Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Arsasoi K, 2013[23]	CSS	Northeast	CD	185	1 community center	52.2	69.9±7.6	BMI MNA	BMI 22 (11.9) MNA 6 (3.2)	MNA 62 (33.5)	Low
Aungsupasakorn S, 2010[24]	CSS	BMR	CD	385	Slum community	65.5	69.6±7.2	BMI	24 (6.2)		Low
Boonchu K, 2002[25]	CSS	Northern	CD	65	Volunteer for check-up	43	70.14	BMI	19 (29.2)		Moderate
Boonpleng W, 2015[26]	CSS	BMR	CD	87	Chaopraya waterfront community	68.2	73.1±8	BMI	7 (8.0)		Moderate
Boontanon N, 2017[27]	CSS	Northeast	CD	276	Random from 4 municipal and 4 non-municipal	62	69.9	BMI MNA-SF	BMI 20 (7.2) MNA-SF 17 (6.2)	MNA-SF 98 (35.5)	Low
Chairit W, 2012[28]	CSS	Southern	CD	194	1 community center	59.8	68.8±6.2	BMI	38 (19.6)		Low
Chalermsri C, 2018[29]	CSS	BMR	OP	324	Geriatric clinic	63.3	77.5±6.8	MNA	27 (8.3)	115 (35.5)	Moderate
Chanchoom N, 2013[30]	CSS	BMR	CD	400	Elderly club	63	60-65 = 36%	BMI	28 (7.0)		High
Chanprasert P, 2013[31]	PCS	NW	CD	594	5 community centers	64	NA	BMI MNA-SF	BMI 81 (13.8)	MNA-SF 213 (35.9)	Moderate
Chinuntuya P, 2016[32]	PCS	BMR	IP	81	Gastrointestinal cancer patient in surgical ward	37	69.7±6.8	MST Albumin	Albumin 20 (24.7)	MST 44 (54.3)	Low
Churak P, 2018[33]	CSS	Northeast	CD	398	2 urban and 2 rural areas	64.8	60-69 =55%	BMI	44 (11.1)		Low
Dangjai S, 2017[34]	CSS	Northern	CD	268	Semi-urban and semi-rural areas	57	60-65 =36.6% 66-70 =25.7%	MNA	15 (5.6)	145 (54.1)	Moderate
Duangjina T, 2020[35]	CSS	Northern	CD	88	Dependent older adults	58	76±11.5	BMI	26 (29.5)		Moderate
Gaewkhiew P, 2019[36]	CSS	Western	CD	788	Independent older adults, 6 of municipal and 11 of non-municipal areas	69.8	69.8	BMI	54 (6.9)		Low
Inthamart P, 2013[37]	CSS	Northeast	CD	205	1 community center	48.3	66	BMI	20 (9.8)		Low
Junlaphan K, 2008[38]	CSS	Northern	CD	30	1 community center	73.3	69.2	BMI	2 (9.1)		Moderate
Kaewpitoon S, 2015[39]	CSS	Northeast	CD	405	NA	63.5	60-70 =75.5% 71-80 =20%	BMI	99 (24.4)		Moderate
Kanin M, 2020[40]	CSS	Central	Primary care center	250	Area under 1 Promoting Health Hospital	71.2	69.8±8.4	BMI MNA	BMI 17 (6.8) MNA 26 (10.4)	MNA risk 104 (41.6)	Moderate

PCS: prospective cohort study; CSS: cross-sectional study; BMR: Bangkok Metropolitan Region; CD: community dwelling; OP: out-patient, IP: in-patient; BMI: Body mass index; MNA: Mini nutritional assessment; MNA-SF: Mini nutritional assessment short form; MST: Malnutrition screening tool; NAF: Nutrition alert form; SGA: Subjective global assessment, NRS: Nutrition risk screening; NRC: Nutrition risk classification; TLC: total lymphocyte count; Hct: hematocrit; CC: calf circumference; MAC: mid arm circumference; NA: not available

Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people (cont.)

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Khanrugsa S, 2017[41]	CSS	Northeast	IP	216	7 departments, admitted at least 7 days	53.2	69±7.5	NRS 2002	183 (84.7)		High
Khodkam K, 2019[42]	CSS	Northeast	CD	279	1 community center	62.4	68.9±6.8	BMI	31 (11.1)		Low
Khongsri N, 2016[43]	CSS	Central	CD	243	volunteer to health activity	74.5	69.7±6.9	BMI	21 (8.6)		Moderate
Kittipimpanon K, 2005[44]	CSS	BMR	CD	105	Slum community	80	70.4±5.9	BMI	10 (9.5)		Low
Klongkitcharoen P, 2019[45]	CSS	BMR	OP	240	Geriatric clinic	70.4	75.6±7.4	BMI	13 (5.4)		Low
Limpawattana P, 2020[46]	CSS	Northeast	OP	85	cancer patients visited chemother-apy clinic	49.4	≥65 =81.2%	BMI	13 (15.2)		Moderate
Limsuwanmanee J, 2020[47]	CSS	Southern	CD	323	1 municipal	66.6	60-69 =53.3% 70-79 =32.5%	BMI	14 (4.3)		High
Manojit T, 2006[48]	CSS	Northern	NH	55	Public nursing home	58.2	75.65	BMI (knee height)	8 (14.5)		Moderate
Mattayaruk S, 2014[49]	CSS	Northeast	OP	182	Non-communicable diseases clinic	66	71.7±6.5	BMI Albumin Hb Hct MAC	BMI 25 (13.7) Albumin 36 (19.8) Hb 135 (74.2) Hct 134 (73.6) MAC 111 (61)		High
Mitprasart U, 2011[50]	CSS	Northeast	IP	209	Medical ward	49	60-69 =43.5% 70-79 =38.3%	MNA Albumin Hb, Hct TLC Cholesterol	MNA 44 (21.0) Albumin 165 (79.0) Hb 169 (80.8) Hct 171 (81.8) TLC 118 (56.5) Cholesterol 61 (29.2)	MNA 96 (46.0)	Low
Nasok W, 2019[51]	CSS	Northeast	CD	96	urban area	66.7	60-69 =37.5% 70-79 =41.7%	BMI	10 (10.4)		Moderate
Nawai A, 2018[52]	CSS	Northern	CD	147	Low-income suburban area	NA	NA	MNA		85 (57.8)	NA
Nilmanat K, 2013[53]	CSS	Southern	CD	580	Rural and urban area of 3 southern border provinces	54.5	70.3±8.1	MNA MNA-SF	MNA 15 (2.6)	MNA-SF 219 (37.8) MNA 136 (23.4)	Low

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Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people (cont.)

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Pengsorn N, 2018[54]	CSS	BMR	OP	159	Geriatric clinic	62.3	76.9±6.4	MNA NAF-BMI NAF-albumin NAF-TLC	MNA 12 (7.5) NAF-BMI: 40 (25.1) NAF-albumin: 37 (23.3) NAF-TLC: 39 (24.5)	MNA 52 (32.7)	Low
Petmuang T, 2018[55]	CSS	BMR	CD	400	NA	41	70.3±8.1	MNA MNA-SF	MNA 26 (6.5)	MNA-SF 146 (36.5) MNA 75 (18.8)	Moderate
Phaibulvatanap-ong E, 2017[56]	PCS	BMR	IP	151	solid malignancy patients sched-uled for chemotherapy, GI tract 47.6%, lung 24.5%	45.7	≤75 =47.7% >75 =52.3%	BMI SGA	BMI 14 (9.3) SGA 92 (60.9)		Moderate
Phantha A, 2009[57]	CSS	Northern	CD	52	1 urban community center without underlying disease	65.4	67.35	BMI	1 (1.9)		Moderate
Phonchai B, 2015[58]	CSS	Northeast	CD	273	rural area	60.2	65-69 =43.6%	BMI	37 (13.6)		Moderate
Phonphai S, 2016[59]	CSS	Central	CD	420	Dependent older people	67.4	76.6±8.6	MNA	129 (30.7)	143 (34.0)	Moderate
Pitantananukune P, 2019[60]	CSS	Northeast	CD	315	Random from address	70.5	60-69 =50.2% 70-79 =34.6%	BMI MNA	BMI 52 (16.5) MNA 6 (1.9)	MNA 113 (35.9)	Moderate
Pitisuttithum O, 2017[61]	CSS	BMR	CD	200	Face to face interview at park	50	72.3±8	MNA	0	21 (10.5)	Low
Pokakul W, 2002[62]	CSS	NW	CD	4753	Multi-stage sampling	63	60-69 =50.2%,70-79 =35.1%, >79 =15.2%	BMI MNA	BMI 802 (16.9) MNA 217 (4.5)	MNA 1996 (42.0)	Low
Pongpaew P, 2000[63]	CSS	BMR	CD	384	Volunteered from informal social activity group	85.7	median 67 (95%CI 67-68)	BMI	6 (1.6)		Moderate
Pruksa S, 2018[64]	CSS	Northeast	CD	281	Random selection from 1 munici-pality	53.4	71.7±8.1	BMI	3 (1.0)		Moderate

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Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people (cont.)

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Reodecha P, 2004[65]	PCS	BMR	IP	190	General surgical and urological wards for major abdominal surgery, cancer 40%	55	69±7.1	MNA-SF NRC MST NRS Albumin	Albumin 44 (23.7)	MNA-SF 67 (35.2) NRC 88 (46.3) MST 62 (32.6) NRS 101 (53.2)	Low
Saijan N, 2018[66]	CSS	Northeast	OP	120	COPD clinic	19.2	71±8.2	MNA	4 (3.3)	38 (31.7)	Low
Samnieng P, 2011[67]	CSS	Northern	CD	612	19 community health centers	74.2	68.8±5.9	MNA	47 (7.7)	411 (67.2)	Low
Saritsiri S, 2020[68]	CSS	BMR	OP	445	Geriatric clinic	66.1	69.0±7.0	BMI MNA	BMI 22 (4.9) MNA 10 (2.4)	MNA 80 (18.9)	Moderate
Seeraksa L, 2016[69]	CSS	Northern	CD	88	Random from urban and rural area, selected dysphagia patients	65.5	78.3±8.4	BMI Tricep skin fold	BMI 31 (35.2) Tricep 29 (32.0)		Low
Seingyai R, 2019[70]	CSS	Western	CD	231	1 rural community center	66.2	69.0±8.1	BMI	15 (6.5)		Low
Singkaew N, 2001[71]	CSS	Northern	CD	53	1 rural community, check-up	62.3	69.32	BMI	7 (13.2)		Moderate
Sommongkol S, 2017[72]	CSS	Northeast	IP	94	Urgent abdominal surgery patients	55.3	60-69 =54.3%	BMI NRS 2002	BMI 22 (23.4)	NRS 87 (92.6)	Moderate
Sonkitdee S, 2010[73]	CSS	BMR	CD	240	Thai-Raman in 1 urban village	59.2	60-69 =45% 70-79 =42.1%	BMI MNA	BMI 27 (11.2) MNA 5 (2.1)	MNA 51(21.2)	Moderate
Sripirom W, 2011[74]	CSS	Northern	CD	39	Elder club	69.2	71.8±8.4	MNA Albumin	MNA 20 (51.3) Albumin 0	MNA 19 (48.7)	Low
Srisawat M, 2012[75]	CSS	Central	IP	265	Medical, surgery and orthopaedics wards	55.5	69.8±6.6	BMI Albumin, Hb, Hct, NRC	BMI 23 (8.7) Albumin 53 (30.6) Hb 89 (33.6) Hct 90 (33.9)	NRC 202 (76.2)	High
Srisilapanan P, 2003[76]	CSS	Northern	CD	623	3 senior day centers in metropolitan area	62.1	60-67 =54.7% 68-74 =45.3%	BMI < 20 kg/m^2	183 (29.4%)		Low
Srisura S, 2009[77]	CSS	Northeast	CD	301	1 municipalty	78.1	65.5±3.7	BMI	33 (11.0)		Low

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Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people (cont.)

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Sriwichian T, 2016[78]	CSS	Central	CD	183	1 community center	NA	60-69 = 48% 70-79 =38.9%	BMI MNA MNA-SF	BMI 12 (6.6) MNA 4 (2.1)	MNA-SF 53 (29.0) MNA 36 (19.6)	Moderate
Suwittawat C, 2011[79]	CSS	Northeast	IP	87	Special nursing department	41.4	60-69 =74.7%	BMI	28 (32.2)		Low
Tachawacha-reekul N, 2008[80]	CSS	Northern	OP	92	Patients in denture project	38	74.6±5.7	BMI MNA	BMI 33 (35.9) MNA 4 (4.3)	MNA 46 (50.0)	Low
Tamthong K, 2003[81]	CSS	Western	CD	40	1 village	57.5	60-79 =65% 71-80 =25%	BMI < 20 kg/m^2	11(27.5)		Moderate
Tanoi N, 2002[82]	CSS	Northern	CD	52	1 community center	51.9	68.1	BMI (by height and arm span)	BMI by height 16 (30.8) BMI by arm span 18 (34.6)		Moderate
Tantranont N, 2015[83]	CSS	Northern	CD	60	1 community center	63.3	60-69 =68.3% 70-79 =25%	BMI	8 (13.3)		Low
Tengrungsun S, 2012[84]	CSS	BMR	CD	426	1 municipalty	68.1	male 67.4±6.2 female 67.3±6.3	BMI	28 (6.6)		Moderate
Tengrungsun S, 2014[85]	CSS	BMR	CD	909	1 municipalty and 1 Subdistrict Administrative Organization	53.9-64.8	68.3-69.8	BMI	21 (2.3)		Moderate
Thiengtham S, 2015[86]	CSS	Northeast	CD	88	Urban area	NA	68.6±5.4	BMI (height and Demiquet)	5 (5.7)		Low
Thinuan P, 2020[87]	CSS	Northern	CD	1806	Each 8 villages from suburban, semi-urban, and rural area	70.5	70.7±7.5	BMI CC MAC	BMI 5 (0.3) CC 545 (30.2) MAC 57 (3.2)		Low
Tubtimtong P, 2019[88]	CSS	Northern	CD	175	Rural area in subdistrict	45.1	66.5±6.2	BMI MNA-SF	BMI 52 (29.7) MNA-SF 10 (5.7)	MNA-SF 86 (49.1)	Low
Wanaratna K, 2019[89]	CSS	Northwest	CD	780	Mobile medical unit for patients with osteoarthritis	77.7	69.4±6.9	MNA-SF		253 (32.4)	Low
Wannasiri T, 2009[90]	CSS	Western	CD	100	Elderly club	85	65-74 =66% 75-84 =30%	BMI MNA MNA-SF	BMI 7(7) MNA 1(1)	MNA-SF 49(49) MNA 26(26)	Moderate

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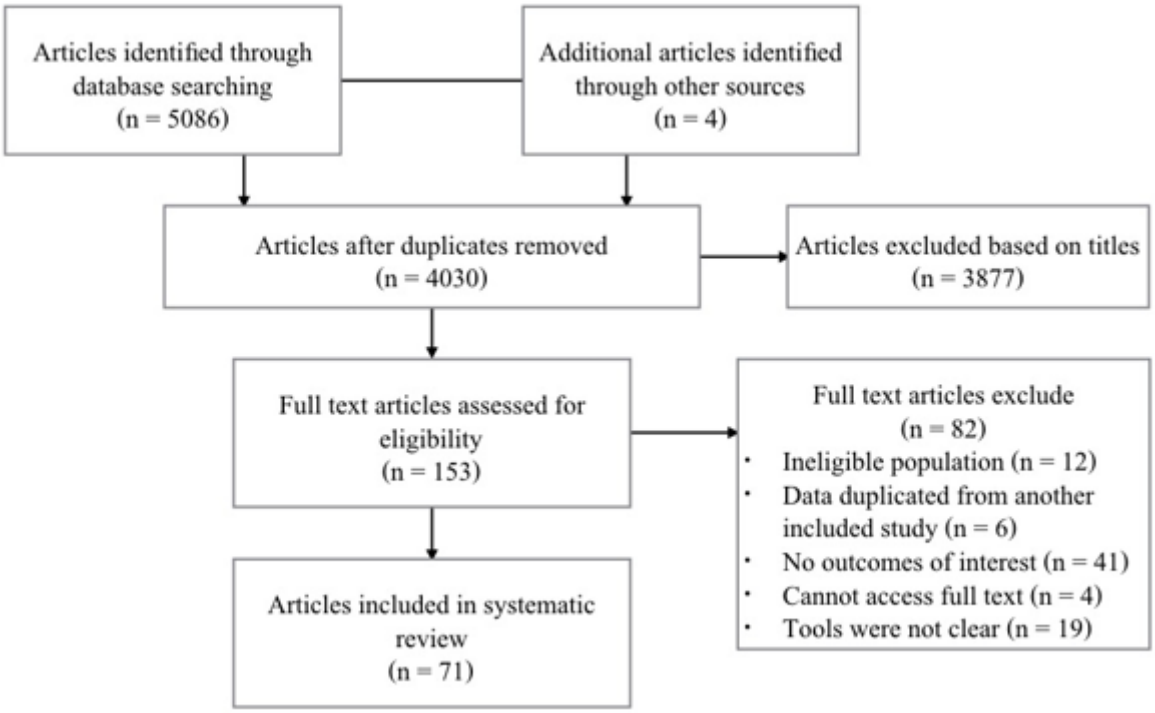
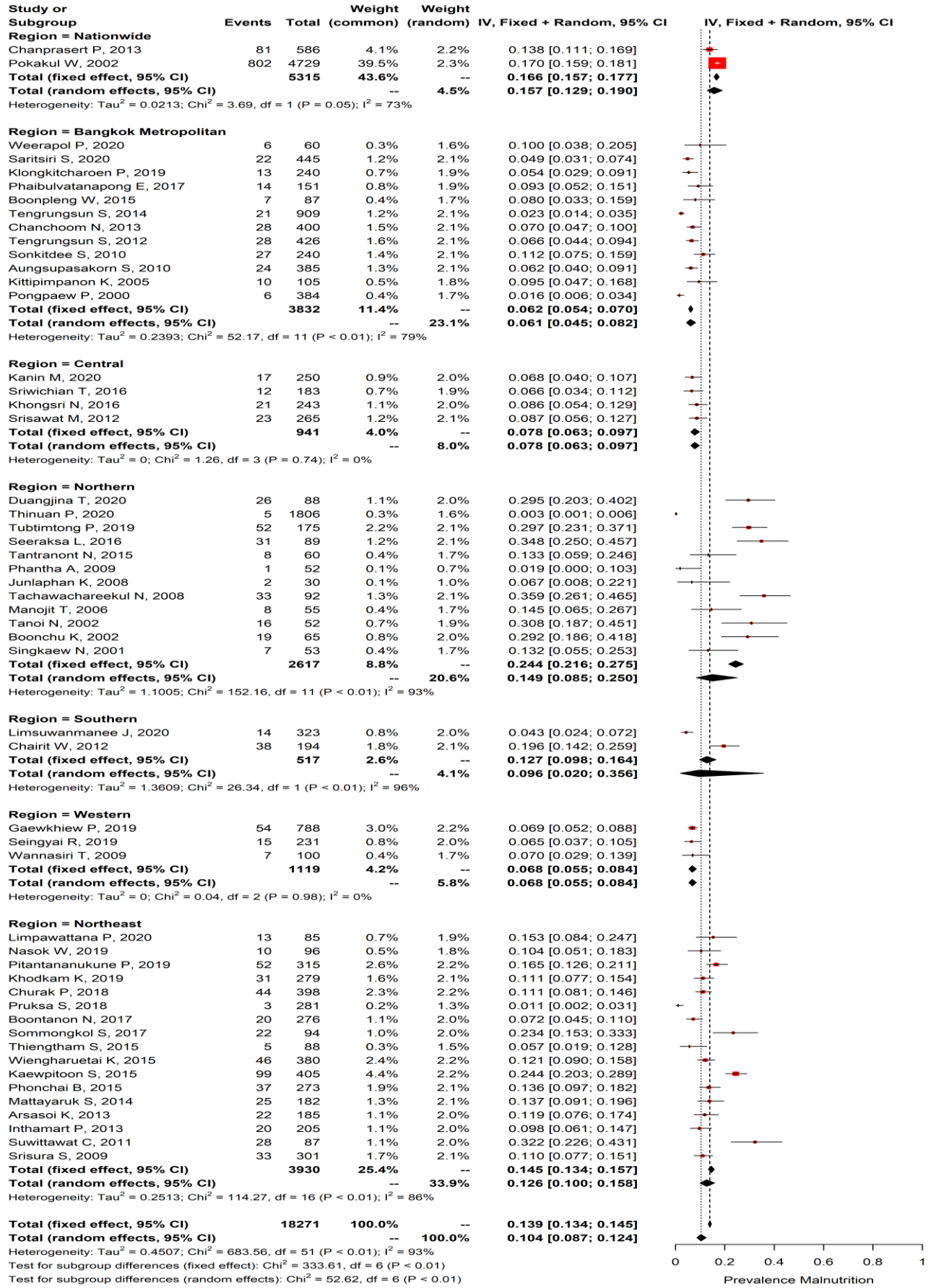
Supplementary table 1. Selected studies for systematic review and meta-analysis of malnutrition in Thai older people (cont.)

Author, year	Type of study	Region	Population	n	Recruitment Strategy	Female (%)	Age, year ±SD	Method	Malnutrition (%)	At risk of malnutrition (%)	Risk of bias
Wattanasaowalak P, 2017[91]	PCS	Northern	IP	78	Cancer patients receiving chemo-therapy CA breast 48.7%, CRC 42.3%	75.4	67.4±6.3	MNA-SF	15 (19.2)	44 (56.4)	Moderate
Weerapol P, 2020[92]	CSS	BMR	OP	60	Mild cognitive impairment patients	76.7	72.2±7.4	BMI MNA	BMI 6(10)	MNA 15 (25)	Moderate
Wiengharuetai K, 2015[93]	CSS	Northeast	CD	380	Random from rural area	75.3	64.0±3.2	BMI MNA	BMI 46 (12.1) MNA 22 (5.8)	MNA 146 (38.4)	Moderate

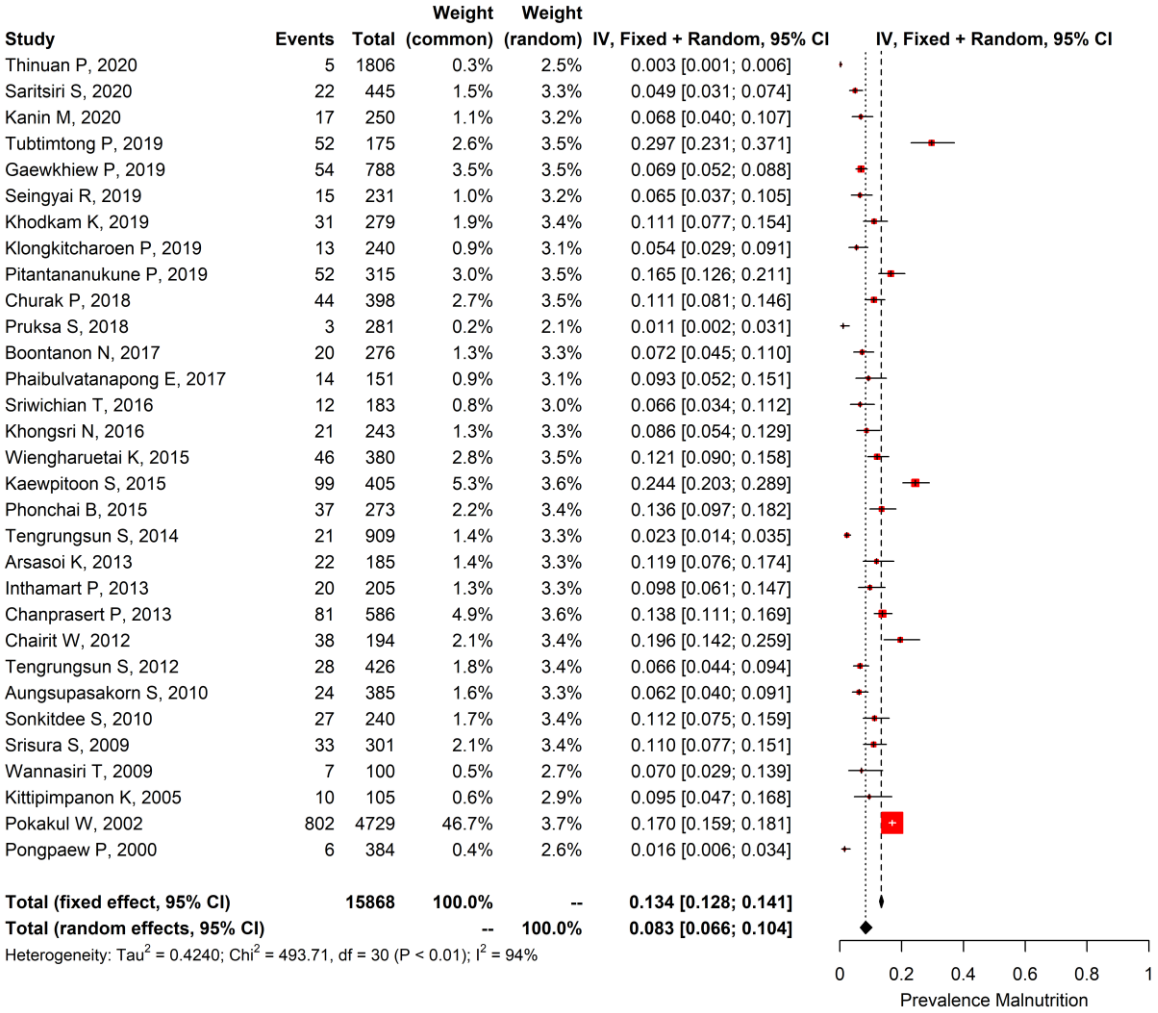
PCS: prospective cohort study; CSS: cross-sectional study; BMR: Bangkok Metropolitan Region; CD: community dwelling; OP: out-patient, IP: in-patient; BMI: Body mass index; MNA: Mini nutritional assessment; MNA-SF: Mini nutritional assessment short form; MST: Malnutrition screening tool; NAF: Nutrition alert form; SGA: Subjective global assessment, NRS: Nutrition risk screening; NRC: Nutrition risk classification; TLC: total lymphocyte count; Hct: hematocrit; CC: calf circumference; MAC: mid arm circumference; NA: not available



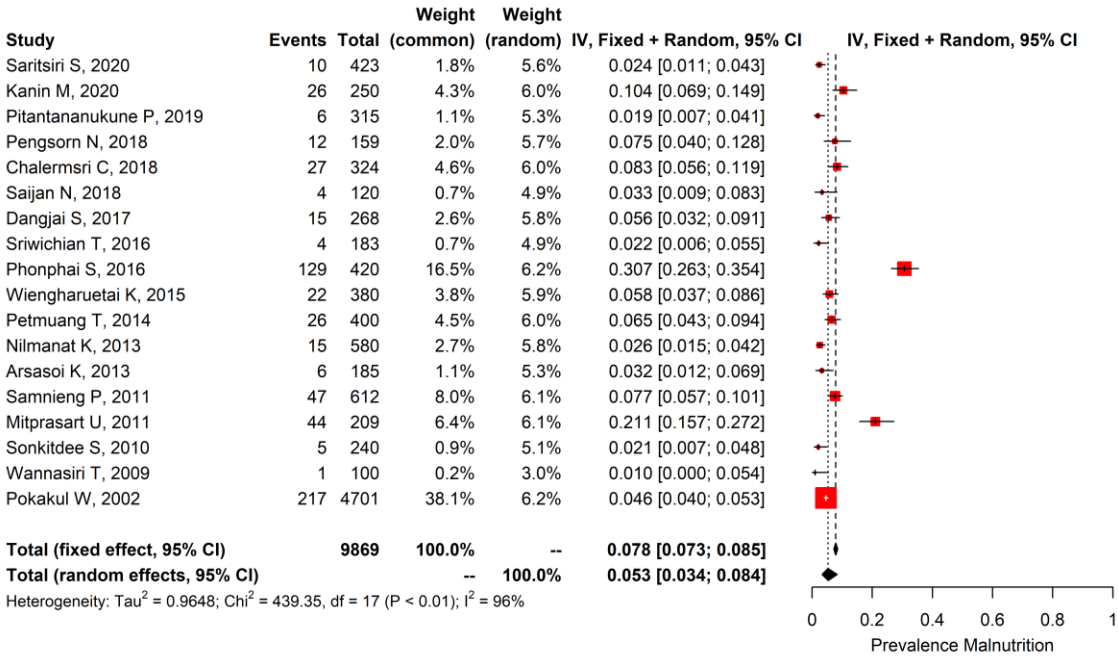
Supplementary figure 1. PRISMA flowchart for the article selection procedure.



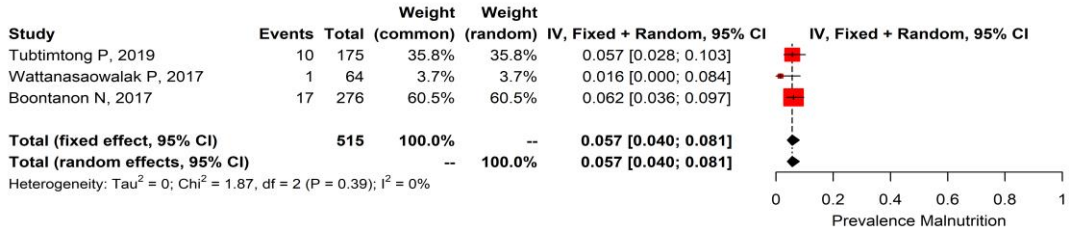
Supplementary figure 2. Meta-analysis forest plot of malnutrition in Thai older people by BMI, subgroup by region.



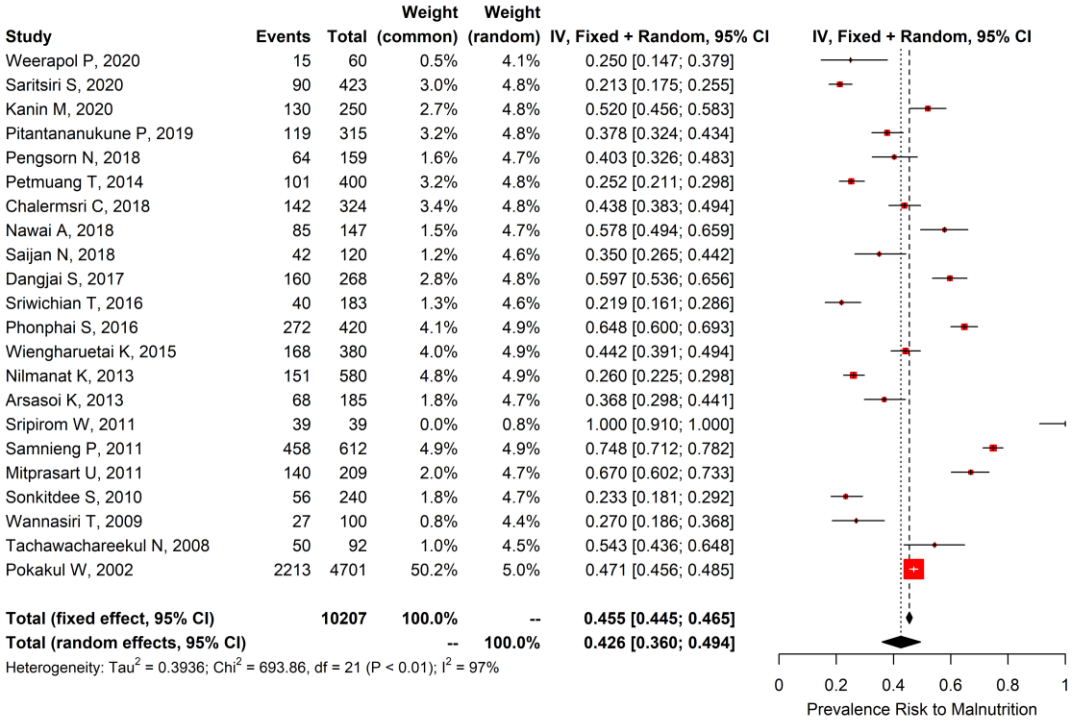
Supplementary figure 3. Sensitivity analysis of malnutrition by BMI exclude N<100 and high risk of bias.



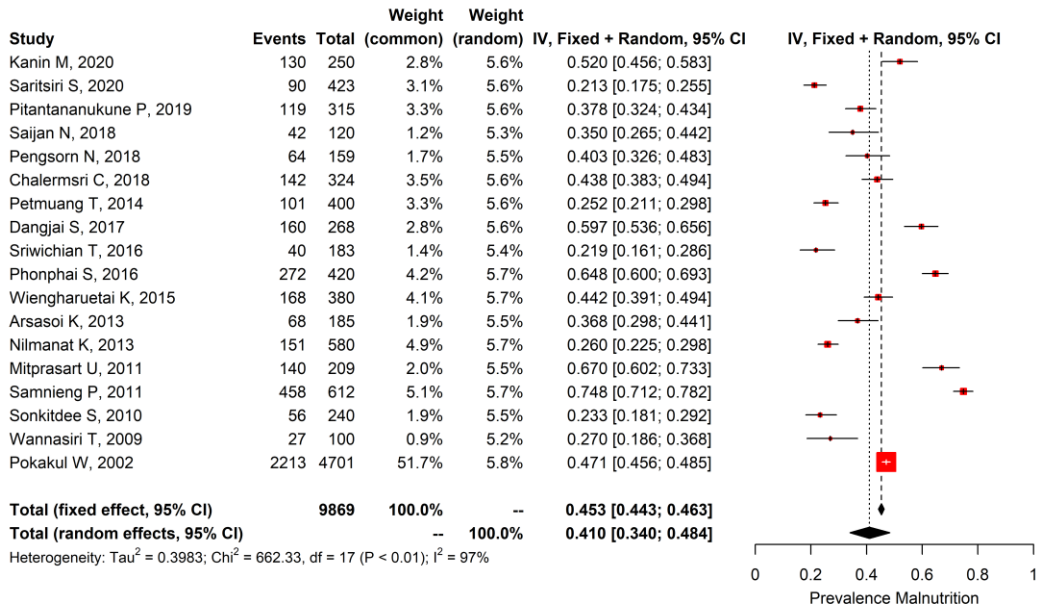
Supplementary figure 4. Sensitivity analysis of malnutrition by MNA exclude N<100 and high risk of bias



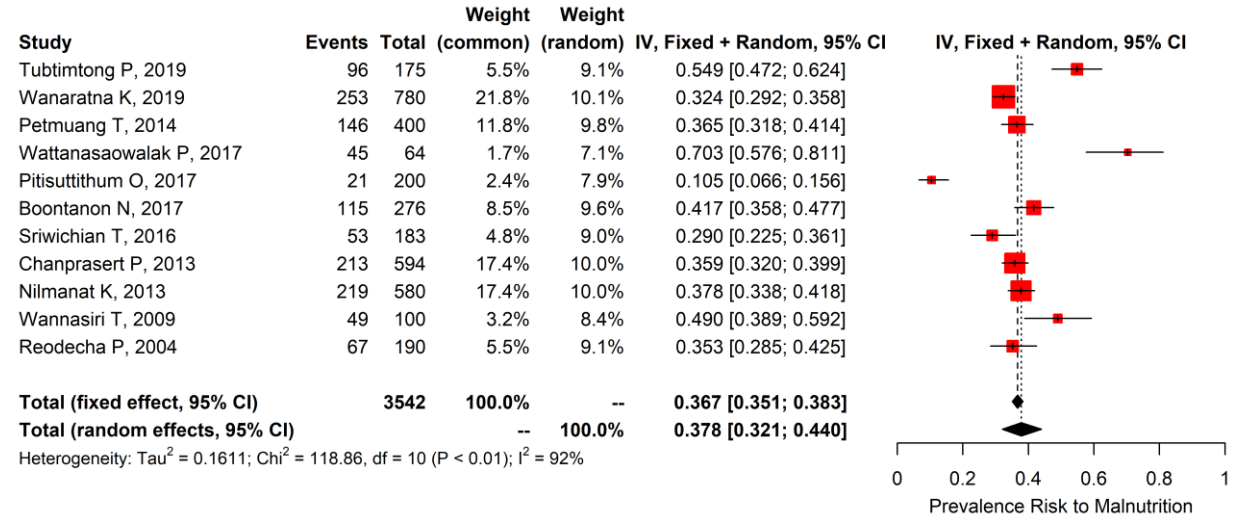
Supplementary figure 5. Forest plot of studies of malnutrition in older Thai people by MNA-SF.



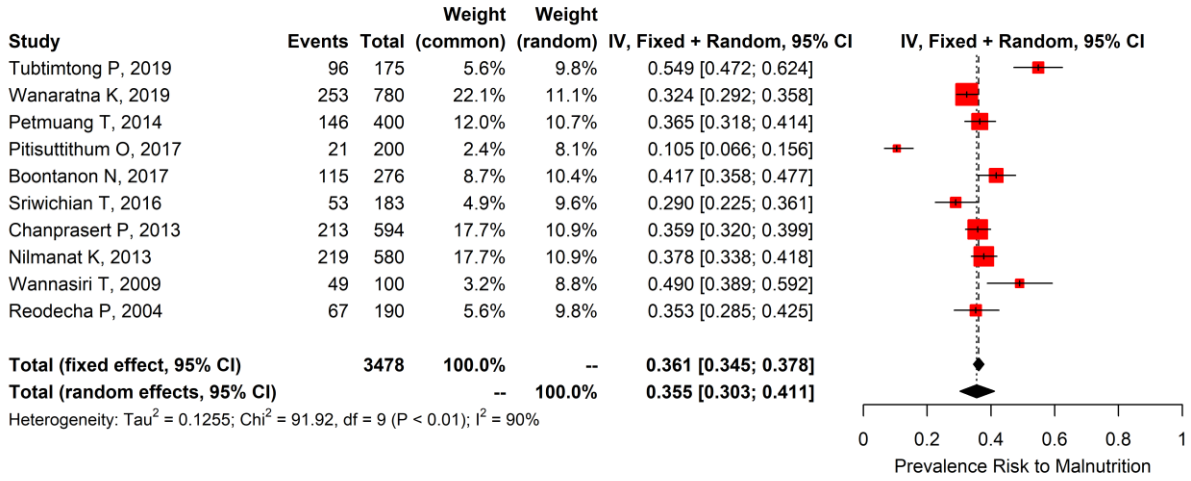
Supplementary figure 6. Forest plot of studies of at-risk of malnutrition in Thai older people by MNA.



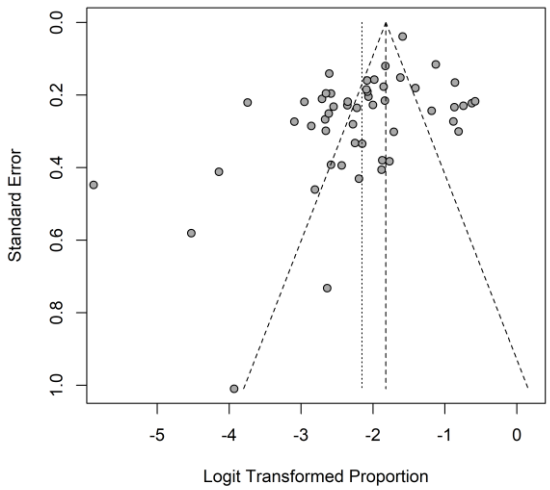
Supplementary figure 7. Sensitivity analysis of risk of malnutrition by MNA exclude N<100 and high risk of bias.



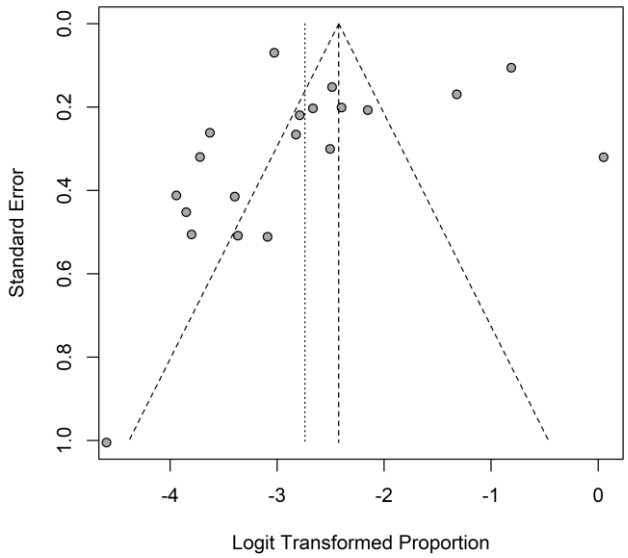
Supplementary figure 8. Forest plot of studies of the risk of malnutrition in Thai older people by MNA-SF.



Supplementary figure 9. Sensitivity analysis of risk of malnutrition by MNA-SF exclude N<100 and high risk of bias.



Supplementary figure 10. Funnel plot for publication bias by BMI.



Supplementary figure 11. Funnel plot for publication bias by MNA.