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Met and Unmet Needs of Community-dwelling older Singaporeans with Cognitive Impairment

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Met and Unmet Needs of Community-dwelling older Singaporeans with Cognitive Impairment

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Key Findings:

- The met and unmet needs of 266 older persons with cognitive impairment (PCI) in the Whampoa area were reported by their caregivers using the Camberwell Assessment of Need for the Elderly.
- On average, caregivers reported 8 care needs of their PCI; of those, 7 were met and 1 was unmet.
- More than half of the caregivers reported needs in the domains of physical health (75%), benefits (61%), memory (54%), money/budgeting (53%), and food (51%), most of which were met except for memory needs.
- More than 10% of caregivers reported unmet needs of their PCI in daytime activities (16%), company (15%), memory (11%), and eyesight/hearing/communication (10%).
- Poor PCI health (a lower level of cognitive function and a higher level of memory and behavior problems) and the involvement of a foreign domestic worker in caregiving were associated with a greater number of met needs.
- Older caregivers, non-Chinese caregivers, and caregivers whose PCI had memory and behavior problems were more likely to report unmet needs.

1. INTRODUCTION

Globally, more than 55 million people live with dementia, a leading cause of dependency, disability, and death [1]. It is also estimated that around 15-20% of persons 60 years and older have mild cognitive impairment (MCI), defined as cognitive decline that is greater than what is expected of normal aging [2]. Although MCI does not always interrupt daily life, more than half of older adults with MCI go on to develop dementia within 5 years [2].

The prevalence of dementia in Singapore is also on the rise. The Well-being of the Singapore Elderly (WiSE) study conducted in 2011, reported that 1 in 10 Singaporeans aged 60 years and above have dementia. A recent study estimated that about 48,906 Singaporeans had dementia in 2019; and it is projected that 222,784 Singaporeans will have dementia by 2050, an increase of 356% from 2019 [3]. The sharp increase in dementia diagnoses will lead to an increase in dementia care needs in Singapore.

However, little is known about the care needs of community-dwelling persons with cognitive impairment (PCI) in Singapore. Identifying care needs of PCI is crucial not only for the health and well-being of PCI and their caregivers, but also for the effective allocation of limited healthcare resources for intervention and treatment against dementia [4-6].

Increasingly, studies from Western countries have employed a standardised instrument, known as the Camberwell Assessment of Need for the Elderly (CANE) to measure the met and unmet needs of PCI [7, 8]. CANE is a multi-item instrument that comprehensively captures the care needs of older adults in the domains of daily activities, physical and psychological health, social relationship, and financial situation. Though the type and intensity of care needs may differ across different sociocultural contexts, to our knowledge, no studies in Singapore have used CANE to evaluate the range of problems possibly experienced by PCI.

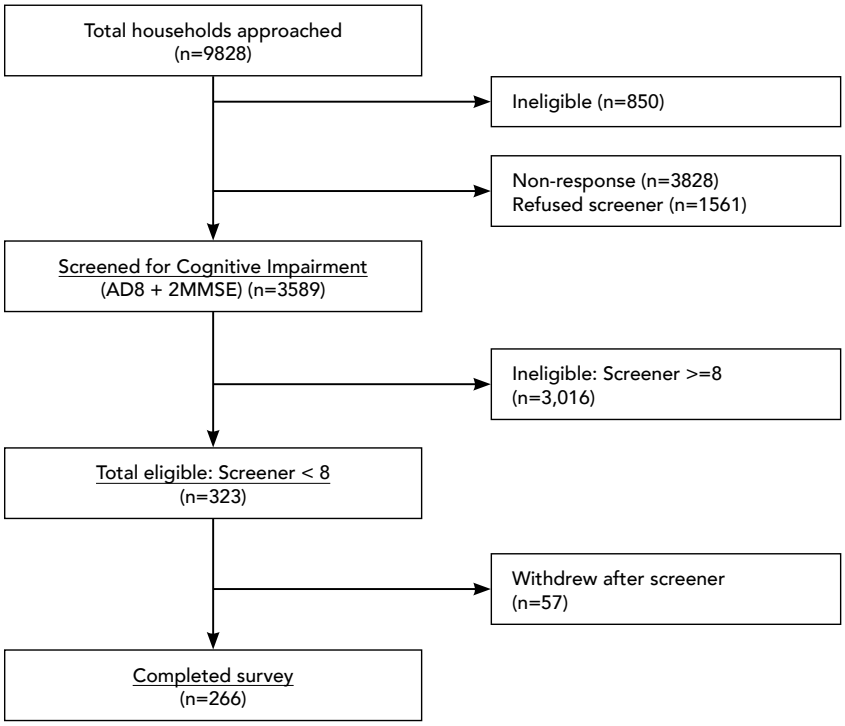
Using the CANE, this brief aims to identify the 1) specific domains in which caregivers report met and unmet needs of their PCI frequently; 2) average number of met, and unmet needs, overall and by PCI sociodemographic characteristics and health status; 3) factors independently associated with met, and unmet needs. This brief thereby contributes to an in-depth understanding of met and unmet care needs of older PCIs in the community in Singapore.

2. Data

This brief uses baseline data on 266 PCI and their caregivers from the Caring for persons with dementia and their caregivers in the community: Towards a sustainable community-based dementia care system (COGNITION) study conducted in 2018. The COGNITION study aimed to comprehensively understand the health and social lives of community-dwelling PCI and their caregivers in Singapore.

In 2018, the study team initially visited 9,828 households in the Whampoa community. A total of 3,589 older Singapore citizens or permanent residents, aged 60 years and older, residing in the households and interested to participate in the study were administered a validated 10-item screener that assessed the participants cognitive status [9]. The screener [9] comprised 8 questions from the Eight-item Interview to Differentiate Aging and Dementia (AD8) [10] and 2 items (copying intersecting paragons and three-item recall) from the Mini-Mental State Examination (MMSE) [11]. A total of 323 PCI, who scored lower than 8 on the screener, were considered to have cognitive impairment [9] and were eligible to respond to the survey. Of them, 266 (82%) PCI and their adult caregiver dyads gave written informed consent for study participation and were interviewed face-to-face. Caregivers eligible to participate in the study have to be a family member or friend who is most involved in providing care or ensuring provision of care to the PCI. Foreign domestic workers (FDW) were not eligible. The COGNITION study was approved by the Institutional Review Board at the National University of Singapore.

Figure 1: Flow chart of the survey



3. Descriptive statistics of the study sample

3.1 Sociodemographic characteristics of PCI

Table 1 shows the sociodemographic profiles of 266 PCI from COGNITION study. Older persons aged 80-89 years formed the highest proportion (45%), followed by those aged 70-79 years (27%). Majority were females (57%), of Chinese ethnicity (91%), and married (47%).

Table 1: Sociodemographic characteristics of PCI (N=266)

Variables	N	Proportion
Age, years (60-104)		
60-69	30	11%
70-79	71	27%
80-89	121	45%
90 and above	44	17%
Gender		
Men	114	43%
Women	152	57%
Ethnicity		
Chinese	241	91%
Non-Chinese	25	9%
Marital status		
Married	126	47%
Widowed	117	44%
Separated/Divorced/Never married	23	9%
Education		
No formal education	125	47%
Primary	86	32%
Secondary	50	19%
Tertiary	5	2%
Employment status		
Working	12	5%
Not Working	254	95%
Housing		
HDB (1-2 room)	31	12%
HDB (3 room)	127	48%
HDB (4+ room)/Other type	108	41%
Living arrangement		
Alone	13	5%
With family members	177	67%
With non-family members	76	29%

PCI: Persons with cognitive impairment; HDB: Housing & Development Board

Almost half of the PCI had no formal education (47%), and almost one-third (32%) had only primary school education. Most respondents were not working (95%). A higher proportion of the respondents resided in 3-room Housing Development Board (HDB) flats, while about 12% of the respondents resided in 1- or 2-room HDB flats. A majority of PCI lived together with family members (67%), while 29% lived with non-family members, and 5% lived alone.

3.2 Cognitive function and memory and behavior problems of PCI

Cognitive function was measured using the 30-item MMSE [11]. The 30-item instrument assessed the orientation, attention, memory, language, and visual-spatial skills of the PCI. The PCI received one point for each correct answer, with higher scores indicating better cognitive function. The maximum possible score of the MMSE was 30 points. The Alzheimer' s Association (https://www.alz.org/alzheimers-dementia/diagnosis/medical_tests) used three cut-off points to detect different degrees of cognitive impairment among adults: a score of 20 to 24 suggests mild dementia, 13 to 20 suggests moderate dementia, and less than 12 indicates severe dementia.

Figure 2: Distribution of Mini-Mental State Examination (MMSE) scores

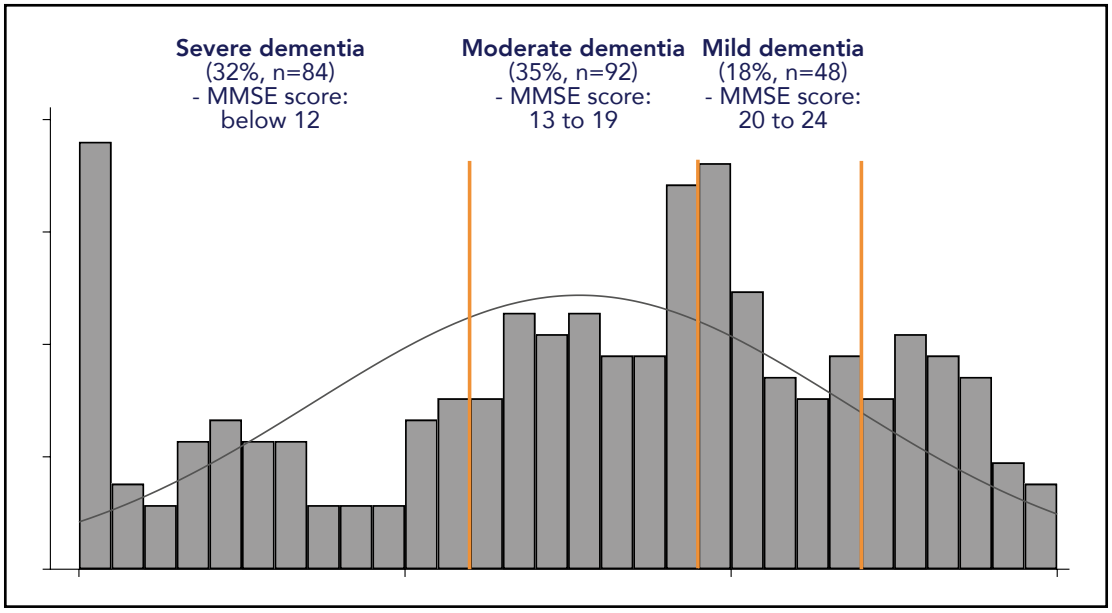


Figure 2 illustrates a distribution of MMSE scores among 263 PCI in this study. About 15% of PCI scored at least 25 points, indicating they were at risk of cognitive impairment. Of those, 32% suffered from severe cognitive impairment, 35% had moderate cognitive impairment, and 18% had mild cognitive impairment. 20 participants (7.6%) scored zero on the MMSE as they were unable to complete the assessment due to cognitive and/or behavioural reasons. Three respondents did not respond to the MMSE for non-health-related reasons.

The average MMSE score was 15.3. Scores varied considerably by PCI age, gender, and education. The average MMSE scores were highest among those aged 70-79, followed by the 61-69 age group, and decreased dramatically with age among those aged 80 and older. Females reported lower average MMSE scores than males. For educational status, the average score was the highest among PCI who completed tertiary education and the lowest for those with no formal education.

Table 2: Cognitive functioning (Mini-Mental State Examination Score [MMSE] score) and Memory and behavior problems (Revised Memory and Behavior Problems Checklist [RMBPC] score) by PCI age group, gender, and education

		Age Group (years)				Gender		Education Level			
	Total	61-69	70-79	80-89	90-103	Male	Female	No formal education	Primary	Secondary	Tertiary
Mini-Mental State Examination (MMSE) Score											
N	263	30	71	120	42	113	150	122	86	50	5
Mean	15.3	17.7	18.8	14.2	11.0	17.4	13.8	13.2	16.4	18.3	20.2
SD	8.2	8.5	7.1	8.0	7.6	7.5	8.4	8.2	7.0	8.6	11.6
Revised Memory and Behavior Problems Checklist (RMBPC) Score											
N	259	29	70	116	44	112	147	121	84	49	5
Mean	15.4	12.1	14.1	16.4	16.8	12.8	17.3	15.4	15.5	15.4	10.6
SD	14.1	15.6	13.9	14.7	11.2	13.7	14.1	13.3	14.9	15.2	9.6

Memory and behavior problems were evaluated by the Revised Memory and Behavior Problems Checklist (RMBPC). The RMBPC, a 24-item instrument, assessed the presence of memory and behavior problems in PCI, from the perspective of their caregivers. There were five response categories: "0=never occurred at all," "1=not in the past week," "2=1 to 2 times per week," "3=3 to 6 times per week," "4=daily or more often." We summated scores from 24 items ranging from 0 to 96. Higher scores indicated more severe memory and behavior problems.

The average RMBPC score was 15.4 among 259 caregivers who completed RMBPC. As shown in Table 2, scores varied considerably by age, gender, and education. The average RMBPC score was the lowest among those aged 61-69 and gradually increased with age, indicating that older PCI experienced frequent and distressing behavioural problems. Females had a higher average of RMBPC scores than males. The average scores were the lowest among those with tertiary education.

3.3 Sociodemographic characteristics of caregivers and caregiving context

Table 3 reports the sociodemographic characteristics of 266 caregivers of PCI. Among caregivers, those aged 60-74 years formed the highest proportion (37%), followed by those aged 50-59 years (37%). There were more females (59%) compared to males (41%), and most of the caregivers were Chinese (90%). The majority of caregivers were married (65%), while one-quarter of respondents had never married (26%).

Table 3: Sociodemographic characteristics of caregivers, and the caregiving context (N=266)

Variables	N	Proportion
Sociodemographic characteristics		
Age		
23-49	39	15%
50-59	70	26%
60-74	99	37%
75-93	58	22%
Gender		
Men	108	41%
Women	158	59%
Ethnicity		
Chinese	240	90%
Non-Chinese	26	10%
Marital status		
Married	172	65%
Widowed/Separated/Divorced	26	10%
Never married	68	26%
Education		
No formal education	39	15%
Some primary	58	22%
Some secondary	104	39%
Tertiary	65	24%
Employment status		
Working	118	44%
Not Working	148	56%
Financial resources		
Adequate/More than adequate	137	52%
Occasionally adequate	75	29%
Usually inadequate	51	19%
Caregiving context		
Relationship to PCI		
Spouse	90	34%
Children	137	51%
Others	39	15%
Caregiving duration		
Shorter than five years	222	83%
Five years or longer	44	17%
FDW		
FDW not involved in caregiving	169	64%
FDW involved in caregiving	97	36%

PCI: Persons with cognitive impairment; FDW: Foreign Domestic Worker

The highest proportion of caregivers had some secondary education (39%), followed by those with tertiary education (24%). Slightly more than half of the caregivers were not working (56%), compared to those who were still working (44%). Approximately half of the caregivers reported adequate or more than adequate financial resources (52%), while one-fifth responded that their resources were usually inadequate (19%).

Regarding caregiving context, half of the caregivers were children of PCI (51%); one-third of respondents were spouses of PCI (34%). About 17% of caregivers had provided care to their PCI for more than five years. About 36% of caregivers had hired a FDW to assist in caregiving.

4. Met, and Unmet needs

The CANE assessed the met and unmet needs of PCI. CANE comprises 26 items: 24 items measure the care needs of older adults in the domains of daily activities, physical and psychological health, social relationship, and financial situation; two items evaluate caregiver need for information and caregiver psychological distress. We excluded the latter two items measuring caregiver burden in this brief to focus on care needs of PCI.

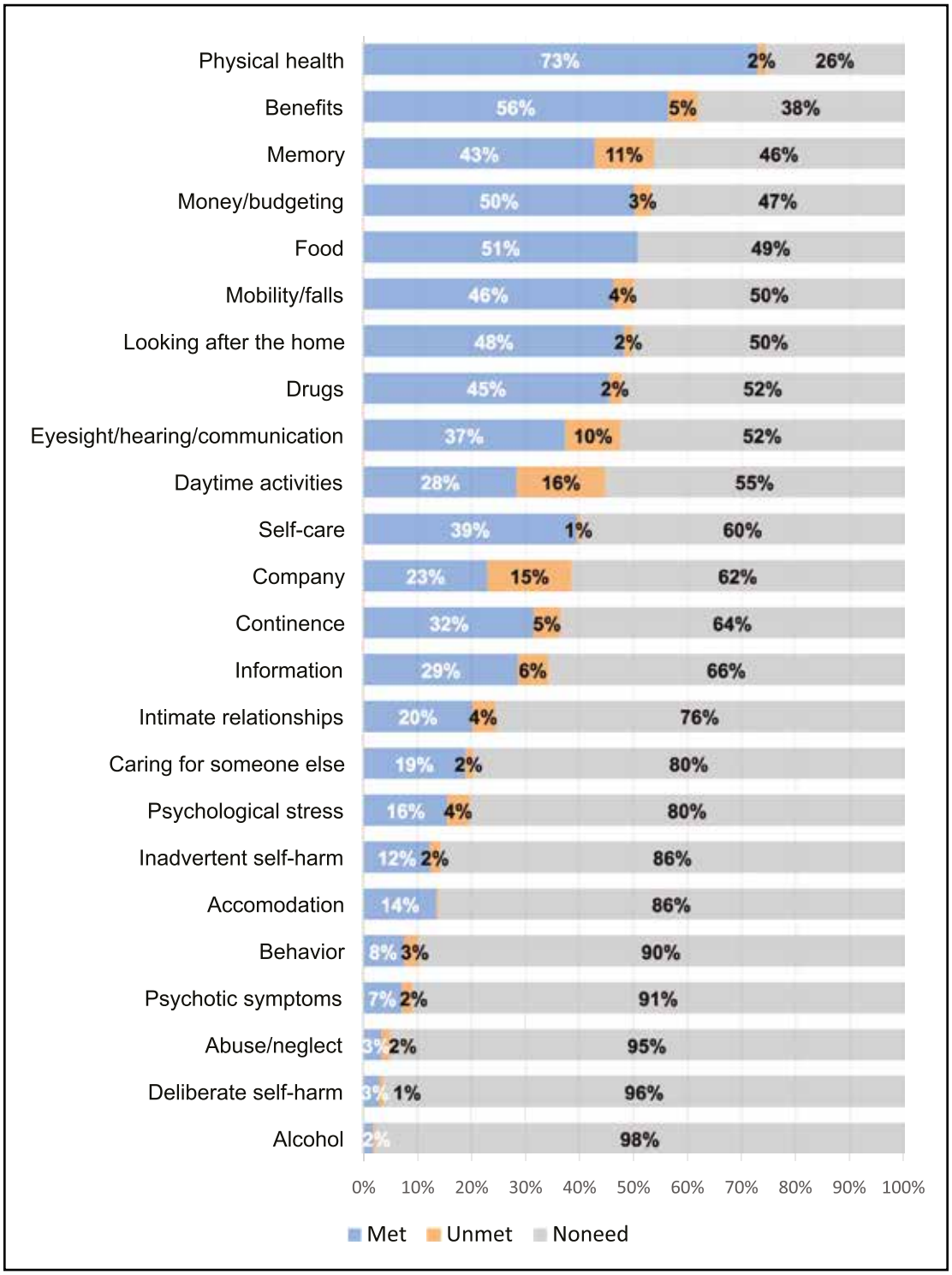
There were three response categories for each item: "no need"; "met need"; "unmet need". Two summated scales, ranging from 0 to 24, were constructed: Met needs and unmet needs. Met needs were a sum of the items recorded as 1=met need; 0=No need/ Unmet need. Unmet needs were a sum of the items recorded as 1=unmet need; 0=no need/met need.

In the COGNITION Study, both PCI and their caregivers responded to the CANE. However, due to health problems, around 50% of PCI were unable to respond to the CANE questions. Therefore, this report focuses on the needs of PCI as reported by caregivers.

4.1 Met and Unmet needs by domains

Figure 3 presents domain-specific details on the met and unmet needs of PCIs as evaluated by their caregivers, through CANE. More than half of the caregivers reported needs in the domains of physical health (75%), benefits (61%), memory (54%), money/ budgeting (53%), and food (51%), most of which were met except for memory needs. Conversely, more than 1 in 10 caregivers reported unmet needs of their PCI in daytime activities (16%), company (15%), memory (11%), and eyesight/hearing/communication (10%).

Figure 3: Camberwell Assessment of Need for the Elderly, evaluated by caregivers (N=266).



Majority of caregivers (75%) reported that they had needs for physical health of their PCI. However, only 2% reported that the needs were not met. Most caregivers acknowledged that their PCI had physical ailments such as high blood pressure but received appropriate treatment and investigation (See Appendix 1 question 11).

More than half of caregivers (61%) reported that they needed to receive benefits that their PCI were entitled to. Nevertheless, only 5% of caregivers stated that their PCI were not receiving all entitled benefits and need support to get the benefit. This was followed by 53% of caregivers reporting that their PCI had problems with memory: 43% of caregivers expressed that this memory problem was manageable, while 11% expressed that their PCI had a clear deficit in recalling new information, misplaced items frequently, became disoriented in time and/or place and did not receive appropriate assistance (See Appendix 1 question 7). Furthermore, about half of caregivers reported needs in money/budgeting (53%), food (51%), mobility/falls (50%), and looking after the home (50%).

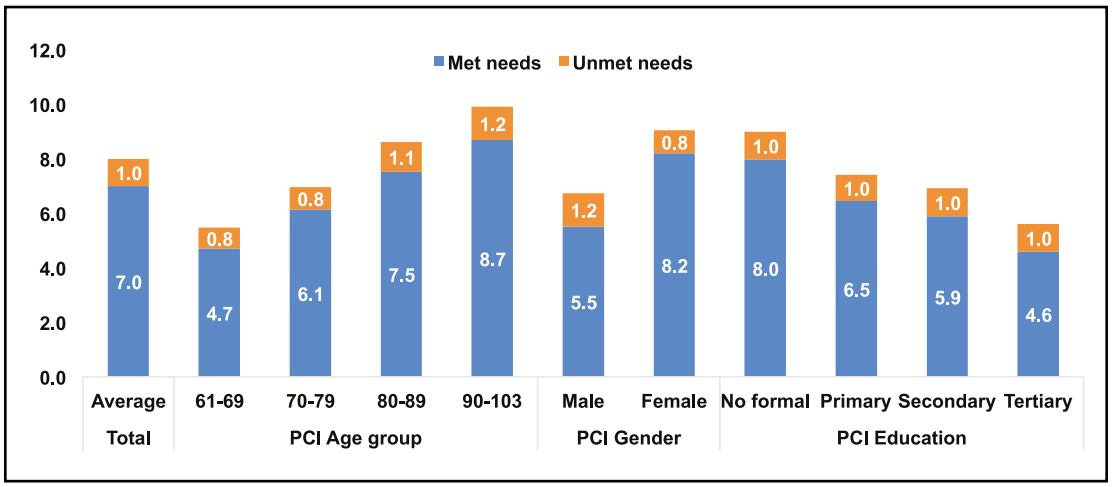
The largest proportion of caregivers reported unmet needs in the social domain; this included daytime activities (16%) and company (15%). Among caregivers who reported having needs in these domains (44% in daytime activities and 38% in company), more than one-third of caregivers reported unmet needs. It seems that among caregivers whose PCI had limited daytime activities and social life (company), many PCI suffered from lack of adequate social, work or leisure activities.

Apart from memory-related needs, 10% of caregivers reported that their PCI had unmet needs in eyesight/hearing/communication. In other words, 1 in 10 caregivers reported that their PCI faced difficulty with hearing what someone says in a quiet room, difficulty in seeing newsprint or watching television. In contrast, less than 10% of caregivers reported that their PCI had problems with alcohol misuse (2%), self-harm or suicide risk (4%), abuse or neglect issues (5%), and psychotic symptoms (9%).

4.2 Met and unmet needs by sociodemographic characteristics of PCI

Figure 4 shows met and unmet needs by PCI age, gender, and education. The mean number of met and unmet needs were 7.0 and 1.0. respectively. The number of met and unmet needs increased with the age of PCI: PCI aged 90 and older had almost twice care needs (met and unmet needs) compared to PCI in their 60s. Female PCI had a substantially greater number of met needs and a smaller number of unmet needs compared to male PCI. PCI with tertiary education had the lowest number of met needs, while PCI with secondary school education and below had relatively higher met needs. However, the number of unmet needs did not differ by education.

Figure 4: Met and unmet needs by age group, gender, and education

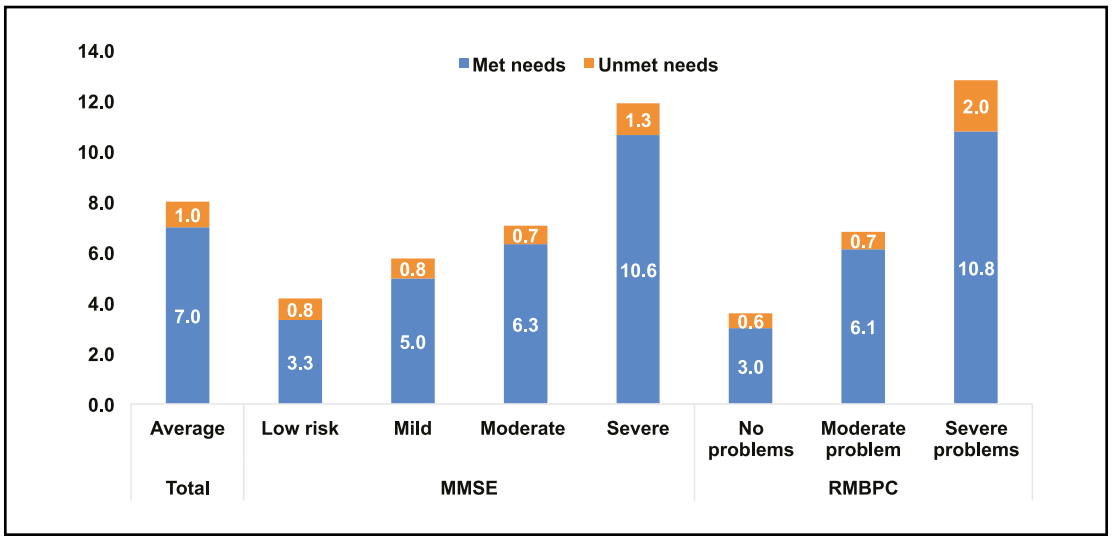


PCI: Persons with cognitive impairment

4.3 Met and unmet needs by cognitive function and memory and behavior problems of PCI

Figure 5 shows met and unmet needs by PCI cognitive function, measured by MMSE, and PCI memory and behavior problems, measured by RMBPC. Briefly, the number of met and unmet needs increased by the extent to which PCI suffered from poor cognitive function, as well as memory and behavioral problems. For instance, caregivers on average reported 3.3 met needs and 0.8 unmet needs when their PCI had a low risk of dementia (MMSE score of 25 or above). In contrast, if PCI suffered from severe cognitive impairment (MMSE score of 12 or below), caregivers reported 10.6 met needs and 1.3 unmet needs. Similarly, caregivers reported three met needs and less than one unmet need when their PCI had no memory and behavior problems with zero RMBPC scores. The number of met needs doubled when the PCI had moderate memory and behavior problems and more than tripled when the PCI had severe memory and behavior problems. Specifically, caregivers reported more than 10 met needs and 2 unmet needs when their PCI suffered from severe memory and behavioral problems.

Figure 5: Met and unmet needs by cognitive functioning and memory and behavioral problem of PCI



PCI: Persons with cognitive impairment

4.4 Factors independently associated with met and unmet needs

Lastly, using multivariable regression, we examined factors independently associated with met and unmet needs, net of other covariates including caregiver and PCI sociodemographic characteristics and caregiving context. Caregiver characteristics included age (in years), gender (female versus male), ethnicity (non-Chinese versus Chinese), marital status (married versus non-married), education (primary, secondary, tertiary versus no formal education), work status (working versus non-working), and financial resources (adequate/more than adequate versus occasionally adequate and usually inadequate). PCI characteristics comprised cognitive functioning (MMSE), memory and behavior problems (RMBPC), age (in years), gender (female versus male), marital status (married versus non-married), and education (primary, secondary, tertiary versus no formal education). Caregiving context included spouse caregiver (spouse caregiver versus non-spouse caregiver), long-term caregiver (more than five years of caregiving versus less than five years of caregiving), and involvement in FDW in caregiving (hired a FDW for caregiving versus the rest).

Table 4: Multivariable regression for the association of caregiver and PCI characteristics, and caregiving context with met, and unmet needs of PCI as reported by caregivers

Variables	Outcome: Met needs Model 1	Outcome: Unmet needs Model 2
Caregiver Characteristics		
Age (in years)	0.00	**0.03***
Gender		
Female (vs. Male)	0.04	0.03
Ethnicity		
Non-Chinese (vs. Chinese)	-0.05	**0.72***
Marital status		
Married (vs. not married)	-0.02	-0.00
Education (Ref. No formal education)		
Primary	0.14	-0.03
Secondary	0.23	0.34
Tertiary	-0.06	0.62
Working Status		
Working (vs. not working)	0.01	-0.10
Financial Resources		
Adequate (vs. not adequate)	0.02	-0.05
PCI characteristics		
Cognitive functioning (MMSE)	**-0.03*****	-0.03
Memory and behavior problem (RMBPC)	**0.37*****	**0.82*****
Age (in years)	0.00	-0.01
Gender		
Female (vs. Male)	0.14	-0.45
Marital Status		
Married (vs. not married)		
Education		
Primary	-0.03	-0.00
Secondary	0.03	0.08
Tertiary		
Caregiving context		
Spouse caregiver (vs. non-spouse caregiver)	-0.15	-0.56
Long term (≥5 years) caregiver vs. <5 years of caregiving)	0.06	-0.19
Involvement of a FDW	**0.26****	-0.12
Number of observations	253	

PCI: Persons with cognitive impairment. FDW: Foreign domestic worker
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 reports the results. Model 1, having met needs as an outcome, showed that two measures of PCI health status – cognitive function as well as memory and behavior problems – were positively associated with met needs. In other words, caregivers were more likely to report a greater number of met needs if their PCI had a lower level of cognitive function and a higher level of memory and behavior problems. Also, the involvement of a FDW in caregiving was associated with a greater number of met needs.

Model 2 shows that PCI memory and behavior problems were associated with unmet needs. Additionally, older caregivers and caregivers of minority ethnicity were more likely to report a greater number of unmet needs.

5. Discussion

The aim of this brief was to identify met and unmet needs among community-dwelling older adults in Singapore and to examine predictors of met and unmet needs. In this brief, we first delineated sociodemographic characteristics of 266 PCI and their caregivers in the Whampoa area who participated in the COGNITION study. We then used CANE to examine the met and unmet needs of PCI, as assessed by their caregivers. Domain-specific proportions were explored first, followed by an average number of met and unmet needs by PCI sociodemographic characteristics and health status. Lastly, we used multivariable regression to test whether any of the PCI and caregiver characteristics and caregiving context variables were associated with met and unmet needs.

This brief yielded three main findings. First, we found that caregivers of community-dwelling PCI in Singapore, on average, reported 7 met needs and 1 unmet need. Compared to the previous studies conducted in non-Asian contexts summarised in Table 5, caregivers in Singapore reported a relatively lower number of met and unmet needs, specifically unmet needs in general. For instance, 322 informal caregivers of persons with dementia (PWD) in the Netherlands reported an average of 7.9 met needs and 1.7 unmet needs [12]. 451 caregivers of PWD from eight European countries reported an average of 8.0 met needs and 1.7 unmet needs [13]. In Chile, an average of 10 met needs and 3.3 unmet needs were reported by 166 caregivers of PWD [14].

Table 5: Previous studies reporting met and unmet needs as evaluated by CANE

Authors	Country	Data	Met[a] needs	Unmet[a] needs	Unmet needs Domains	Evaluator
Zhang, Xu, Yang and Wang [16]	China	378 home-living residents with mild to moderate dementia	NA	NA	Caring for someone (65.1%), Looking after the home (63.5%), Self-care (58.7%), Intimate relationships (44.4%)	PWD
Tapia Muñoz et al. [14]	Chile	166 PWD-caregiver dyads	10	3.3	Daytime activities (39.2%), Company (36.1%), Memory (34.9%)	Caregiver
Kerpershoek et al. [13]	The Netherlands, Germany, The United Kingdom, Ireland, Sweden, Norway, Portugal, Italy	451 PWD-caregiver dyads	8 (5.5)	1.7 (1.0)	Company (24%), Information (10%) and Daytime activities (28%).	Caregiver & PWD
Mazurek, Szcześniak, Urbańska, Dröes and Rymaszewska [17]	Poland	47 PWD and 41 caregivers	4.8 (3.6)	2.1 (1.5)	Daytime activities (57.4%), Company (48.9%), Psychological distress (44.7%)	Caregiver & PWD
Bakker et al. [4]	The Netherlands	215 Young-onset dementia patients and their primary caregivers	9.6 (7.9)	3.1 (2.0)	Daytime activities (45.5%), Company (37.8), Eyesight/hearing (37.3%), Memory (23.4%), Mobility (19.6%)	Caregiver & PWD
Miranda-Castillo et al. [6]	The United Kingdom	152 PWD living at home	7.4	2.6	Daytime activities (50.7%), Company (39.5%), Psychological distress (30.9%)	PWD
Freyne, Dolan and Cooney [18]	Republic of Ireland	40 community dwelling PWD	10	5	Memory (57.5%), Psychological distress (50%), Daytime activities (47.5%) Caregiver	Caregiver
Van Der Roest et al. [12]	The Netherlands	236 PWD and 322 informal carers	7.9 (4.9)	1.7 (0.5)	Memory (32.5%), Daytime activities (16%), Company (13.1%)	Caregiver & PWD

PWD: Persons with Dementia;
[a] Average score reported; Met and Unmet needs in parenthesis were answered by PWD.

Our analysis sample consisted of community-dwelling older adults with mild, moderate, and severe cognitive impairment. Therefore, we are unable to directly compare our results with previous studies that applied CANE to caregivers of PWD. Additionally, the reliability and validity of CANE questions, developed in the United Kingdom, is yet to be validated in the Singaporean context. Nonetheless, as shown in Figure 5, even when we considered caregivers of PCI with severe cognitive impairment with MMSE scores below 12 (n=84), we still observed that caregivers in our study sample reported relatively fewer unmet needs, which was an average of 1.3, than caregivers in other countries in the literature. This may be due to certain nuances unique to Singapore. For instance, caregivers are more likely to receive social support from their families and friends living nearby in a small city-state. Caregivers in Singapore are also encouraged to hire a live-in FDW for assistance [15]. Future studies may revisit the met and unmet needs of PCI in other Asian societies to examine if any regional or cultural patterns exist.

Second, top five unmet needs caregivers reported were daytime activities (16% of caregivers), company (15%), memory (11%), and eyesight/hearing/communication (10%). This is similar to the unmet needs reported in the previous studies summarized in Table 5. For instance, caregivers in Chile reported the same top three unmet needs: daytime activities, company, and memory [14]; as Dutch caregivers [12]. Specifically, unmet needs frequently reported in two social domains—daytime activities and company—revealed that caregivers generally find it difficult to arrange adequate social activities for their PCI across countries.

Previous studies recommended comparing and contrasting met and unmet needs reported by PCI and their caregivers: as studies have found disparities between them [7, 8]. Although only slightly over 50% of healthy PCI (135 out of 266) responded to the CANE instrument, we checked whether PCI reported similar types of unmet needs as their caregivers. Appendix 2 shows that more than five percent of PCI reported unmet needs in two social domains, daytime activities (8%) and company (7%), in addition to memory (13%), benefits (8%), and mobility/falls (6%). Continued efforts, therefore, should be made to help PCI maintain their social connectedness and engagement.

Lastly, we tested whether there were sociodemographic and health disparities in reporting met and unmet needs. Bivariate analyses showed some differences by PCI age, gender, education, cognitive functioning, and memory and behavioral problems. However, when these factors were concurrently considered in multivariable models, only PCI health – cognitive function as well as memory and behavioral problems – were associated with a greater number of met needs, while caregiver age, ethnicity, and PCI memory and behavioral problems were associated with a greater number of unmet needs. This brief thus verifies that identifying PCI health status—not only cognitive function but also memory and behavioral problems—is important for designing effective interventions. Also, more attention needs to be paid to ethnic minority and aged caregivers who are at risk of suffering from a higher number of unmet needs.

Overall, this brief is the first step to systematically identifying the care needs of community-dwelling older adults with cognitive impairment in Singapore. We urge more research projects to include the CANE instrument for the comprehensive and comparative assessment of met and unmet care needs of older adults with cognitive impairment. At the same time, public health initiatives should orchestrate tailored interventions for older, non-Chinese, and caregivers whose PCI suffer from poor cognitive health and behavioral problems.

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Appendix 1: Camberwell Assessment of Needs for Elderly

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_01	**Accommodation** Does the person have an appropriate place to live? (What kind of home do you live in? Do you have any problems with accommodation?)		
	Rating	**Meaning**	**Example**
	0	No need	Has adequate and appropriate home (even if currently in hospital). No need for assistance
	1	Met need	Home undergoing adaptation/ redecoration. Needs and is getting help with accommodation, e.g., in residential care, sheltered housing
	2	Unmet need	Homeless, inappropriately housed or home lacks basic facilities such as water, electricity, heating, or essential alterations
	9	Not known	
CANE_02	**Looking after the home** Does the person look after their home? (Are you able to look after your home? Does anyone help you?)		
	Rating	**Meaning**	**Example**
	0	No need	Independent in looking after the home, home may be untidy but kept basically clean
	1	Met need	Limited in looking after home and has appropriate level of domestic help
	2	Unmet need	Not receiving appropriate level of domestic assistance. Home is a potential health/fire/ escape hazard
	9	Not known	
CANE_03	**Food** Does the person get enough of the right type of food to eat? (Are you able to prepare your own meals and do your own shopping? Are you getting the right sort of food?)		
	Rating	**Meaning**	**Example**
	0	No need	Independent in looking after the home, home may be untidy but kept basically clean
	1	Met need	Limited in looking after home and has appropriate level of domestic help
	2	Unmet need	Not receiving appropriate level of domestic assistance. Home is a potential health/fire/ escape hazard
	9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)

CANE_04

Self-care
How does the person look after their self-care?
(Do you have any difficulty with personal care like washing, cutting your nails or dressing? Do you ever need help?)

Rating	Meaning	Example
0	No need	Appropriately dressed and groomed independently
1	Met need	Needs and gets appropriate help with self-care
2	Unmet need	Poor personal hygiene, unable to wash or dress, not receiving appropriate help
9	Not known	

CANE_05

Caring for someone else
Does the person care for another? Can they manage this caring?
(Is there anyone that you are caring for? Do you have any difficulty in looking after them?)

Rating	Meaning	Example
0	No need	Independent in looking after the home, home may be untidy but kept basically clean
1	Met need	Limited in looking after home and has appropriate level of domestic help
2	Unmet need	Not receiving appropriate level of domestic assistance. Home is a potential health/fire/ escape hazard
9	Not known	

CANE_06

Daytime activities
How does the person occupy their day?
(How do you spend your day? Do you have enough to do?)

Rating	Meaning	Example
0	No need	Adequate social, work, leisure or learning activities, can arrange own activities
1	Met need	Some limitations in occupying self, has appropriate activities organized by others
2	Unmet need	No adequate social, work or leisure activities
9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_07	**Memory** Does the person have a problem with memory? (Do you often have a problem remembering things that happened recently? Do you often forget where you've put things?)		
	Rating	**Meaning**	**Example**
	0	No need	Occasionally forgets, but remembers later. No problem
	1	Met need	Some problems, but having investigations / assistance
	2	Unmet need	Clear deficit in recalling new information: loses things, becomes disoriented in time and/or place, not receiving appropriate assistance
	9	Not known	
CANE_08	**Eyesight/hearing/communication** How is the person's eyesight and hearing? (Do you have any difficulty hearing what someone says to you in a quiet room? Do you have any difficulty in seeing newsprint or watching television? Are you able to express yourself clearly?)		
	Rating	**Meaning**	**Example**
	0	No need	No difficulties (wears appropriate corrective lenses or hearing aid, is independent)
	1	Met need	Some difficulty, but aids help to some extent, receiving appropriate investigations or assistance to care for aids
	2	Unmet need	A lot of difficulty seeing or hearing, does not receive appropriate assistance
	9	Not known	
CANE_09	**Mobility/falls** How does the person get around inside and outside their home? (Do you have trouble moving about your home? Do you have falls? Do you have trouble with transport?)		
	Rating	**Meaning**	**Example**
	0	No need	Physically able and mobile
	1	Met need	Some difficulty walking, climbing stairs or using public transport, but able with assistance (walking aids, wheelchair). Occasional fall. Safety plan in place
	2	Unmet need	Very restricted mobility, even with walking aid. Frequent falls. Lack of appropriate help
	9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_10	**Continence** Does the person have incontinence? (Do you ever have accidents/find yourself wet if you can't get to the toilet quickly? How much of a problem? Ever any soiling? Are you getting any help?)		
	Rating	**Meaning**	**Example**
	0	No need	No incontinence/independent in managing incontinence
	1	Met need	Some incontinence. Receiving appropriate help/investigators
	2	Unmet need	Regularly wet or soiled. Deteriorating incontinence needing assessment
	9	Not known	
CANE_11	**Physical health** How is the person's physical health? (How well do you feel physically? Are you getting any treatment from your doctor for physical problems?)		
	Rating	**Meaning**	**Example**
	0	No need	Physically well. Receiving no medical interventions
	1	Met need	Physical ailment such as high blood pressure under control, receiving appropriate treatment/investigation. Reviews of physical conditions
	2	Unmet need	Untreated serious physical ailment. Significant pain. Awaiting major surgery
	9	Not known	
CANE_12	**Drugs** Does the person have problems with medication or drugs? (Do you have any problems (e.g., side-effects) with medication? How many different tablets are you on? Has your medication been reviewed by your doctor? Do you take drugs that are not prescribed?)		
	Rating	**Meaning**	**Example**
	0	No need	No problems with compliance, side-effects, drug misuse or dependency
	1	Met need	Regular reviews, advice, district nurse/CPN administers medication, dosette boxes/aids
	2	Unmet need	Poor compliance, dependency, or misuse of prescribed or non-prescribed drugs, inappropriate medication given
	9	Not known	

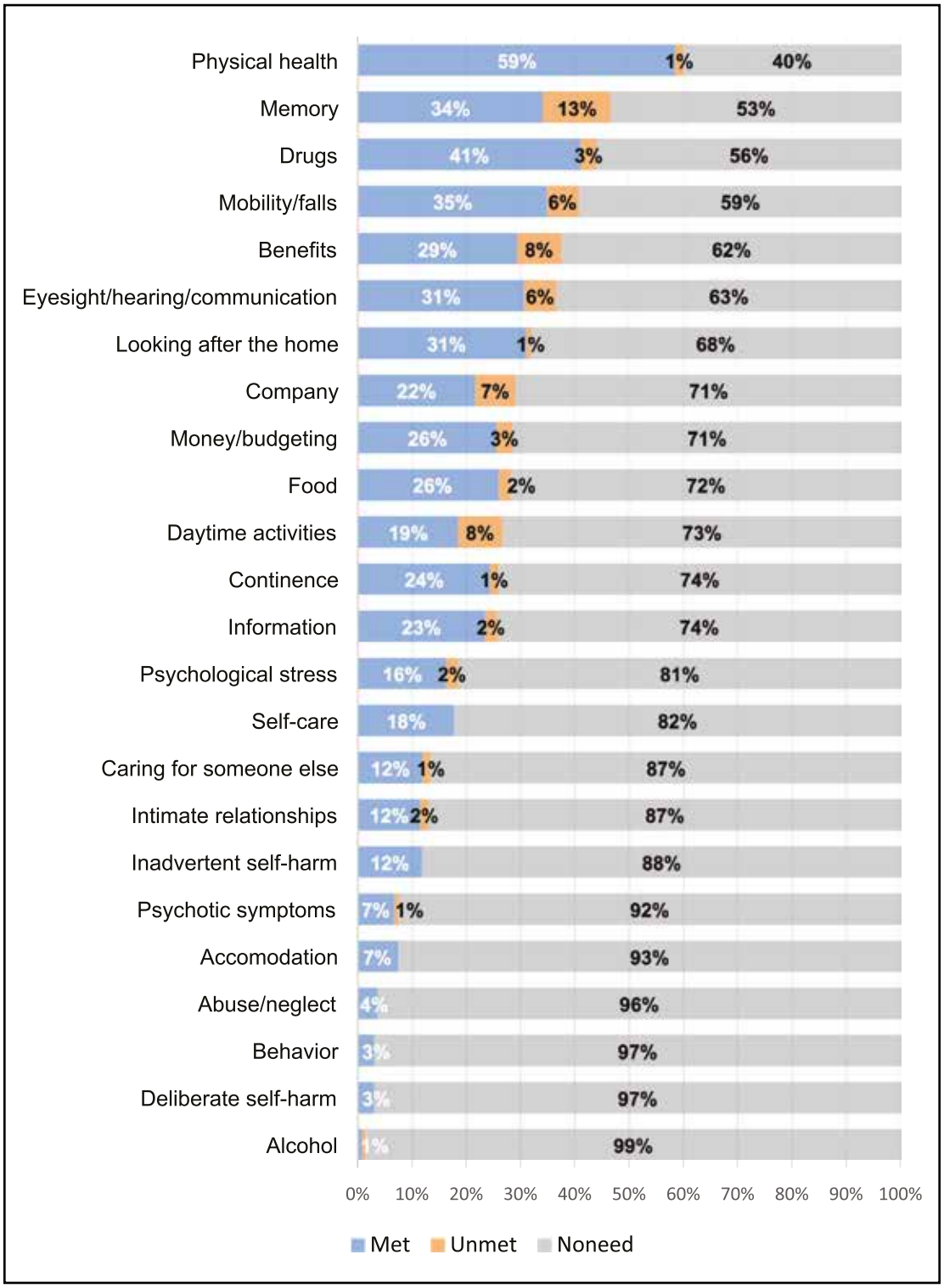
SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_13	**Psychotic symptoms** Does the person ever see or hear things others don't? (Do you ever hear voices, see strange things, or have problems with your thoughts? Are you on medication for this?)		
	Rating	**Meaning**	**Example**
	0	No need	No definite symptoms. Not at risk or in distress from symptoms and not on medication for psychotic symptoms
	1	Met need	Symptoms helped by medication for other help, e.g., coping strategies, safety plan
	2	Unmet need	Currently has symptoms or is at risk
	9	Not known	
CANE_14	**Psychological stress** Does the person have problems with mood or anxiety? (Have you recently felt very sad or fed up? Have you felt very anxious, frightened, or worried?)		
	Rating	**Meaning**	**Example**
	0	No need	Occasional or mild distress. Copes independently
	1	Met need	Needs and gets ongoing support
	2	Unmet need	Distress affects life significantly, e.g., prevents person from going out
	9	Not known	
CANE_15	**Information (on condition and treatment)** Has the person had clear information about their condition? (Have you been given clear information about your condition, medication, or other treatment? Do you want such information? How helpful has the information been?)		
	Rating	**Meaning**	**Example**
	0	No need	Has received and understood adequate information. Has not received but does not want information.
	1	Met need	Receives assistance to understand information. Information given that is appropriate for the person's level of communication/understanding
	2	Unmet need	Has received inadequate or no information
	9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_16	**Deliberate self-harm** Is the person a danger to themselves? (Do you ever think of harming yourself or actually harm yourself?)		
	Rating	**Meaning**	**Example**
	0	No need	No thoughts of self-harm or suicide
	1	Met need	Suicide risk monitored by staff, receiving counselling, adequate safety plan in place
	2	Unmet need	Has expressed suicidal intent, deliberately neglected self, or exposed self to serious danger in the past month
	9	Not known	
CANE_17	**Inadvertent self-harm** Does the person have accidents? (Do you ever do anything that accidentally puts you in danger, such as leaving gas taps on, leaving the fire unattended or getting lost?)		
	Rating	**Meaning**	**Example**
	0	No need	No accidental self-harm
	1	Met need	Specific supervision or help to prevent harm, e.g., memory notes, prompts, secure environment, observation
	2	Unmet need	Dangerous behavior, e.g., getting lost, gas/ fire hazard, no safety plan in place
	9	Not known	
CANE_18	**Abuse/neglect** Is the person at risk from others? (Has anyone done anything to frighten or harm you, or taken advantage of you?)		
	Rating	**Meaning**	**Example**
	0	No need	No abuse/neglect issues in the past month
	1	Met need	Needs and gets ongoing support or protection. Safety plan in place
	2	Unmet need	Regular shouting, pushing or neglect, financial misappropriation, physical assault
	9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_19	**Behavior** Is the person's behavior problematic for others? (Do you come into conflict with others, e.g., by interfering with their affairs, frequently annoying, threatening or disturbing them? What happens?)		
	Rating	**Meaning**	**Example**
	0	No need	No disturbance from others
	1	Met need	Under supervision/treatment because of potential risk
	2	Unmet need	Recent violence, threats, or seriously interfering behavior
	9	Not known	
CANE_20	**Alcohol** Does the person have a drinking problem? (Do you drink alcohol? How much? Does drinking cause you any problems? Do you ever feel guilty about it? Do you ever wish you could cut down on your drinking?)		
	Rating	**Meaning**	**Example**
	0	No need	Does not drink or drinks sensibly
	1	Met need	At risk from alcohol misuse and receiving assistance
	2	Unmet need	Current drinking harmful or uncontrollable, not receiving appropriate assistance
	9	Not known	
CANE_21	**Company** Does the person have an adequate social life? (Are you happy with your social life? Do you wish you had more social contact with others?)		
	Rating	**Meaning**	**Example**
	0	No need	Able to organize enough social contact with friends
	1	Met need	Lack of company identified as a problem. Has specific interventions for company needs, e.g., lonely at night but attends drop-in or day centre. Social work involvement
	2	Unmet need	Frequently feels lonely and isolated. Very few social contacts
	9	Not known	

SECTION H: WELL ASSESSMENT OF NEEDS FOR ELDERLY (CANE)			
CANE_22	**Intimate relationships** Does the person have a close emotional/physical relationship? (Do you have a partner, relative or friend you feel close to? Do you get on well? Can you talk about your worries or problems? Do you lack physical contact/intimacy?)		
	Rating	**Meaning**	**Example**
	0	No need	Happy with current relationships or does not want an intimate relationship
	1	Met need	Has problems concerning intimate relationships, specific plan/counselling/ support that is helpful
	2	Unmet need	Desperately lonely. Lack of confidant
	9	Not known	
CANE_23	**Money/budgeting** How does the person manage their money? (Do you have any difficulty managing your money? Are you able to pay your bills?)		
	Rating	**Meaning**	**Example**
	0	No need	Able to buy essential items and pay bills independently
	1	Met need	Benefits from help with managing affairs and budgeting
	2	Unmet need	Often has no money for essential items or bills. Unable to manage finances
	9	Not known	
CANE_24	**Benefits** Is the person receiving benefits he/she is entitled to? (Are you sure that you are getting all the money that you are entitled to?)		
	Rating	**Meaning**	**Example**
	0	No need	Has no need of benefits or receiving full entitlement
	1	Met need	Receives appropriate help in claiming benefits, social worker involvement over past month
	2	Unmet need	Not sure/not receiving full entitlement of benefits
	9	Not known	

Appendix 2: Camberwell Assessment of Need for the Elderly, evaluated by persons with cognitive impairment (N=135).



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The Centre for Ageing Research and Education (CARE) is an academic research centre based in Duke-NUS Medical School. It aims to harness the potentials of population ageing both in Singapore and the region through its interdisciplinary expertise and collaborations across medical, social, psychological, economics and environmental perspectives. Recognising the need for a consolidated and long-term approach towards longevity, CARE spearheads educational programmes to build competencies in ageing among researchers, policy and programme professionals. CARE also actively engages with government and industry partners to meet the needs of population ageing.

CARE's vision is an ageing population that is healthy, socially included and enjoys a high quality of life.

CARE's mission is to:

- Provide an environment that enables interdisciplinary research and education on ageing
- Implement and evaluate best practices to improve health and function of older adults
- Inform policy and practice agenda on ageing

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