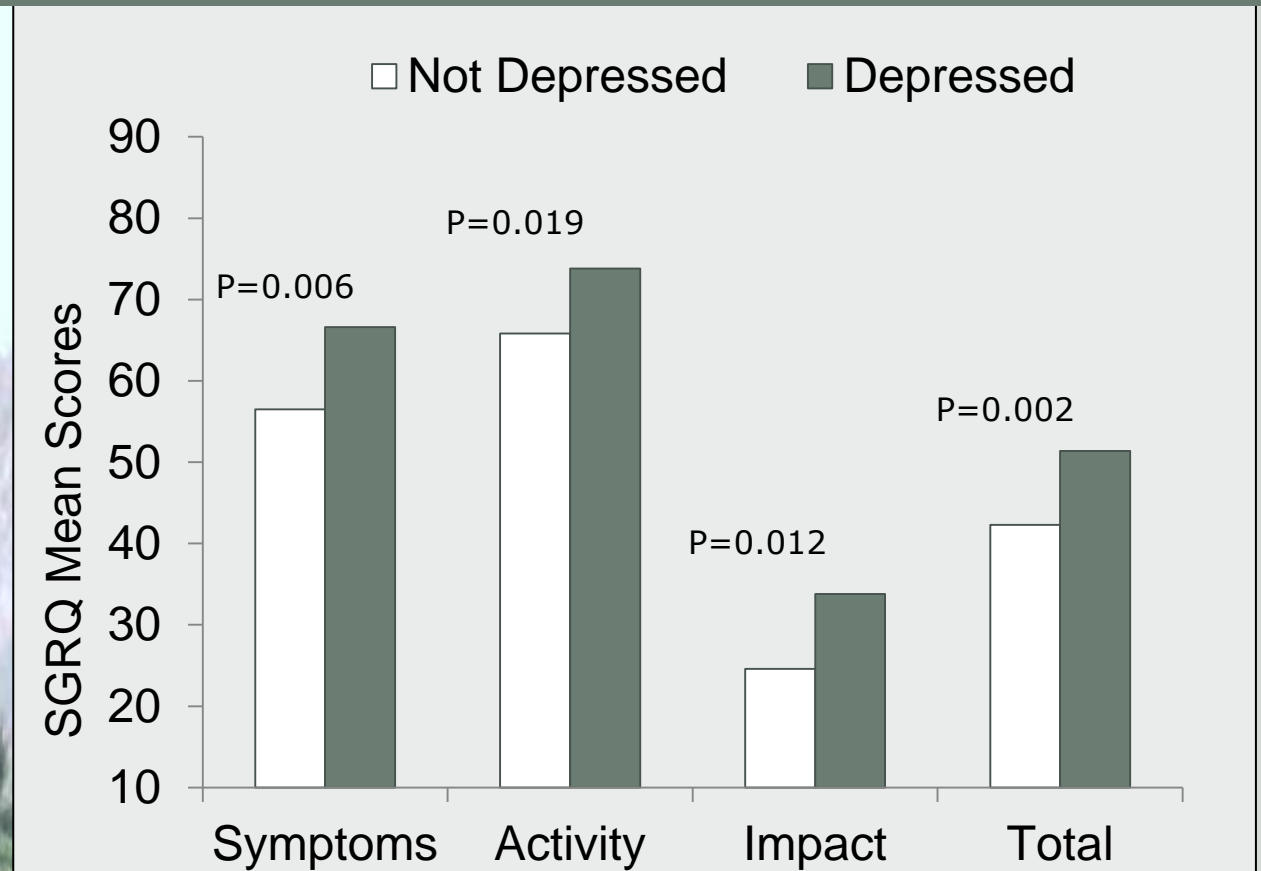
Depression among COPD in-patients

- Increases hospital stay



Depression among COPD in-patients

- is associated with Poorer Quality of Life 1 year post-discharge

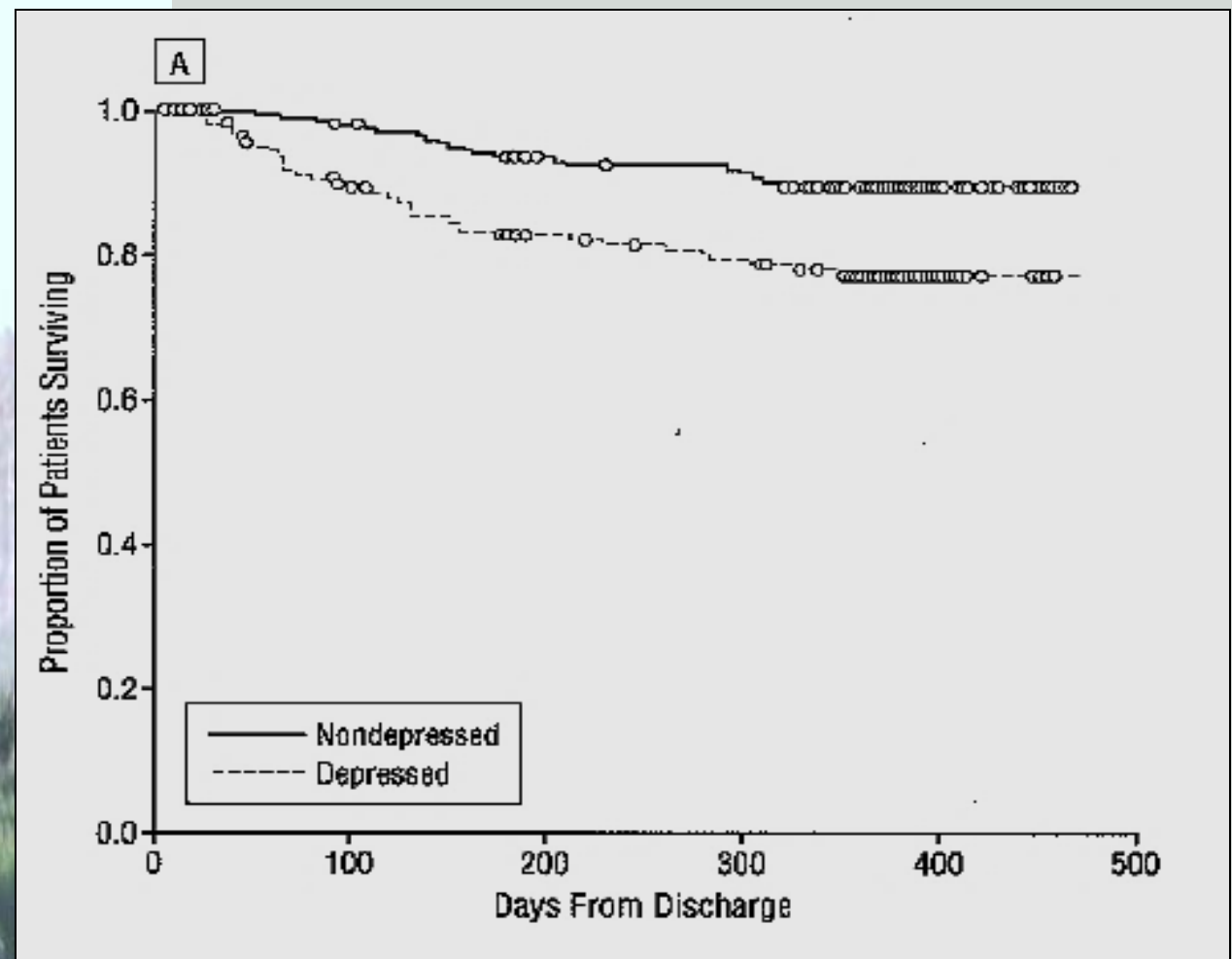


Higher SGRQ score denotes poor quality of life.

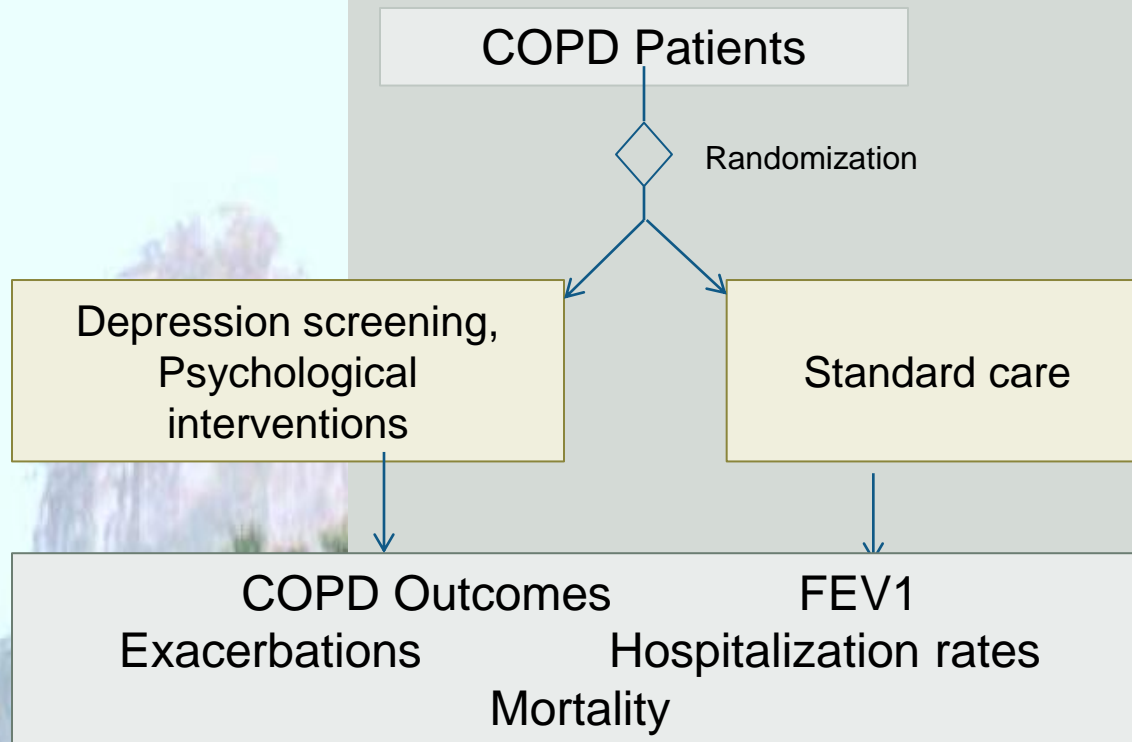
Adjusted in model that included: Sociodemographic factors [age, gender, ethnicity, housing type, marital status, living arrangement]; Clinical factors [chronic mucus hypersecretion, BMI, comorbidity]; Disease severity markers [duration of COPD, No. of readmissions, dyspnea, FEV1% predicted]; Psychosocial and behavioural factors [anxiety, smoking, caregiver-family support]

Depression among COPD in-patients

- Increases post-hospital discharge mortality

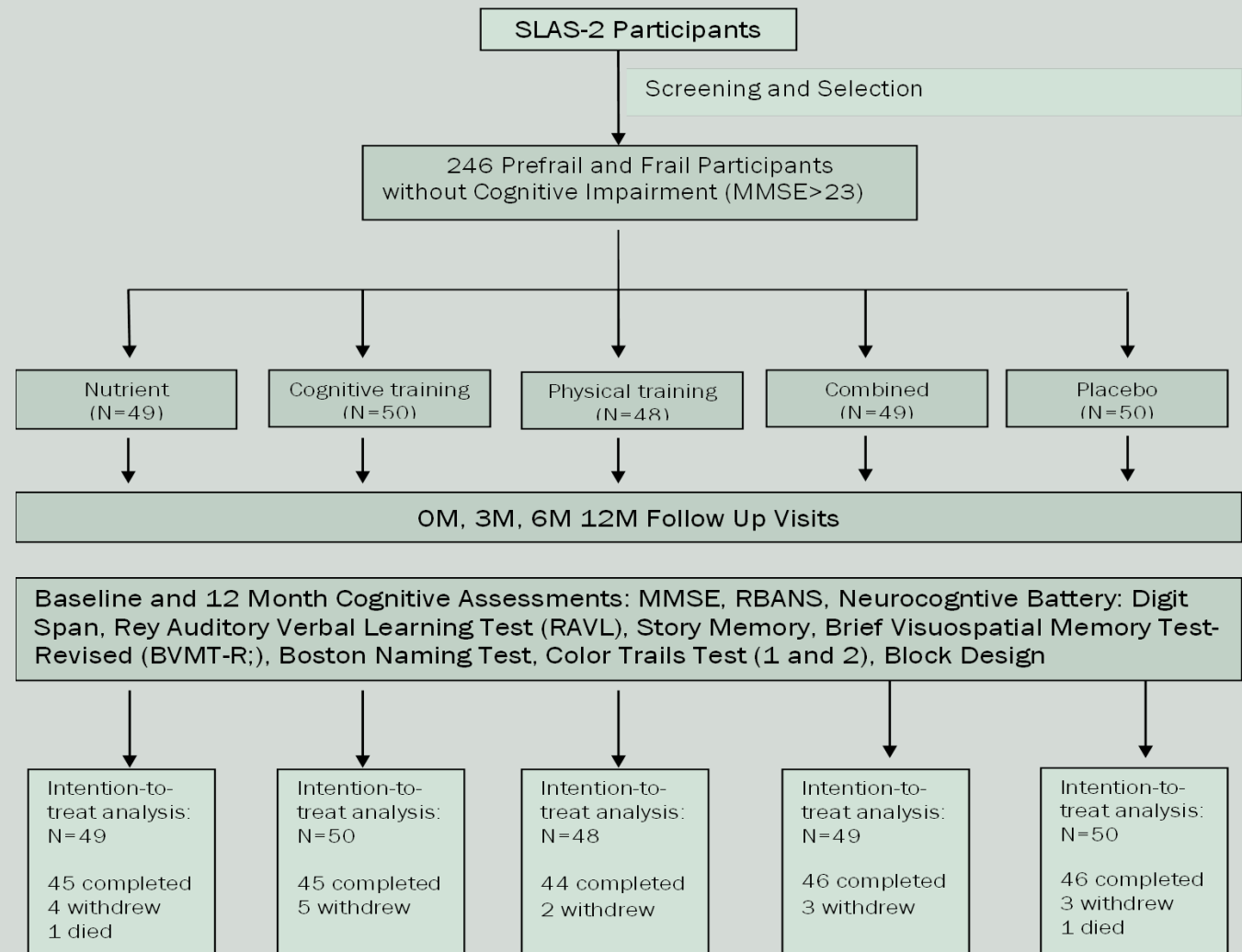


Consultation Liaison and Integrated Care for COPD patients with Psychiatric Co-Morbidity

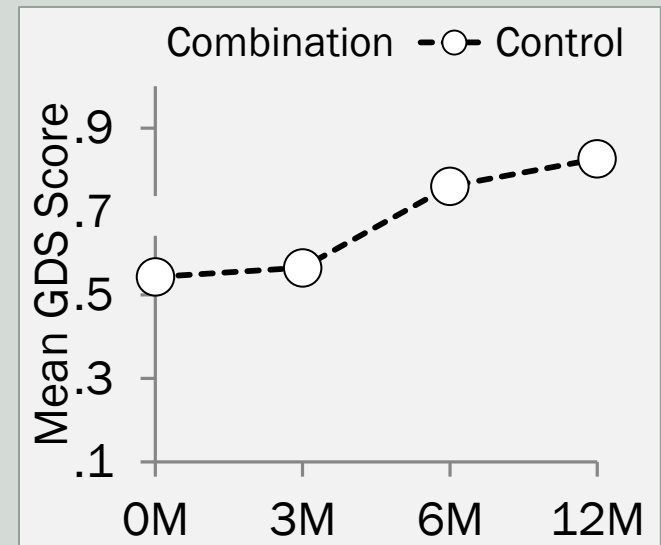
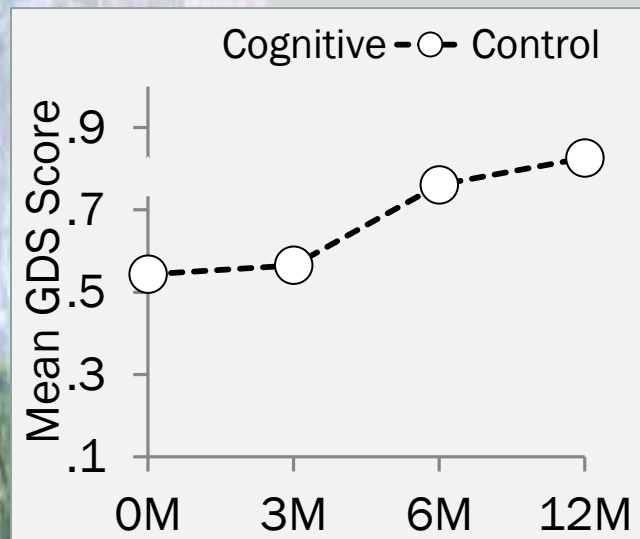
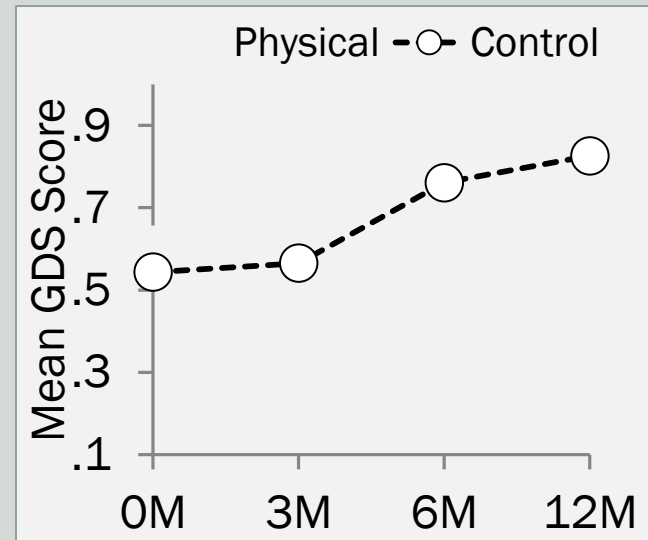
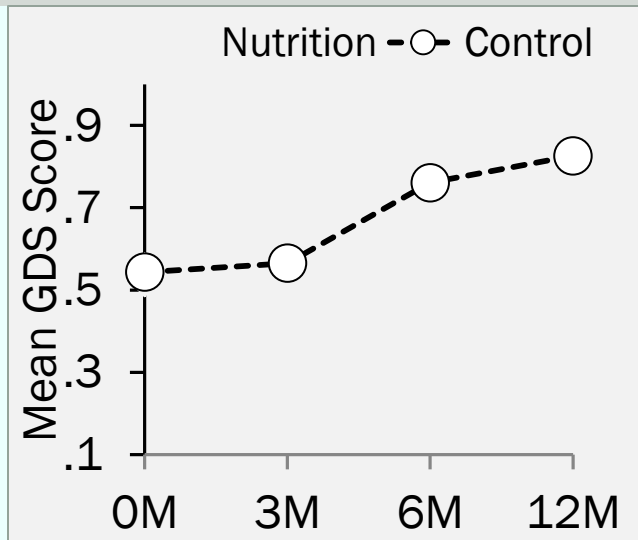


Lifestyle Intervention in Frail Elderly

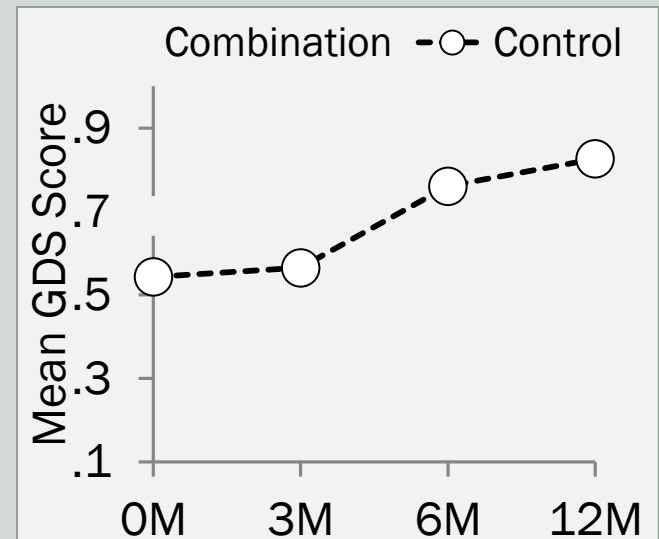
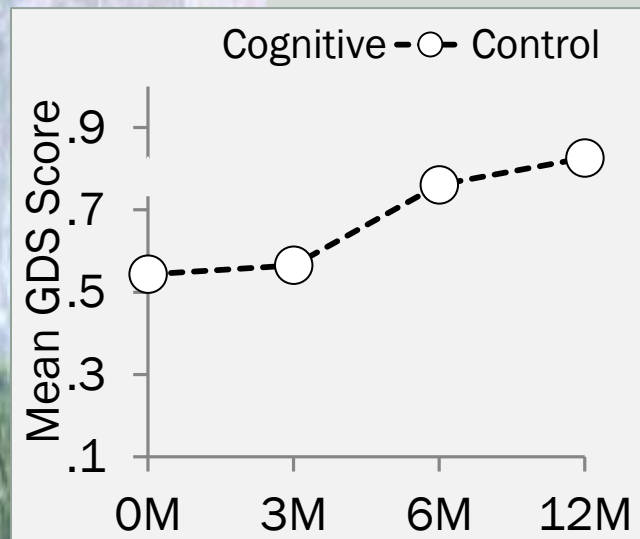
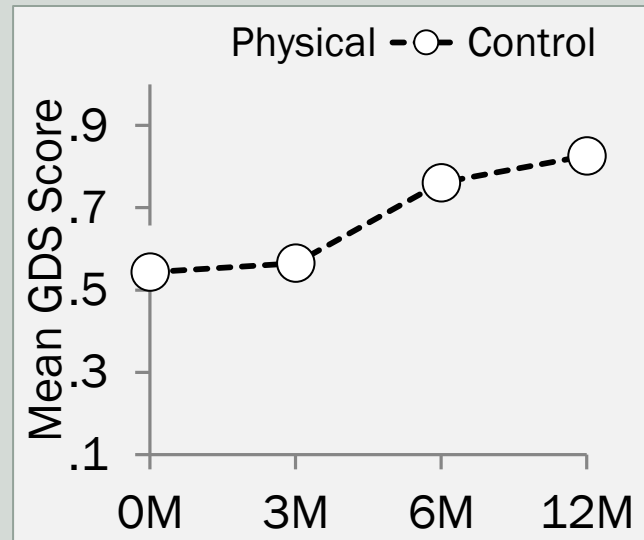
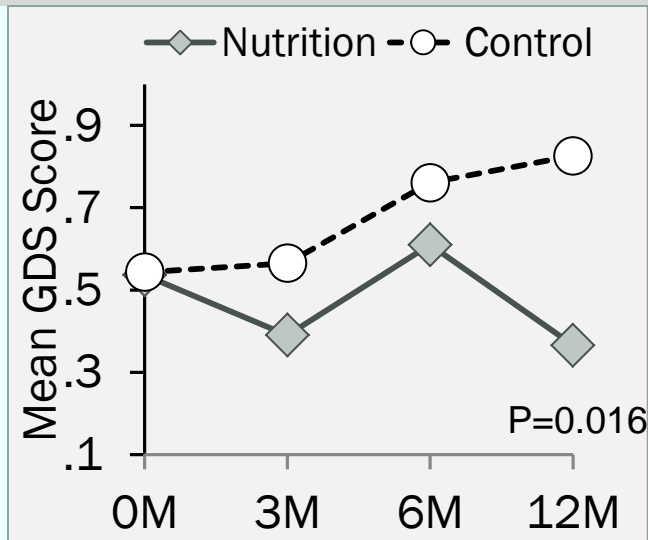
Singapore Frailty Intervention Trial (FIT)



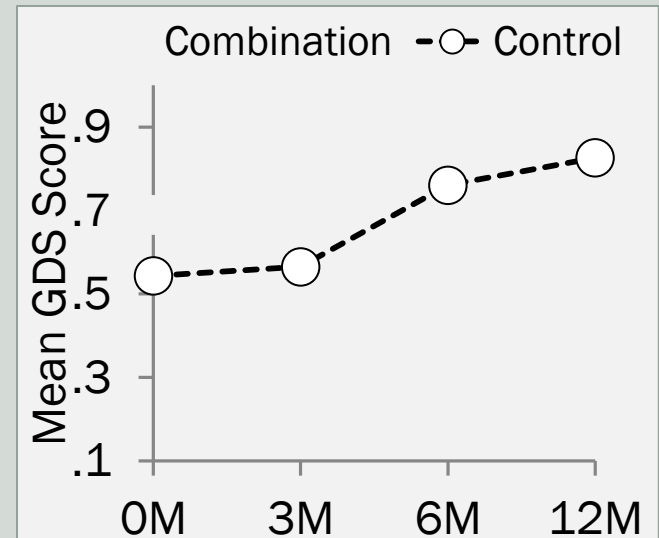
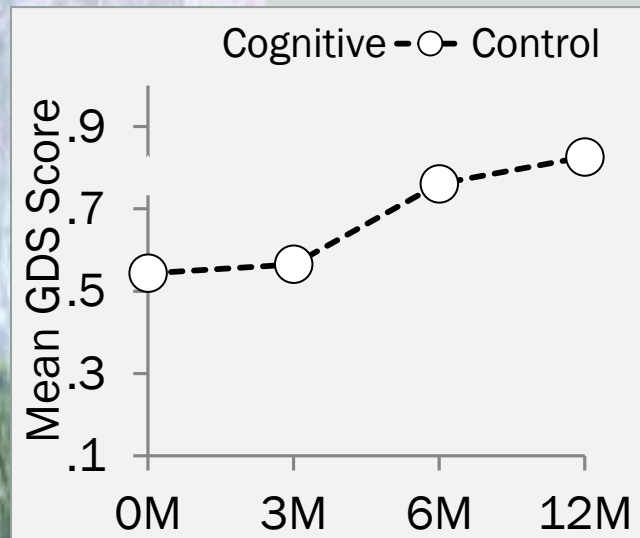
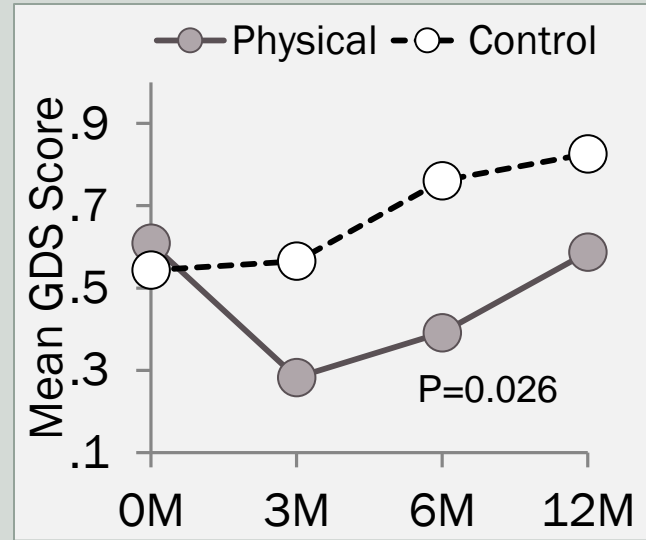
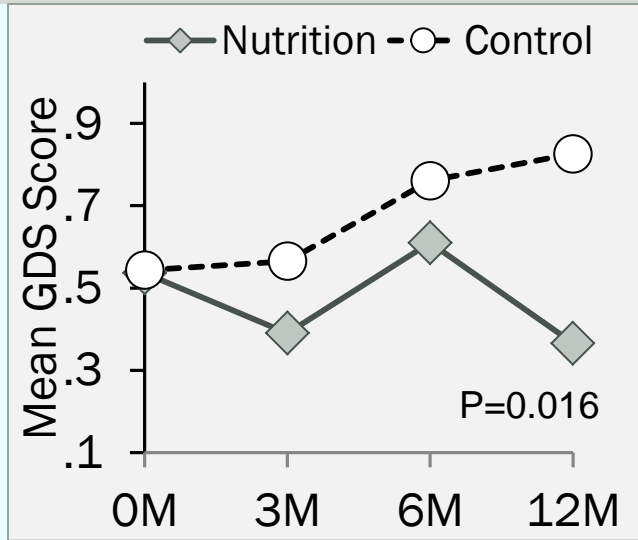
Lifestyle Intervention in Frail Elderly



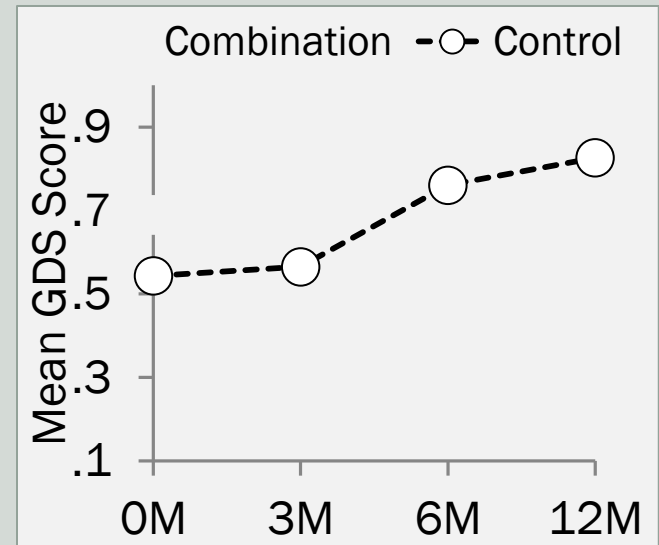
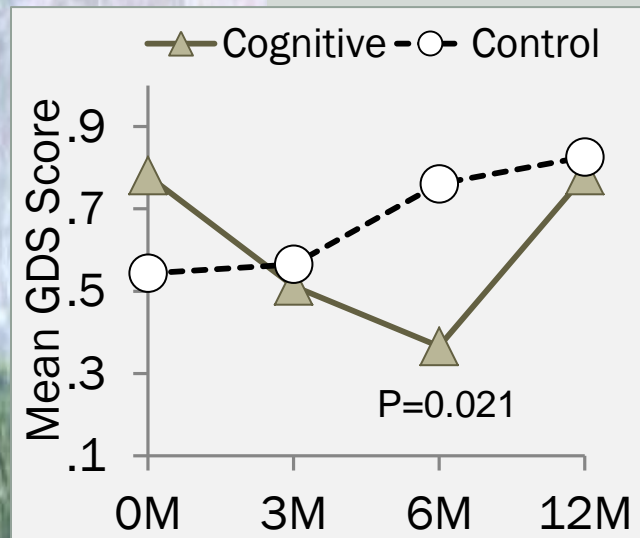
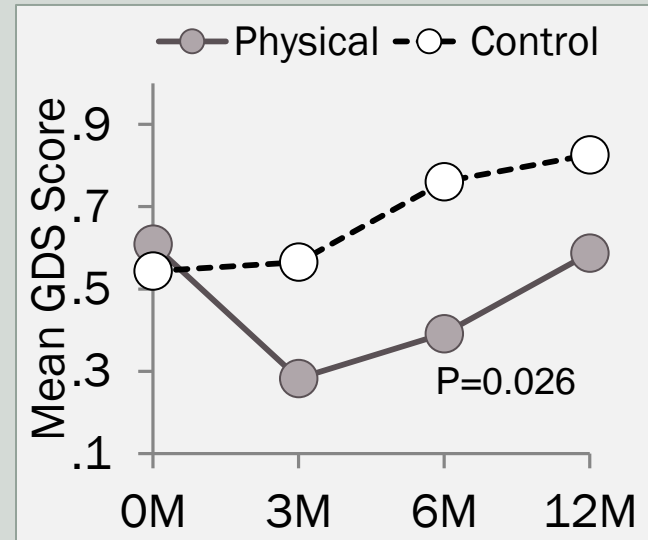
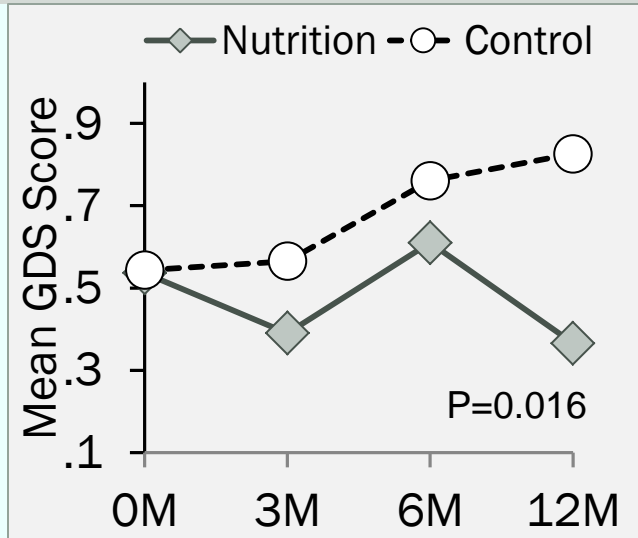
Lifestyle Intervention in Frail Elderly



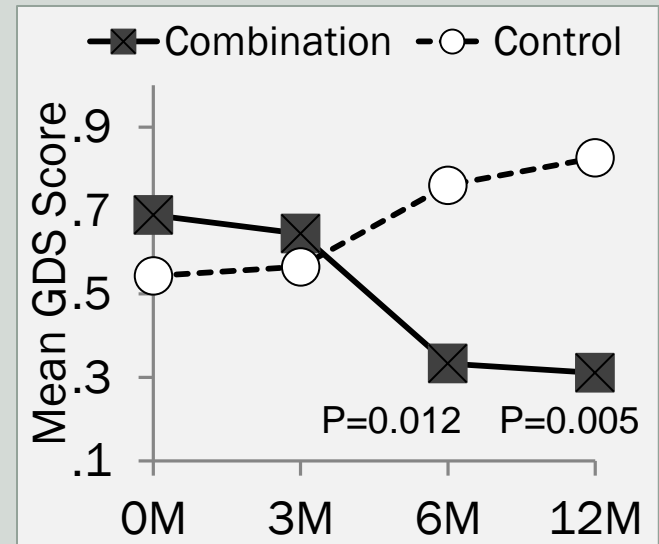
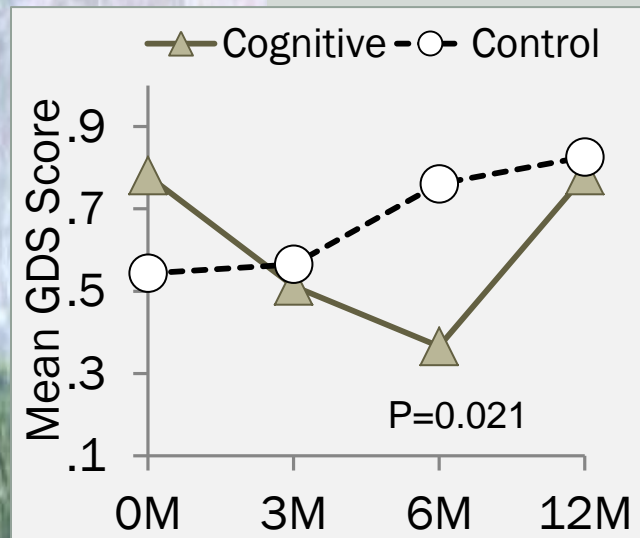
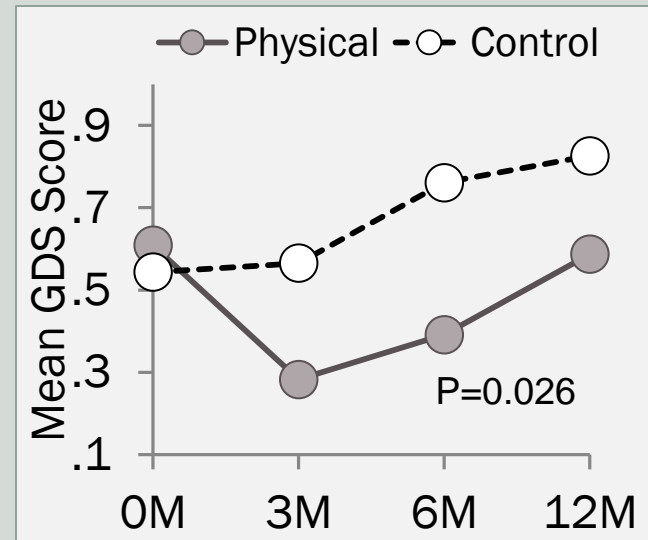
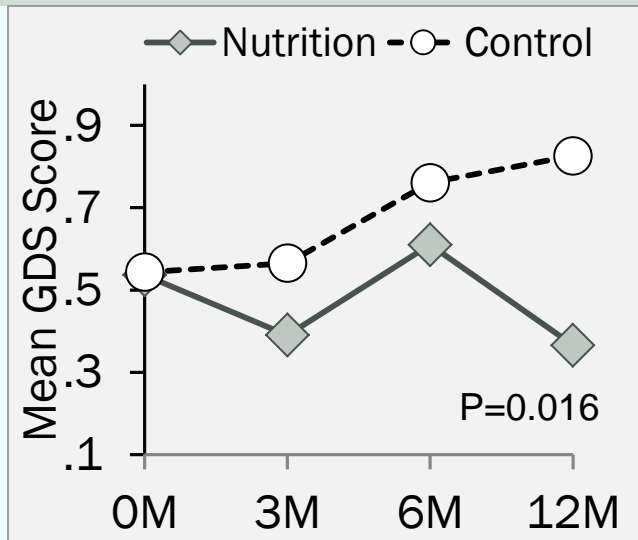
Lifestyle Intervention in Frail Elderly



Lifestyle Intervention in Frail Elderly

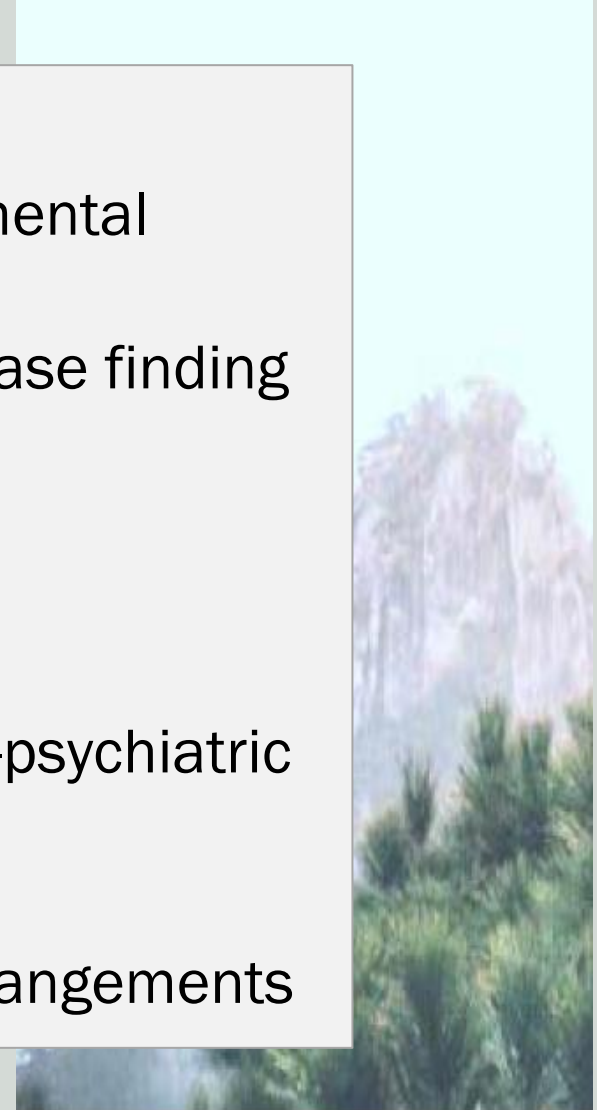


Lifestyle Intervention in Frail Elderly



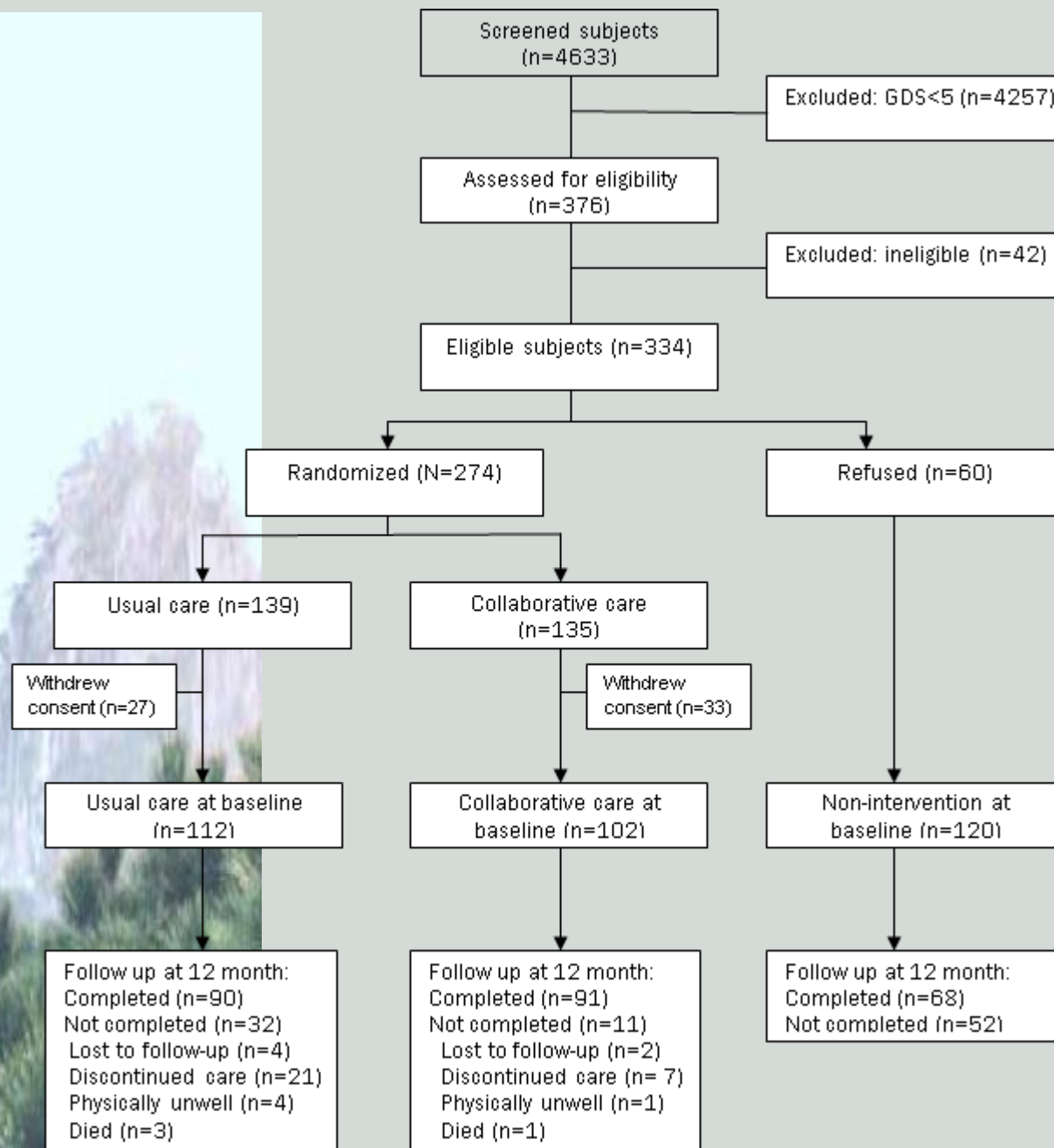
Innovations and models of care

- Primary care outreach:
 - Aims to improve access and use of mental health services
 - Depression/ Anxiety screening and case finding
 - Assessment and Referral
- Integrated collaborative care:
 - Aims to improve quality of care
 - Consultation and treatment in non-institutionalized community and non-psychiatric settings
 - Treatment algorithms or protocols
 - Integrated and collaborative care arrangements



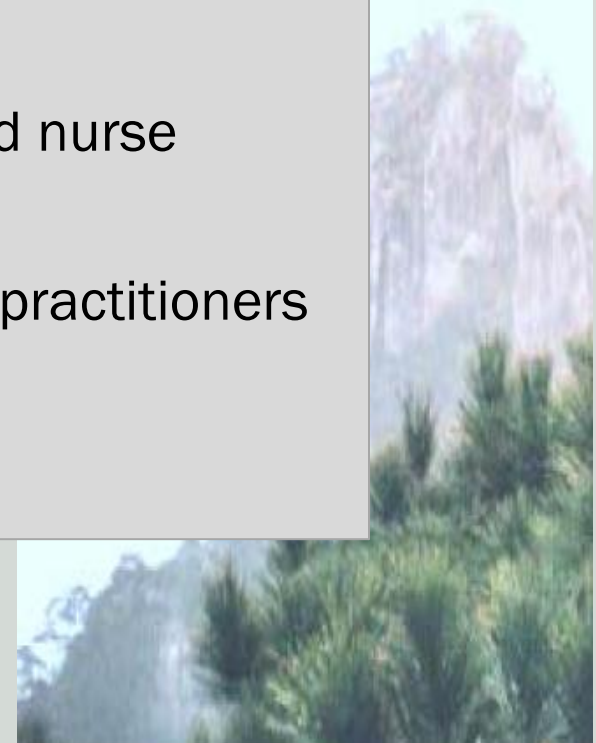
CEPIS

- Community-Based Early Psychiatric Interventional Strategy (CEPIS) programme in Singapore
- Island-wide community-based outreach service and collaborative care model
- Aimed at improving access and treatment outcomes for depression among the elderly in Singapore



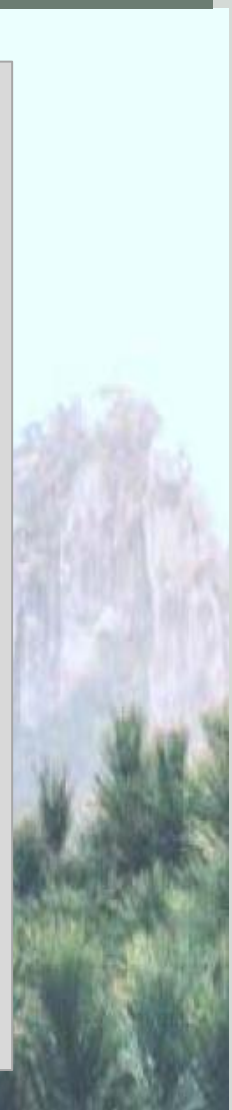
CEPIS

1. Community-wide outreach through neighbourhood social service centres for seniors;
2. Active case detection: routine screening of depressive symptoms
3. Psychoeducation and counseling by trained nurse educators to accept treatment
4. Primary care treatment by trained general practitioners in neighbourhoods
5. Case manager support



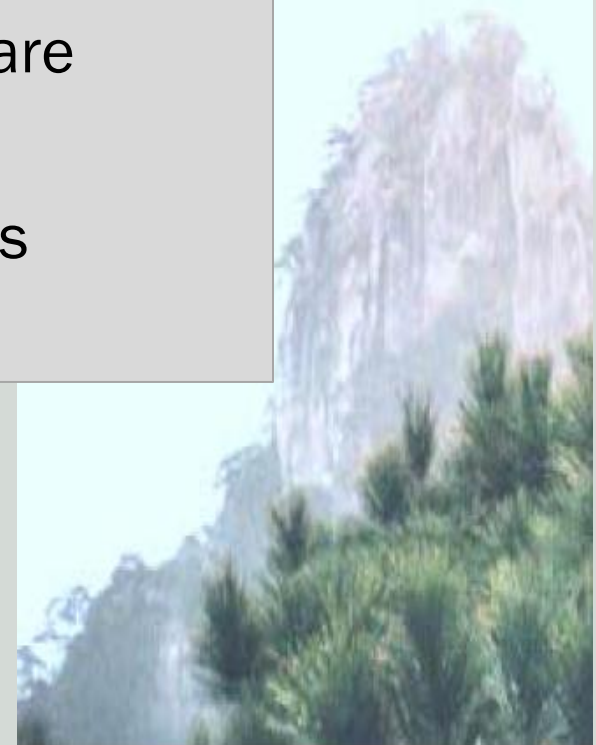
CEPIS

- Seniors $GDS \geq 5$ were randomized to collaborative care or usual care
- Primary care-centered treatment
- Integrated structured collaborative shared care framework
- GPs were trained in primary care treatment of late life depression, according to treatment algorithm and flexible management protocol
- Support from a case manager and nurse educator
- Consultation liaison and referral to psychotherapist or psychiatrist



Outreach sites

- 42 social service sites ('community services centers', 'senior activities centers', 'elderly care corners')
- 18 special needs services (social day care center, rehabilitation center)
- 12 sheltered and welfare home facilities
- 4 nursing homes



Outreach participants

- 4633 participants
- Mean age was 73.7 (SD,7.9)
- 58% were women
- 89% were Chinese
- 51% had no formal education
- 45% were separated, divorced or widowed
- 64% resided in low-end public housing apartments, welfare, sheltered homes
- 29% lived alone
- 36% reported having 3 or more chronic medical diseases.

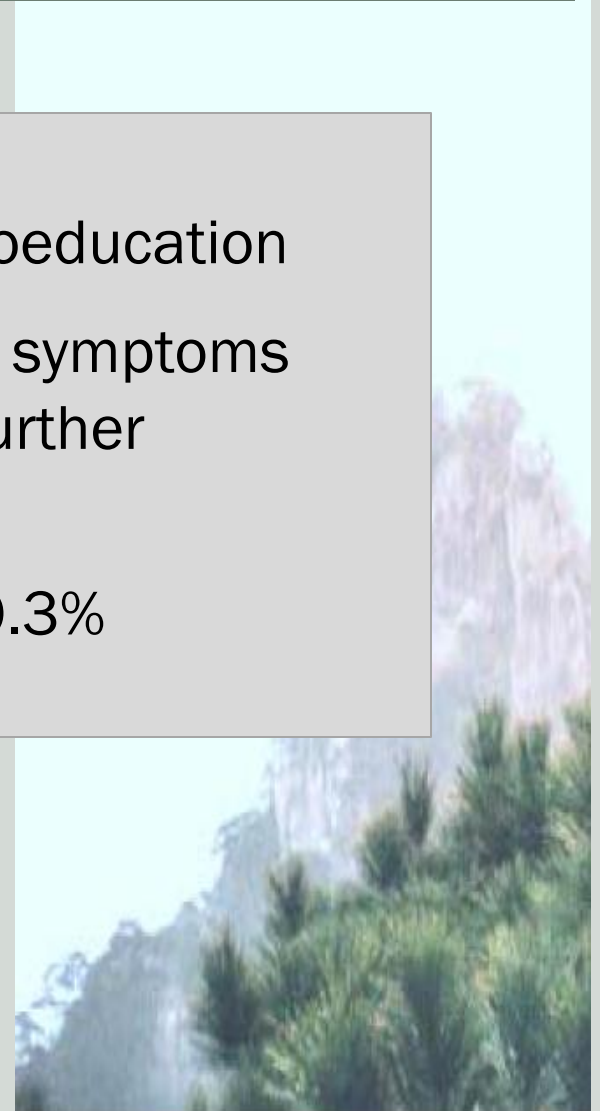


Depression

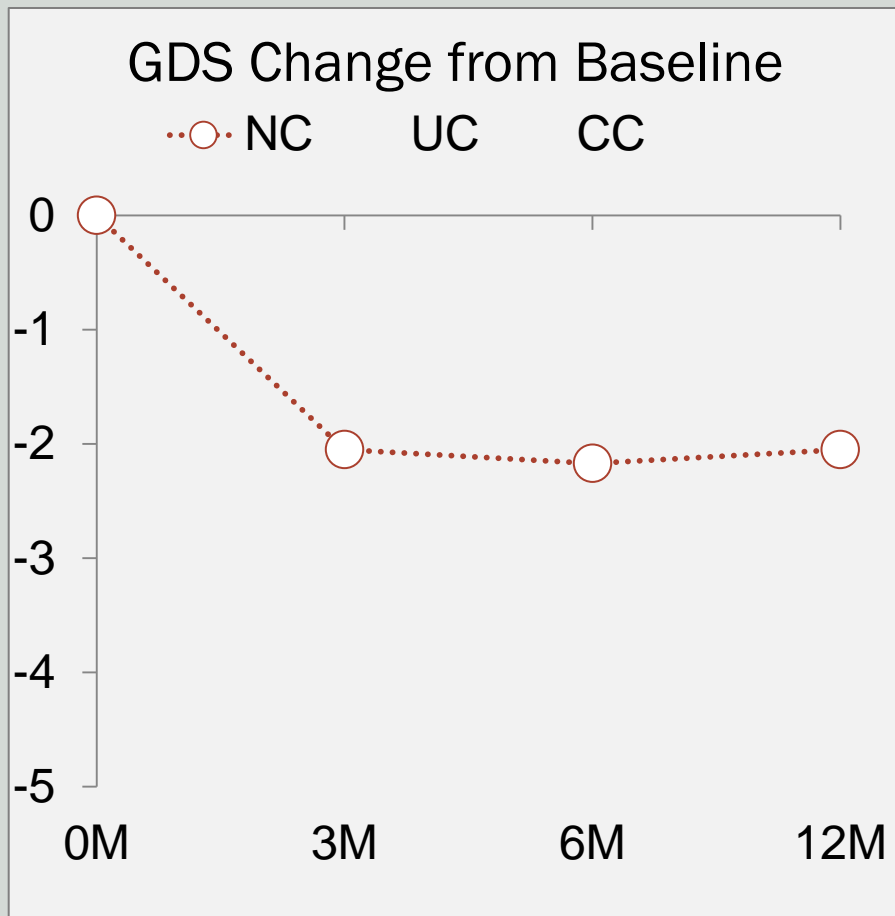
- 370 (8%) screened positive for depressive symptoms
- 151 (40.8%) major depressive disorder
- 69 cases comorbid disorders
- Less than 25% reported having a mental disorder, or poor mental health, or perceived need for help
- Only 38 (10.3%) had spontaneously sought treatment for mental problems in the past year

Outreach results

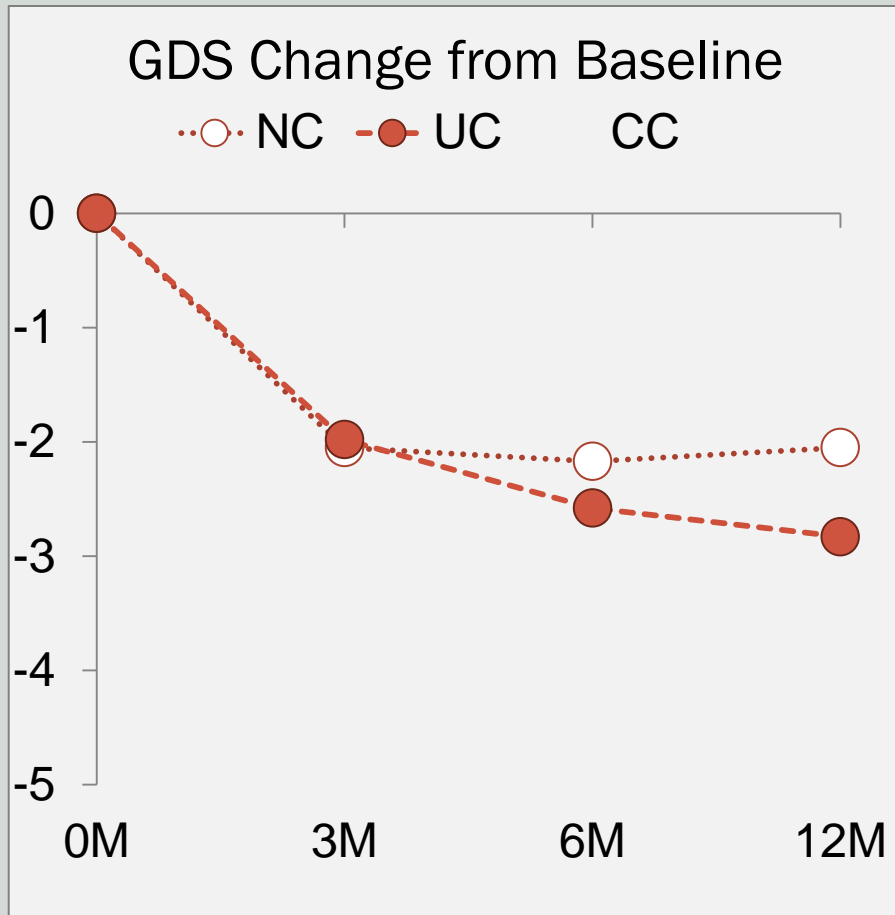
- Nurses' visits and follow-through psychoeducation
- 273 (73.8%) of seniors with depressive symptoms were successfully referred to a GP for further assessment and treatment.
- Pre-outreach treatment seeking was 10.3%



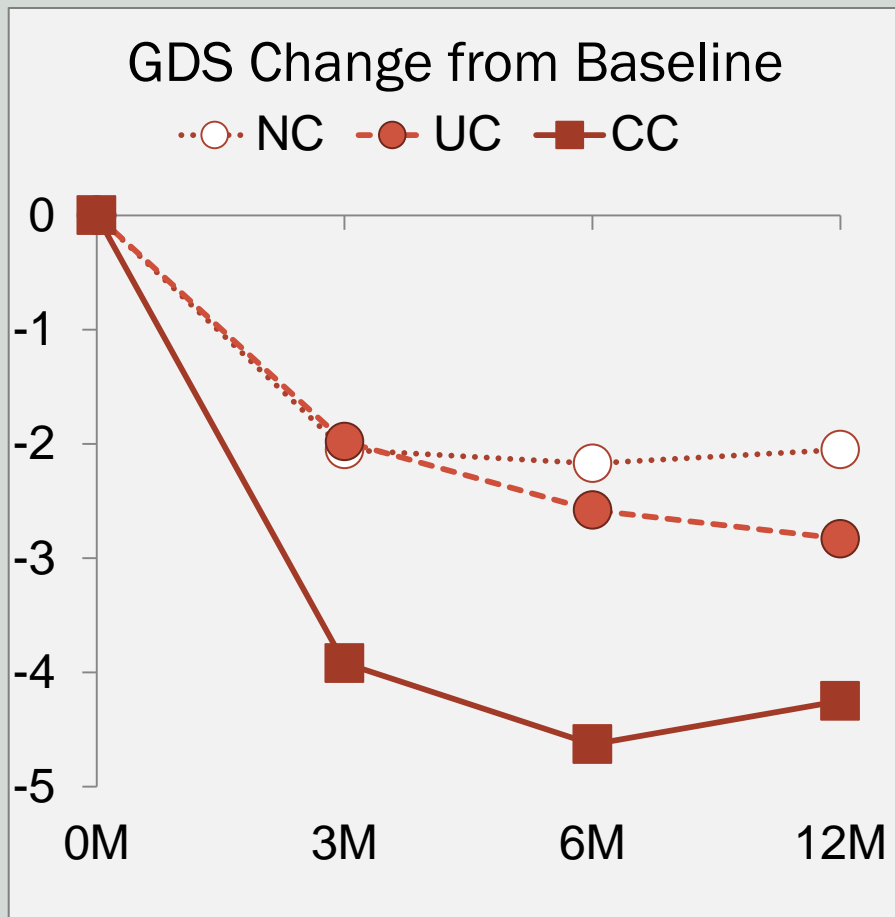
Collaborative Care Results



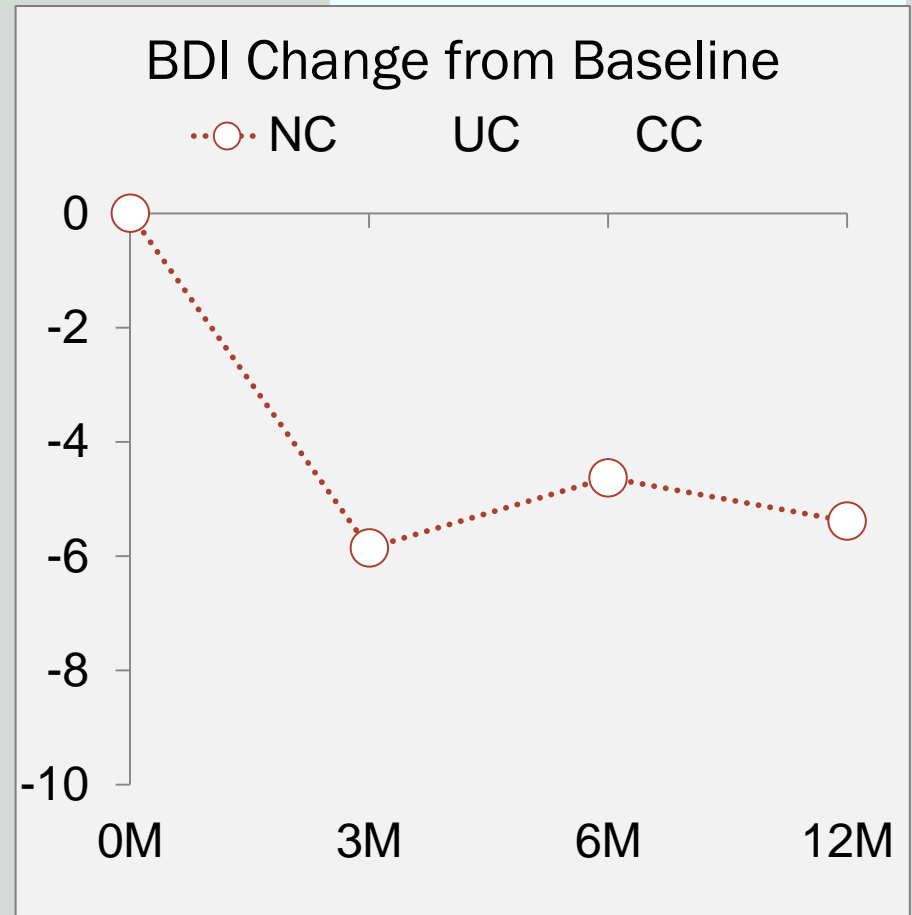
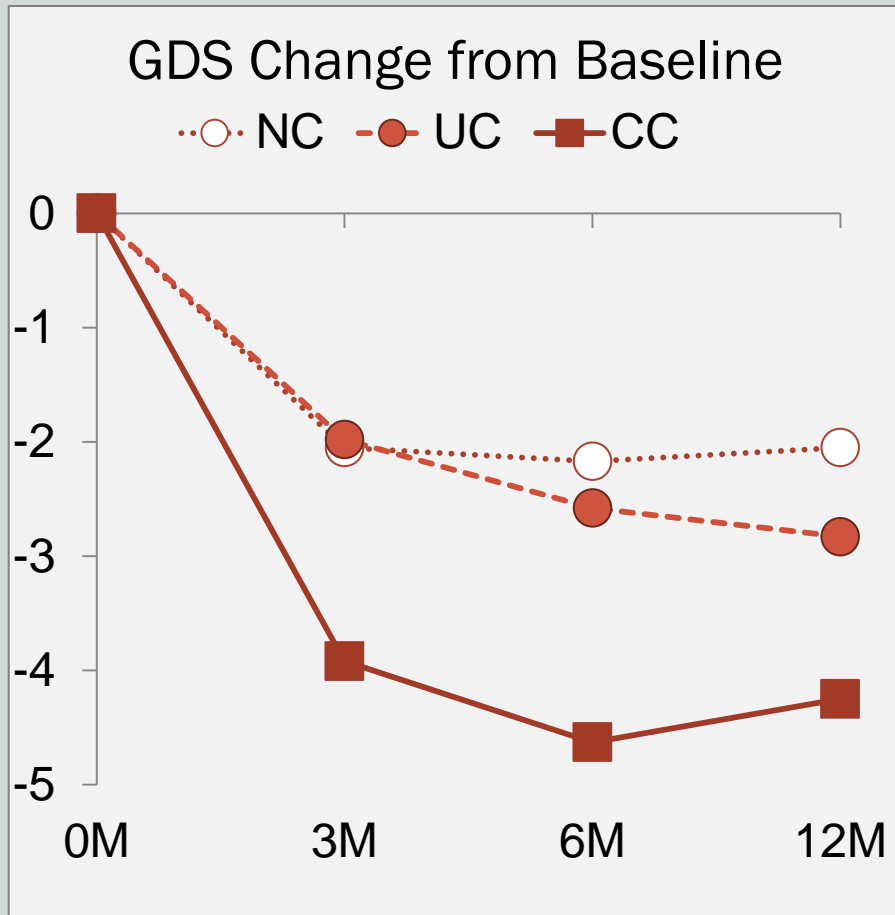
Collaborative Care Results



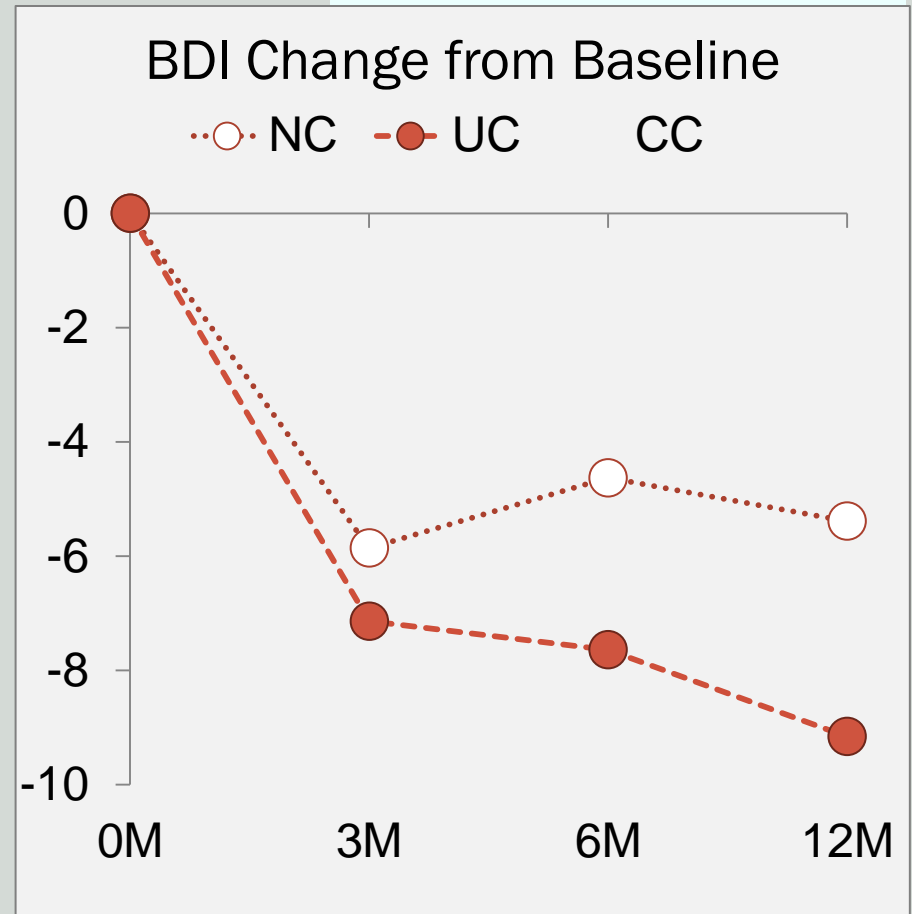
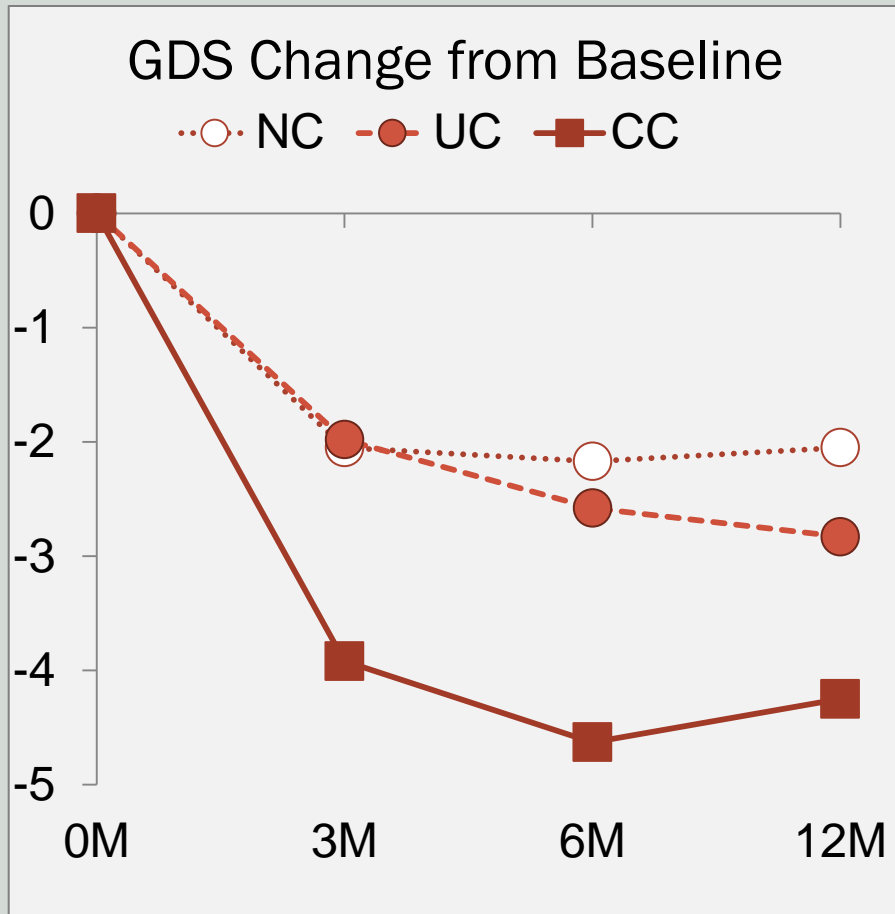
Collaborative Care Results



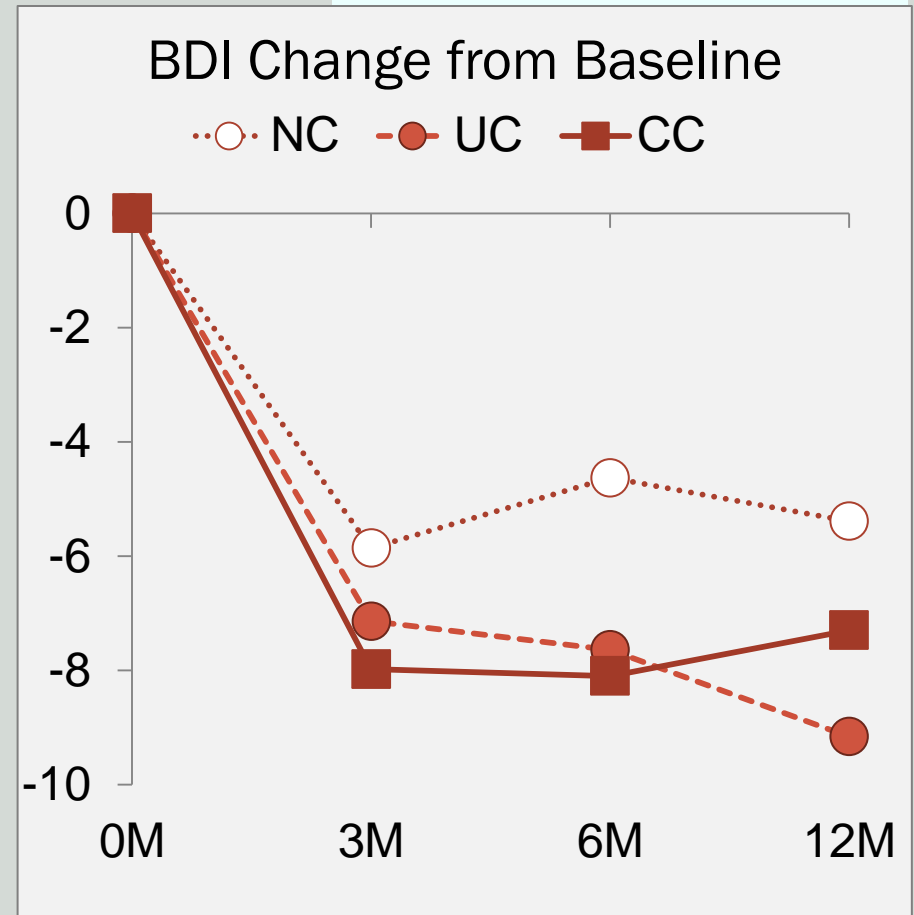
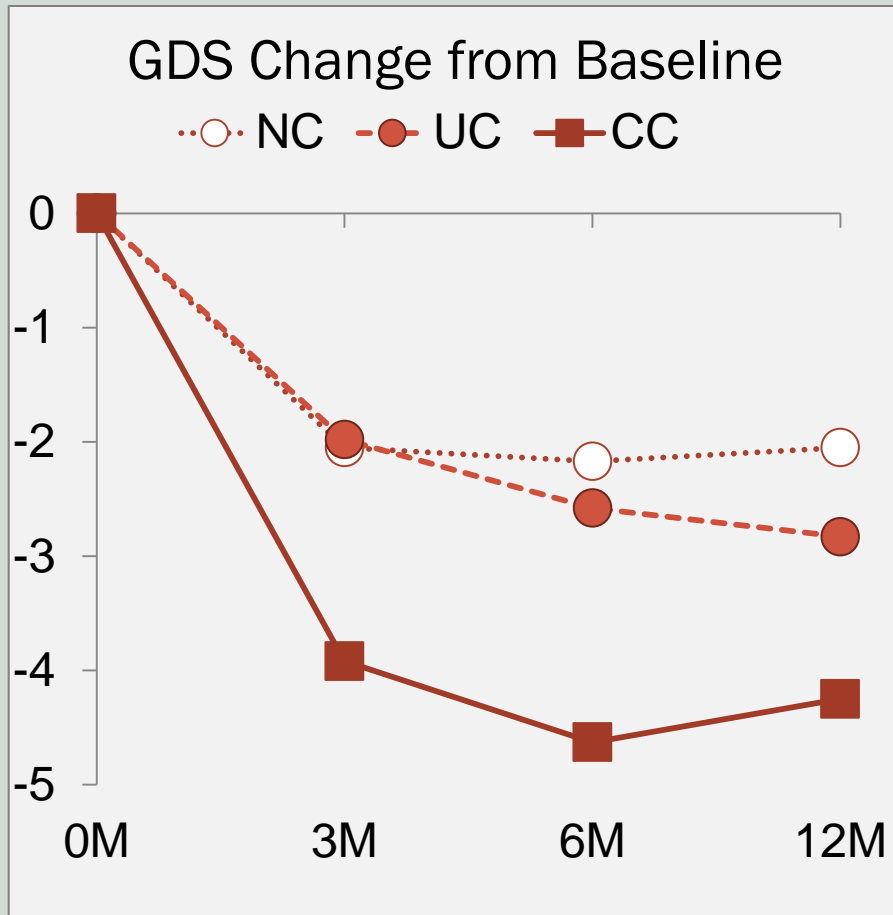
Collaborative Care Results



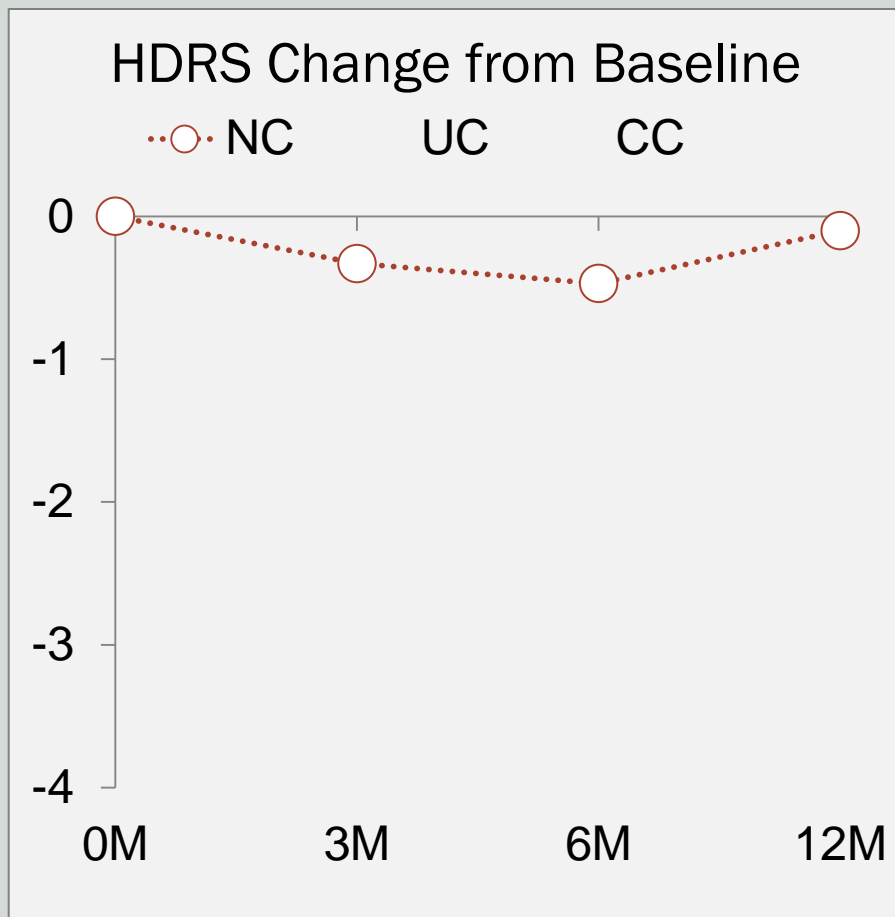
Collaborative Care Results



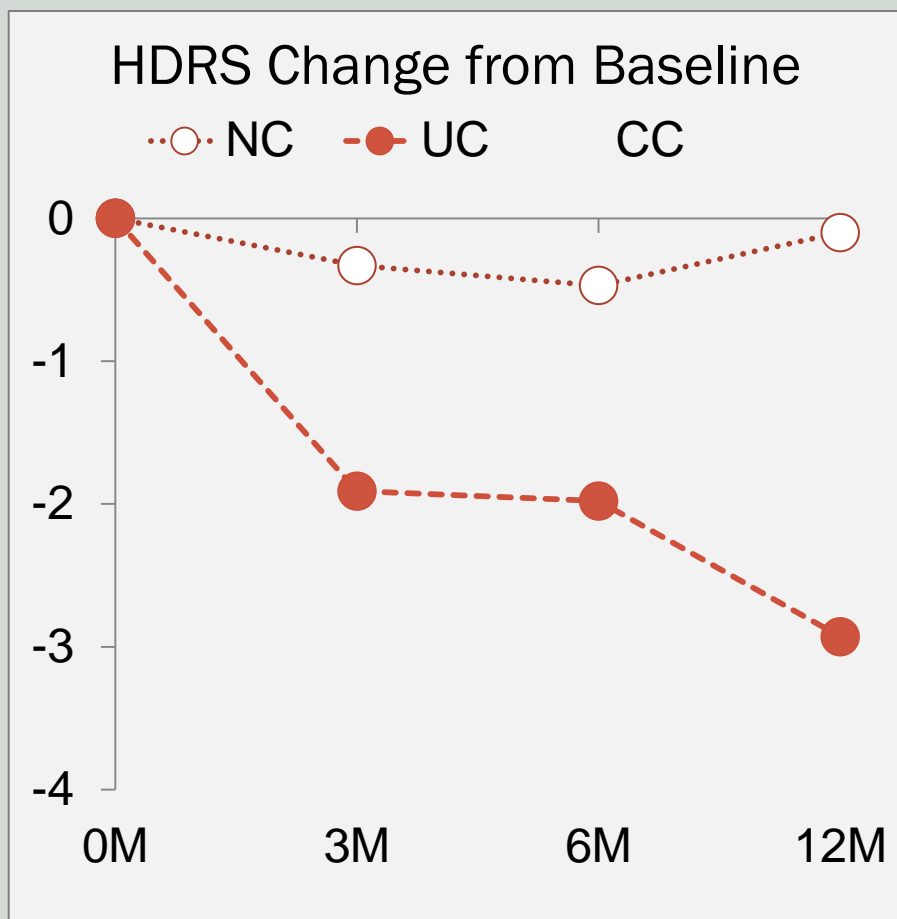
Collaborative Care Results



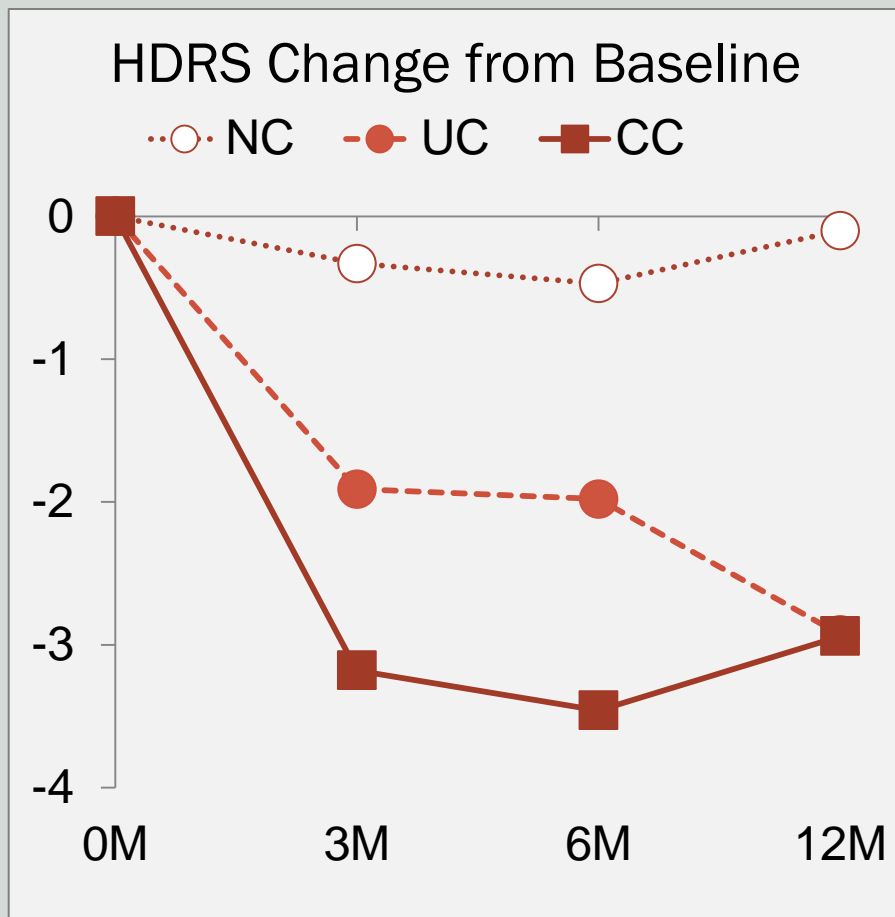
Collaborative Care Results



Collaborative Care Results



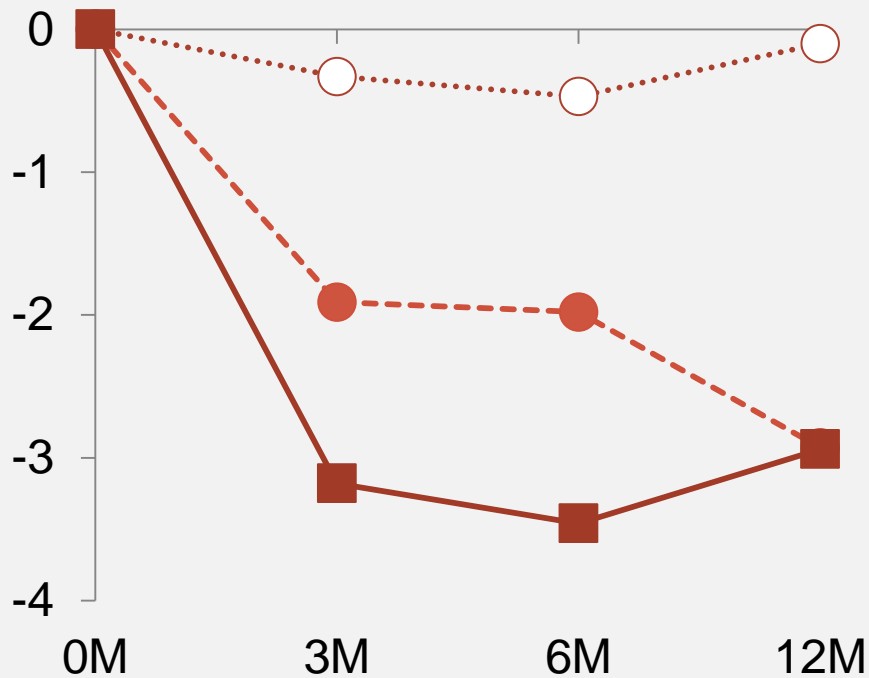
Collaborative Care Results



Collaborative Care Results

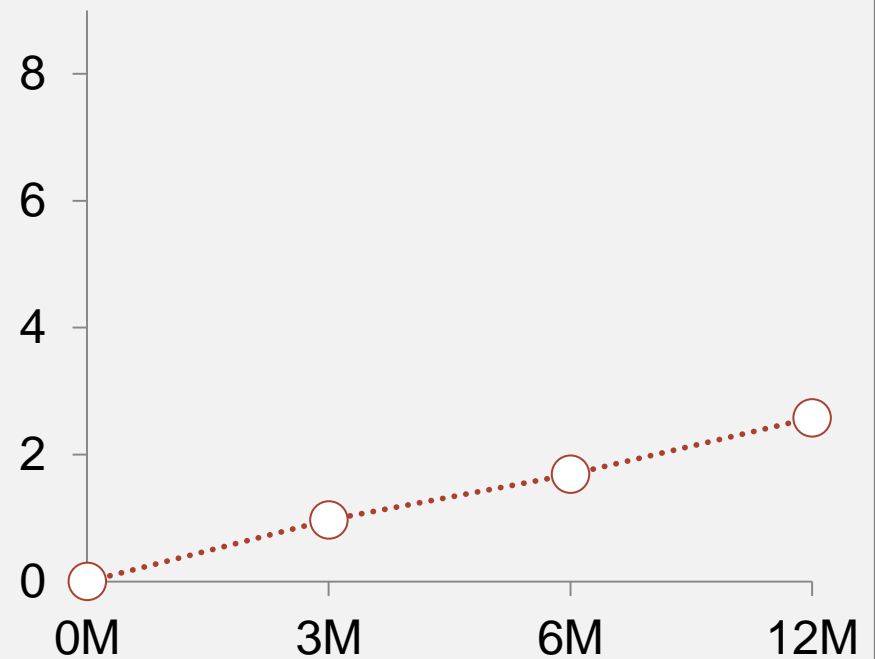
HDRS Change from Baseline

● NC ● UC ■ CC



MCS Change from Baseline

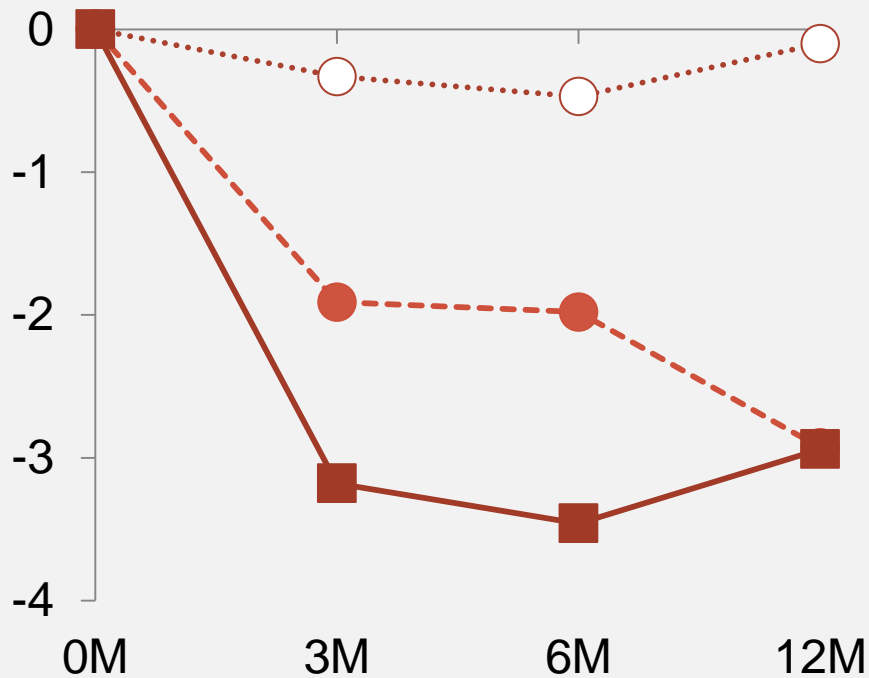
● NC ● UC ■ CC



Collaborative Care Results

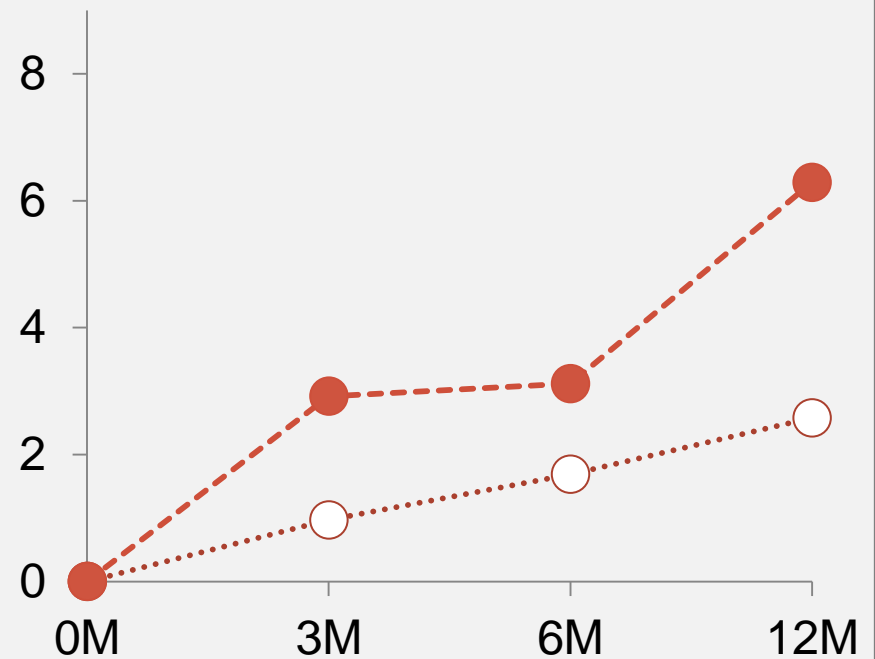
HDRS Change from Baseline

○ NC ● UC ■ CC



MCS Change from Baseline

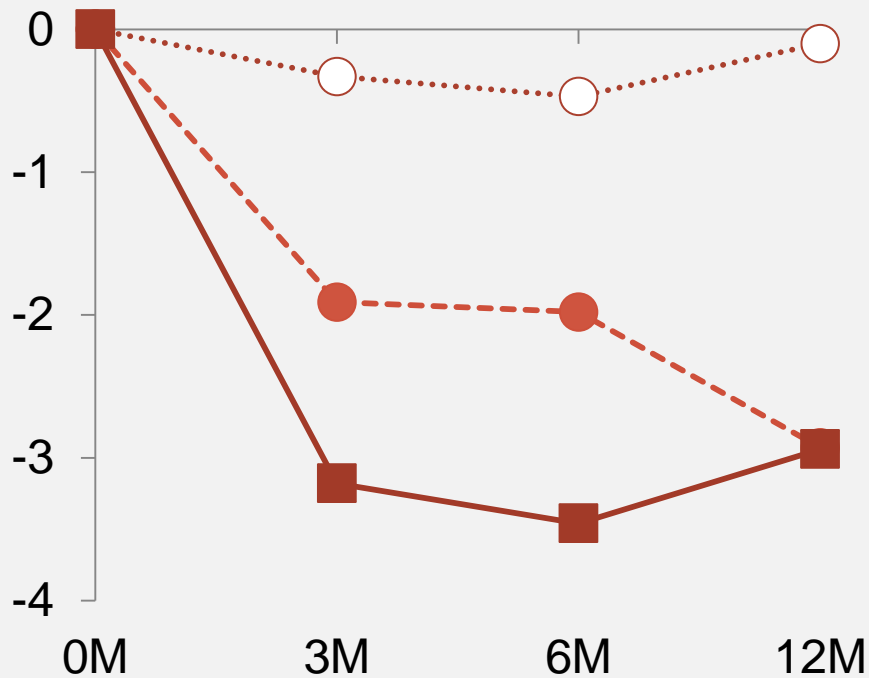
○ NC ● UC ■ CC



Collaborative Care Results

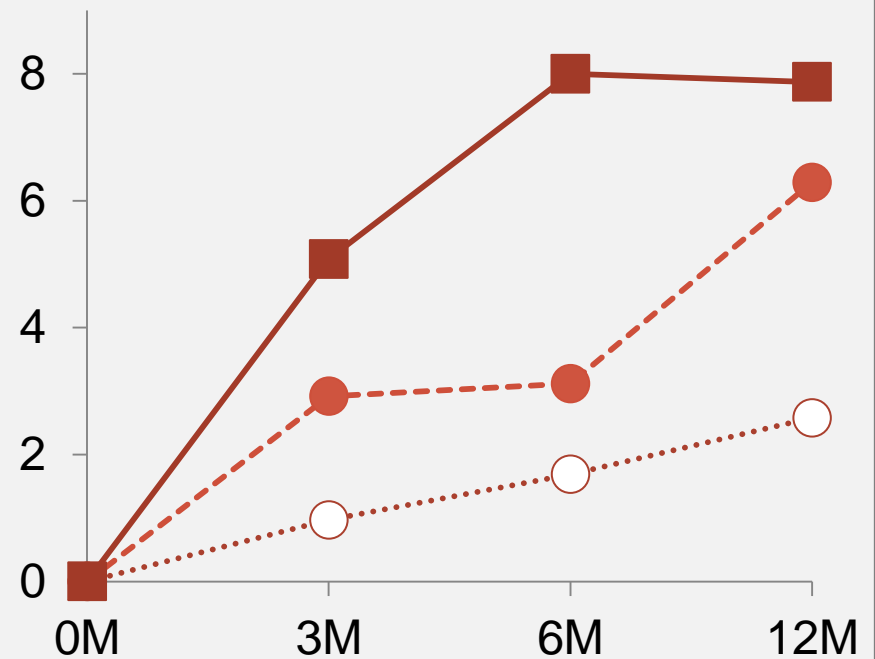
HDRS Change from Baseline

○ NC ● UC ■ CC



MCS Change from Baseline

○ NC ● UC ■ CC



Collaborative Care Results

Treatment and care satisfaction	Usual Care	Collaborative Care	p
Primary care doctor's diagnosis of depression	53.6	56.9	0.63
Any anti-depressant use	27.5	34.5	0.30
Psychiatrist referral	2.1	1.2	0.66
Psychotherapist referral	1.0	4.8	0.12
Social worker	10.9	9.4	0.74
Patient satisfaction questionnaire survey, N*	93	92	
Understanding your problem or illness	6.6	15.1	0.001
Advice about how to cope with your problem and illness	4.3	21.7	0.001
Doctor's management of your health problem	5.4	19.4	0.002
Having access to specialist help if you need it	3.2	8.6	0.004
The amount of money you have to pay	26.9	26.1	0.80
The practical support to continue your road to recovery	8.6	16.3	<0.001
Relieving your pain and suffering	4.3	18.5	0.004
Recovering from your emotional and mental distress	4.3	19.6	<0.001
Returning to your normal activities	3.2	15.2	0.002
Overall care and help	12.9	28.3	0.02



Grant funding support

A*STAR Biomedical Research Council

- 03/1/21/17/214: Gerontology Research Programme : Biological, Clinical, Psychosocial And Behaviourial Predictors Of Health Status In Prospectively Followed-Up Cohorts Of Elderly Persons
- SigN 10-036: Immune Signatures and Biomarker Profiling of Frailty

Ministry of Health National Medical Research Council

- NMRC/0846/2004: Randomised Controlled Trial Of A Community-Based Early Psychiatric Intervention Strategy To Screen And Manage Depression In The Elderly
- NMRC/1108/2007: Randomized Controlled Trial of Community-based Nutritional, Physical and Cognitive Training Intervention Programmes for At Risk Frail Elderly
- NMRC/08/1/21/19/567: Gerontology Research Programme: Nutritional, cardiometabolic and vascular factors, ApoE4 gene interactions, and dementia and depression risk”
- CIRG12may033: Insulin Resistance and Mild Cognitive Impairment (MCI) in Older Adults with Pre-Diabetes and Diabetes: Cognitive Effects of Lifestyle Intervention and Metformin Treatment in a Randomized Controlled Trial
- HSRG0016/2010 : Consultation Liaison and Integrated Care for COPD patients with Psychiatric Co-Morbidity

National University Health System, National University of Singapore,

- AIRC R-177-000-031-133: The built environment and quality of life of older persons
- NUHSRO/2011/009/STB/B2B-05: Levels and activities of sirtuins in peripheral blood cells as biomarkers for healthy ageing and ageing disorders

Venerable Yen Pei-National Kidney Foundation Research Fund

- NKFCR/2010/07/16Mood,cognitive, physical functioning and quality of life in older adults with chronic kidney disease

Alice Lim Memorial Fund

- R-177-000-030-290: The Association between diet & health status in Asian Elderly

Anonymous Donor

R-177-000-028-720. Successful Ageing: Characterizing its Multiple Dimensions in Singaporean Seniors and the Development and Validation of a Measurement Scale for Health Care and Promotion Programmes.

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- Thye Hua Kwan Moral Society (Moral Neighbourhood Links),
- Henderson Senior Citizens' Home, NTUC Eldercare Co-op Ltd,
- Thong Kheng Seniors Activity Centre (Queenstown Centre)
- Redhill Moral Seniors Activity Centre.

Thank You

