

BMJ Open Social support network typologies and their association with dementia and depression among older adults in Singapore: a cross-sectional analysis

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ABSTRACT

Objectives To examine the social support network type and its associations with depression and dementia among older adults in Singapore.

Design This study is a cross-sectional analysis of data from the Well-being of the Singapore Elderly study. The Practitioner Assessment of Network Type was used to identify five social support network types. Odds Ratios (OR) of dementia and depression were estimated with logistic regression and multinomial logistic regression, respectively, adjusted for sociodemographic variables.

Setting Singapore.

Outcome measures 10/66 criteria and Automated Geriatric Examination for Computer Assisted Taxonomy computer algorithm.

Participants 2421 older adults aged 60 years and above, and their informants.

Results Logistic regression revealed that as compared with participants in the family dependent social support network type, those in the locally integrated social support network type were negatively associated with dementia. It was observed that it is the older adults' perception of the quality of social interaction that influences the likelihood of depression.

Conclusion The social support network typology presents knowledge about the older adults' social network profile and their cognitive functioning-ability which would help stakeholders better identify older adults who might be at risk of cognitive decline or experiencing delay in diagnosis of dementia.

INTRODUCTION

Population ageing is a worldwide demographic trend which has intensified in recent decades due to increasing life expectancies and declining fertility rates.¹ Singapore is no exception to this phenomenon, where older adults over the age of 60 form 18.8% of the resident population.² This percentage is expected to increase further as more baby boomers (ie, those born between 1947 and 1964) age.³ Consequently, the old-age support ratio is deteriorating.² From the perspective

Strengths and limitations of this study

- This study was conducted in a multiethnic setting in Singapore and explores the association of social support network type with dementia and depression in older adults aged 60 and above.
- To our knowledge, this is the first study in Singapore that uses the Practitioner Assessment of Network Type to classify social support networks in older adults which allows for comparison with similar international studies.
- While we are unable to derive any causal inferences from our results given that this is a cross-sectional study, social support network type was found to be significantly associated with dementia.

of healthcare, this translates to increasing socioeconomic burden on the younger population to support and care for the population of older adults as the magnitude of comorbidity and disability in older adults intensify with age.^{4,5} It is, therefore, imperative that the older adults maintain a good state of health and well-being.

In the context of mental health, the most common neuropsychiatric disorders diagnosed in older adults are depression and dementia.⁶ Depression in the older adults has been established as a risk factor for mortality, poor health and disability^{7–10} and dementia is one of the major causes of disability in older adults¹¹ ranked the ninth most burdensome condition in people aged 60 and above.¹² In Singapore, the prevalence of dementia was 10%¹³ and prevalence of depression was 3.7%¹⁴ among those aged 60 years and above. Due to the disabling effects, dementia and depression can hinder independent living in the older adults.

Apart from biological factors, social support network has been found to have a direct

effect on the older adults' mental health.¹⁵ Social support network can generally be defined as the network of social interactions that provide help and companionship when in need.^{16–18} Studies have shown that social activities of the older adults are associated with depression^{19 20} and dementia.²¹ Maintaining sociability in old age is found to buffer unfavourable effects of ageing, some of which could also arise from depression and dementia, such as mortality,^{22 23} institutionalisation,^{24 25} functional decline²⁶ and disability.^{27 28} In contrast, social disengagement brings about higher risks of morbidity^{29 30} and cognitive decline.³¹ Therefore, understanding the social support network of older adults would help to facilitate the development of effective health policies and targeted interventions where necessary.³²

Aspects of social support network such as network size, frequency of contact, living are usually examined individually.^{20 27 28} However, Fiori *et al*³³ reasoned that it might be more informative to examine social support network typology instead of the individual aspects of social support network—social support network typology identifies categories of social network composition to capture distinct social environments that may be harmful or beneficial to health outcomes.³⁴ On this premise, our study adopted Wenger's³⁵ concept of social network typology, comprising five distinct social support network types each representing different levels of integration into the society and the extent of support received within the social network. This provides an overview into the state of the social support network rather than quantitative interpretations of the network.

To the best of our knowledge, no previous research conducted in Singapore has explored the association of social support network/social support network typology with dementia and depression. Chan *et al*'s study³⁰ which explored the association between social network and depression had found that weak social networks outside the household were associated with higher depressive symptoms scores. However, the social network was quantified by a total score and was meant to identify persons at risk of social isolation (weak social network) using a cut-off score instead of providing an insight into the condition of the social network. Considering the lack of studies on social support network typology among the older adults in Singapore and noting the association of social support networks with depression and dementia, this study aims to (1) examine the social support network typology in this population-based sample of older adult and (2) identify which social support network type is associated with depression and dementia to predict the group of older adults who may require interventions in the future.³⁶

MATERIALS AND METHODS

Study design

The data used was from the Well-being of the Singapore Elderly (WiSE) study, a single-phase cross-sectional survey conducted in 2013. Participants of this study

were Singapore residents and permanent residents aged 60 years and above, randomly selected from a national registry using a disproportionate stratified sampling design. Residents aged 75 years old and above and those of Malay and Indian ethnicity were oversampled to ensure reliability of our estimates. Participants who were in day care centres, nursing homes, and institutions were also included. All interviewers underwent a 2-week training on ethical guidelines and administration of the questionnaires. The survey was administered at the residence of the older adults through face-to-face interviews using an online computer-assisted personal interviewing application to both the participants and their chosen informants, defined as 'a person who knows the older person best' and could be a caregiver, co-residents or other close contacts. Written informed consent was obtained from all respondents or their legal representative/next-of-kin prior (if necessary) to the study. The methodology of the WiSE study can be found in an earlier article.¹³

Patient and public involvement

No patient or the public were involved in the development of the research question, study design and outcome measures. No patients or the public were involved in the recruitment to and conduct of the study. Results of the study were not disseminated to the participants directly but would be reported in publications and newsletters to the communities.

Measures

The WiSE study had adopted the 10/66 protocol³⁷ developed by the 10/66 Dementia Research Group; the 10/66 questionnaire was considered to be suitable for use in the Singapore population given that it was developed principally for the lower-income and middle-income countries and had been validated in China, India and Malaysia. The entire test battery was administered to assess the participants. Measures used in this current study were from the 10/66 test battery.

Sociodemographic variables—age group, gender, ethnicity, marital status, employment status, education level, income level and number of assets were recorded as part of the survey. The income variable refers to the receipt of income, benefits, pensions or allowances and is analysed as a binary variable (yes/no). Participants were also asked from a list of household items if they owned any of these items and the positive responses was summed to derive the assets variable which can range from 0 to 8.

The Practitioner Assessment of Network Type (PANT) is an eight-item instrument (see online supplementary text 1) used to identify the group of people whom the older adults rely on for support. The older adults' responses to the questions were measured using the exact same algorithm developed by Wenger to identify the social support network typologies.³⁵ The five different social network typologies (see online supplementary text 2) are: family dependent support network type, locally integrated support network type, locally self-contained

support network type, wider community-focused support network type and private restricted support network type.

Dementia diagnosis was established using the 10/66 criteria,³⁷ and its algorithm was validated in our sample.¹³ The diagnosis requires³⁸: the Geriatric Mental State (GMS) examination, a semi-structured clinical mental state interview, which applies the Automated Geriatric Examination for Computer Assisted Taxonomy (AGECAT) computer algorithm (GMS-AGECAT)³⁹; the Community Screening Instrument for Dementia (CSI-D)⁴⁰ which incorporates the Consortium to Establish a Registry for Alzheimer's Dementia (CERAD) animal naming verbal fluency task and modified CERAD 10-word list learning task with delayed recall to generate the global cognitive score (COGSCORE)⁴¹ and; an informant interview, the CSI-D informant score (RELScore),⁴⁰ for evidence of cognitive and functional decline. Data were collected from both participants and their informants. The cut-off point for dementia diagnosis was derived from the logistic regression equation developed in the 10/66 international pilot study.³⁸ The 'dementia' variable was treated as a dichotomous variable.

The GMS-AGECAT generates nine diagnostic clusters and the depression cluster was used to identify depression cases.³⁹ A GMS-AGECAT score of 3 or more is indicative of depression; a score of 1–2 indicates subsyndromal depression and a score of 0 indicates no depression. This measure has been used in our sample.¹⁴ The 'depression' variable was treated as a categorical variable.

Participants were asked to answer questions on twelve common physical impairments and were grouped into three categories: none, one to two and three or more impairments. The 12 physical impairments were: arthritis/rheumatism, eyesight problems, hearing difficulty/deafness, persistent cough, breathlessness/difficulty breathing/asthma, high blood pressure, heart trouble/angina, stomach/intestine problems, faints/blackouts, paralysis/weakness or loss of one leg or arm, skin disorders and cancer. Disability was measured by the 12-item WHO Disability Assessment Schedule 2.0⁴² and is a continuous variable where higher scores indicate greater disability.

Statistical analysis

All analyses were conducted using STATA V.14.0 (StataCorp, 2015). The data were weighted and analysed using survey data analysis procedures to adjust for over-sampling, non-response and poststratification according to age and ethnicity. The sample was categorised into the social support network typologies. Descriptive analyses were conducted to describe sample characteristics for the overall sample and also for each social support network type. Logistic regression analysis was performed to examine the association between dementia and social support network typologies. Multinomial logistic regression was used to examine the association between depression and social support network typologies. Both regression analyses were controlled for sociodemographic

characteristics including age, gender, ethnicity, education level, marital status, educational status and employment status, income, assets, as well as physical impairment and disability since these factors may influence the social support network typologies that an older adult is in. All statistically significant results were reported at p value <0.05 .

RESULTS

Sociodemographic characteristics

Data from 2421 older adult respondents and their informants were included in the analysis. Sociodemographic characteristics of the study sample are presented in [table 1](#). The majority of the participants were females (57%), aged between 60 and 74 years (74.8%), of Chinese ethnicity (82.6%) and currently married (65.4%). Majority of them (89.3%) received some form of income (eg, salary, benefits, pensions, allowances) and had one or two physical impairments (51.7%).

Sociodemographic characteristics by social support network typologies

Nearly half of the participants (44.4%) belonged to the family dependent social support network type. 27.1% were in the locally integrated social support network type, 4.6% in the locally self-contained social support network type, 0.8% in the wider community-focused social support network type and 2.6% in the private social support network type. 20.4% of the participants were classified under non-conclusive network. [Table 1](#) presents the sample characteristics for each social support network type. Univariate analyses (χ^2 test or analysis of variance) revealed significant differences in age group, ethnicity, education level, income, dementia and disability across the social support network typologies. The PANT characteristics of each social support network type may be found in [online supplementary text 3](#).

Social support network typologies: association with dementia and other correlates

Logistic regression revealed that dementia was negatively associated (OR=0.34, 95% CI 0.15 to 0.79) with participants in the locally integrated social support network type as compared with those in the family dependent social support network type. There were no dementia cases identified in the wider community-focused social support network type. In addition, dementia was found to be negatively associated with Indian ethnicity and higher education level, and positively associated with age group of 75 years and above, those with no income and those with disability. The results are presented in [table 2](#).

Social support network typologies: association with depression and other correlates

Multinomial logistic regression revealed that social support network typologies were not associated with depression. Depression and subsyndromal depression

Table 1 Sociodemographic characteristics by social network typologies

	Social network type						P value			
	Whole sample (n=2421)	Wider			Family dependent (n=1075)	Non-conclusive (n=495)				
		Locally integrated (n=655)	Locally self-contained (n=112)	community-focused (n=21)						
n	Unweighted %	Weighted % n (weighted %)			Private (n=63)					
Age group							<0.001			
60-74	1403	58.0	74.8	451 (82.6)	57 (74.1)	14 (76.2)	597 (73.5)	19 (44.9)	265 (69.0)	
75-84	633	26.1	19.5	151 (14.7)	35 (20.2)	5 (15.5)	283 (20.5)	13 (26.6)	146 (23.0)	
85+	385	15.9	5.7	53 (2.7)	20 (5.7)	2 (8.3)	195 (6.0)	31 (28.5)	84 (8.0)	
Sex										0.439
Female	1382	57.1	57.0	376 (59.8)	59 (49.4)	11 (66.3)	604 (55.1)	37 (64.0)	295 (59.1)	
Male	1039	42.9	43.0	279 (40.2)	53 (50.6)	10 (33.7)	471 (44.9)	26 (36.0)	200 (40.9)	
Ethnicity										<0.001
Chinese	931	38.5	82.6	211 (78.4)	39 (80.8)	4 (51.7)	487 (86.9)	13 (63.1)	177 (79.4)	
Malay	728	30.1	9.8	224 (12.8)	56 (15.8)	4 (10.1)	266 (7.0)	26 (14.4)	152 (11.6)	
Indian	728	30.1	6.1	209 (7.0)	17 (3.4)	9 (12.9)	311 (5.1)	23 (18.3)	159 (7.2)	
Others	34	1.4	1.5	11 (1.8)	0 (0.0)	4 (25.3)	11 (1.0)	1 (4.2)	7 (1.8)	
Marital status										0.069
Never married	108	4.5	6.8	26 (5.0)	3 (5.6)	1 (7.3)	48 (7.6)	3 (1.3)	27 (7.7)	
Married/cohabiting	1419	58.7	65.4	423 (67.9)	68 (64.0)	17 (67.9)	605 (66.4)	23 (32.4)	283 (61.4)	
Widowed	798	33.0	22.8	181 (22.2)	36 (19.3)	3 (24.8)	376 (22.1)	34 (60.8)	168 (24.3)	
Divorced/separated	94	3.9	5.0	25 (4.9)	5 (11.1)	0 (0.0)	44 (3.9)	3 (5.5)	17 (6.6)	
Education										<0.001
None	502	20.9	17.1	85 (11.0)	36 (23.6)	2 (4.3)	235 (17.7)	19 (14.2)	125 (23.4)	
Did not complete primary	579	24.1	23.8	136 (19.9)	27 (20.8)	3 (9.2)	280 (27.6)	18 (28.6)	115 (20.3)	
Completed primary	597	24.8	24.1	181 (23.4)	22 (21.6)	6 (21.0)	265 (25.3)	7 (18.9)	116 (22.7)	
Completed secondary	488	20.3	22.5	163 (27.9)	18 (20.0)	4 (23.3)	197 (19.5)	10 (27.8)	96 (23.3)	
Completed tertiary	241	10.0	12.5	89 (17.8)	9 (14.0)	6 (42.3)	89 (9.9)	6 (10.5)	42 (10.3)	
Income										0.001
Yes	2059	85.2	89.3	599 (94.5)	92 (86.5)	16 (81.6)	880 (88.0)	45 (74.1)	427 (87.0)	
No	358	14.8	10.7	56 (5.5)	20 (13.5)	5 (18.4)	193 (12.0)	17 (25.9)	67 (13.0)	
Assets (Mean (SD/SE))		6.3 (1.50)	6.4 (0.041)	6.5 (0.08)	5.8 (0.25)	5.2 (0.55)	6.5 (0.06)	6.0 (0.28)	6.2 (0.09)	0.600*

Continued

Table 1 Continued

Continued: Sample characteristics by social network typologies

	Social network type							P value	
	Whole sample (n=2421)		Wider				Non-conclusive (n=495)		
	Unweighted %	Weighted %	Locally integrated (n=655)	Locally self-contained (n=112)	community-focused (n=21)	Family dependent (n=1075)			Private (n=63)
n	%	n (weighted %)	n (n)	n (n)	n (n)	n (n)	n (n)		
Dementia								<0.001	
No	2022	83.5	90.0	625 (98.3)	86 (85.3)	21 (1)	852 (87.8)	29 (65.6)	409 (86.1)
Yes	399	16.5	10.0	30 (1.7)	26 (14.7)	0 (0)	223 (12.2)	34 (34.4)	86 (13.9)
Depression									0.171
No	1848	76.3	82.9	542 (87.4)	82 (84.7)	18 (78.6)	700 (81.5)	42 (69.2)	365 (80.5)
Subsyndromal	409	16.9	13.5	80 (10.5)	24 (12.1)	2 (20.0)	200 (14.3)	15 (28.3)	88 (14.8)
Yes	164	6.8	3.6	33 (2.1)	6 (3.2)	1 (1.4)	76 (4.2)	6 (2.5)	42 (4.7)
Physical impairments									0.395
None	299	12.4	12.4	100 (15.5)	16 (13.8)	2 (4.4)	118 (11.1)	6 (15.2)	57 (10.8)
Two or below	1211	50.0	51.7	350 (50.4)	55 (53.3)	11 (67.6)	528 (52.5)	28 (27.0)	239 (52.3)
Three or more	911	37.6	35.9	205 (34.1)	41 (32.9)	8 (28.0)	429 (36.4)	29 (57.8)	199 (36.9)
Disability (mean (SE))		17.1 (0.50)	11.3 (0.47)	4.9 (0.48)	13.1 (2.65)	4.59 (1.92)	12.57 (0.74)	32.32 (6.07)	15.3 (1.50)

* Analysis of variance was used.

Table 2 Association between social network typologies and dementia

		OR	95% CI
Social network type	Family dependent	ref	
	Locally integrated	0.34*	(0.15 to 0.79)
	Locally self-contained	1.11	(0.22 to 5.68)
	Wider community focused	No dementia cases	
	Private	1.15	(0.36 to 3.73)
Age group	Non-conclusive	0.80	(0.43 to 1.51)
	60–74	ref	
	75–84	3.64*	(1.82 to 7.26)
Sex	85+	6.92*	(3.08 to 15.55)
	Female	ref	
Ethnicity	Male	1.46	(0.77 to 2.75)
	Chinese	ref	
	Malay	0.74	(0.43 to 1.26)
	Indian	0.52*	(0.30 to 0.90)
Marital status	Others	No dementia cases	
	Married/cohabiting	ref	
	Never married	0.57	(0.11 to 2.79)
	Widowed	1.13	(0.59 to 2.14)
Education	Divorced/separated	0.45	(0.13 to 1.49)
	Completed primary	ref	
	None	0.81	(0.37 to 1.75)
	Did not complete primary	0.79	(0.38 to 1.64)
	Completed secondary	0.36*	(0.14 to 0.88)
Income	Completed tertiary	0.13*	(0.03 to 0.63)
	Yes	ref	
Physical impairments	No	3.59*	(1.87 to 6.88)
	Two or below	ref	
	None	1.65	(0.63 to 4.33)
Assets	Three or more	0.90	(0.51 to 1.57)
		0.90	(0.74 to 1.11)
Disability		1.06*	(1.05 to 1.08)
Constant		0.03*	(0.01 to 0.18)

*Significant given 95% CI does not contain 1.

were found to be positively associated with the Malay and Indian ethnicity, physical impairments as well as disability. The results are presented in [table 3](#).

DISCUSSION

This study sought to examine the social support network typologies and its association with depression and dementia in a population-based sample of older adults in Singapore. Our results indicated that the social support network typology profile of the older adults in Singapore differed from those in other developed and developing countries. We also identified that being in the locally integrated social support network type was associated with

lower odds of developing dementia as compared with being in the family dependent social support network type. On the contrary, we did not find any significant association between social support network typology and depression.

We observed that the nature of social interaction among the older adults in Singapore was unlike other countries. The findings from a cross-sectional study conducted in Ireland on 683 people aged 65–99 years, revealed that older adults in Ireland belonged mostly to the locally integrated social network type.¹⁵ This was similar to the findings from population-based studies conducted on individuals aged 65 years and above in eight

Table 3 Association between social network typologies and depression

			OR	95% CI
Depression	Social network type	Family dependent	ref	
		Locally integrated	0.62	(0.29 to 1.31)
		Locally self-contained	0.56	(0.15 to 2.14)
		Wider community focused	0.35	(0.03 to 3.78)
		Private	0.31	(0.08 to 1.17)
	Ethnicity	Non-conclusive	0.82	(0.43 to 1.55)
		Chinese	ref	
		Malay	4.11*	(2.31 to 7.33)
		Indian	5.97*	(3.51 to 10.19)
	Physical impairments	Others	3.37	(0.63 to 17.99)
		Two or below	ref	
		None	0.23*	(0.08 to 0.65)
	Disability	Three or more	2.05	(1.16 to 3.60)
		Constant	1.04*	(1.03 to 1.06)
	Subsyndromal	Social network type	Constant	0.02*
Family dependent			ref	
Locally integrated			0.73	(0.46 to 1.15)
Locally self-contained			0.68	(0.33 to 1.42)
Wider community focused			1.58	(0.15 to 16.94)
Age group		Private	1.43	(0.44 to 4.71)
		Non-conclusive	0.86	(0.55 to 1.36)
		60–74		
Ethnicity		75–84	0.67	(0.44 to 1.03)
		85+	0.36*	(0.19 to 0.70)
		Chinese	ref	
Marital status		Malay	1.59 *	(1.14 to 2.23)
		Indian	2.13 *	(1.54 to 2.94)
		Others	1.42	(0.45 to 4.44)
		Married/cohabiting	ref	
Physical impairments	Never married	1.04	(0.47 to 2.30)	
	Widowed	1.20	(0.76 to 1.90)	
	Divorced/separated	2.41*	(1.13 to 5.12)	
Disability	Two or below	ref		
	None	0.36*	(0.18 to 0.72)	
Constant	Three or more	2.16*	(1.49 to 3.13)	
	Constant	1.02	(1.01 to 1.03)	
Normal	(Base outcome)	0.20*	(0.08 to 0.51)	

Only variables with significant results are presented in the table.

*Significant given 95% CI does not contain 1.

countries (Cuba, Dominican Republic, Peru, Venezuela, Mexico, Puerto Rico, China and India).³⁴ In particular, the older adults in developing countries such as Latin America, India and China (the urban populations were an exception where majority of the older adults belonged

to the private social support network type possibly due to urbanisation) mostly belonged to the locally integrated social network type. This indicated that while majority of older adults in Singapore had close relationships with family and/or relatives, they connected less with friends

and neighbours as compared with the older adults in the aforementioned countries.

Approximately 94% of the resident households in Singapore live in government-developed public housing or private condominiums,² both of which place the residents in close proximity to one another and are optimum for social interaction and involvement. However, cultural influences on support seeking⁴³ may have an impact on the older adults' social lifestyle that is, our sample of older adults might not be comfortable being close or divulging too much information to others apart from family members, resulting in generally minimal interaction with other people. Also, given the small geographical size and convenience of transportation in Singapore, the older adults might not recognise the need to maintain social relationships since they could easily get in touch and depend on family members for help and support in times of need.

Another potential contributing factor to the disparity could be the older adults' physical health status. Our findings revealed that (1) majority of the older adults had more than one physical impairment, (2) half of those who had '2 or below' and 'more than 3' impairments belonged to the family dependent social support network type and (3) the disability score was highest in the private social support network type followed by the family-dependent social support network type. It is thus possible that physical health influences the degree of sociability of an older adult likely due to the inconveniences brought about by the impairment(s) thereby restricting their network.

A considerable percentage of our participants did not belong to any particular social support network type and were categorised as 'non-conclusive'. Based on our observation, there is no distinctive trait among this group of participants for meaningful interpretation. Their social support network could have been in a state of flux or shifting from one network to another due to changes in their circumstances.¹⁷ Even so, we had included this group of participants in our analysis as late life is likely a period of transitions where the older adults experience major changes such as retirement and bereavement of their close ones, requiring time to adjust to a 'new' life which might affect their living arrangements and social interactivity.^{44 45} Further exploration will be required to identify the actual reasons.

Ageing trends have been a national interest and several ministerial committees have been formed to address issues that could arise from an ageing population in Singapore.⁴⁶ The policies were targeted at securing well-being in old age and had placed emphasis on active ageing and social involvement for the older adults to maintain an active and engaged lifestyle.⁴⁷ Despite the long-standing efforts to promote social integration, observation from our sample showed otherwise. It might be helpful to conduct an evaluation of the current policies in place to determine their effectiveness and facilitate the development of future strategies. Nevertheless, it is heartening to note that the Singapore government is invested

in this subject matter, continuously working on new initiatives to promote active ageing; one of the latest initiatives to commence in 2020 is the 'Community Networks for Seniors' scheme to help lonely older adults find new friends and strengthen the community care network.⁴⁸

About the influence of social support network typology on the prevalence of dementia, our results revealed that being in the locally integrated social support network type was significantly associated with lower odds of developing dementia as compared with being in the family dependent social support network type. Although the results were not significant, being in the non-conclusive social support network type was associated with lower odds of having dementia, while being in the locally self-contained social support network type and private social network type were associated with higher odds of having dementia. Wenger had observed that older adults in the private or locally self-contained social support networks were more vulnerable to social isolation than those in the locally integrated and wider community-focused social support network.^{49 50}

The findings of this study are consistent with that from a longitudinal study conducted among a community-based cohort on older adults in Sweden, which concluded that older adults without close social ties (contact with friends and/or relatives) and who were single and living alone had an increased risk of developing dementia.⁵¹ Our sample had no diagnosed cases of dementia in the wider community focused social support network type. As such, we postulate that in addition to family relation which is an important source of support,⁵² it may be also beneficial for older adults to maintain an appropriate level of interaction with friends and/or neighbours to keep themselves engaged with the social environment which would help sustain their cognitive function to prevent or delay dementia.⁵³

Our findings did not reflect any association between the social support network types and depression, in contrast to two studies conducted among community-dwelling older adults in Singapore. Both studies had established negative associations between social support and depression. It is noted that the instruments used to measure social support were however different. In the study conducted by Chan *et al.*,²⁰ social support was examined through: (1) living arrangements (categorical variable) and (2) social network (continuous variable) measured by the Lubben's Social Network Scale-Revised that assessed the size of network outside the household, frequency of contact, closeness and perceived social support from this network. Li *et al.*⁵⁴ similarly examined: (1) living arrangements (categorical variable) and (2) perceived social support (continuous variable) with the Duke Social Support Index which comprised two constructs: social satisfaction and social interaction.

The PANT combines both living arrangements and social network into an entirety and measured 'facts' such as distance and frequency of contact, unlike the other two scales which included subjective questions, for example,

'Do you feel...' The way the questions are phrased suggests that the type of social support network per se has no effect on the onset of depression, but it is whether the older adult perceives support from the network that has an influence over depression. There were also studies which did not find the predictive effect of social support on depression in older adults.^{55 56} Further research is certainly required to conclude this inference, considering there may be confounding factors such as the mental health condition, outlook on life, degree of self-reliance, personal preference that may affect the older adults' assessment on the social support received.

Interpretation of these findings should take into consideration several limitations. First, our results might not be representative of the entire population of older adults as the response rate was 65.6% and might have missed out on participants with more severe dementia or depression. Second, we were unable to identify any associations/traits in the non-conclusive network, which leaves this particular group of older adults neglected when they might actually require intervention or attention. Third, the non-significant finding for depression could be attributed to the small sample sizes ($n < 5$) in the subgroups, reflected in table 1. Lastly, given the cross-sectional design of the study, we are unable to derive any causal inferences from our results.

Notwithstanding these limitations, this study provides preliminary insight into the usage of PANT and development of future interventions with regards to prevention against dementia and depression in population of older adults in Singapore corresponding to their social support network typology, since no similar research has been conducted before. Our findings have shown that the social support network typology presents us the knowledge about the older adults' social network profile (living arrangements and social contacts) and accordingly, their cognitive functioning-ability which could have an impact on the onset of dementia. Using the PANT, stakeholders will be able to identify isolated groups of older adults who might be at risk of cognitive decline. Appropriate interventions could then be implemented to ensure that the group of older adults will be cared for and promote the importance of social interaction among them. We infer from our findings that the social support network is not a good enough predictor for depression; rather, it is the older adults' perception of the quality of social interaction that will influence the likelihood of depression. In this regard, future research is essential to measure the quality of social interaction and establish its associated factors in older adults in order to develop effective preventive measures against depression.

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protocol, was involved in conducting the study and critically reviewed the article. All authors have read and approved the final manuscript.

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