Gender difference in unmet need for assistance with activities of daily living among disabled seniors in China: a cross-sectional study

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ABSTRACT

Objectives This study explores the gender difference in unmet need for assistance with activities of daily living among older adults with disabilities in China. Design Logistic regression analysis was employed to examine the gender difference and identify influential factors among disabled male and female seniors. Setting 23 provinces throughout China. Participants A total of 1700 disabled seniors were included in the analysis. Results Of 1700 respondents, 619 (36.4%) were disabled male seniors. Overall, the possibility of unmet need for activity of daily living assistance among disabled female seniors was significantly lower than that among male group (OR 0.728; 95% CI 0.559 to 0.948) than males. Family care resources, economic status and loneliness were influential factors among disabled seniors regardless of genders. Furthermore, disabled female seniors from rural area (p=0.011), whose primary caregiver was willing to take care of them (p=0.022), whose community could provide daily life service (p=0.002) were more likely to have unmet need. Meanwhile, disabled female seniors whose community could provide medical service (p=0.001) were less likely to report unmet need. Conclusions The study showed that disabled male seniors were more likely to experience unmet need compared with female ones. Reducing unmet need for assistance with activities of daily living among disabled seniors and existing gender disparities therefore requires not only universal strategy, but also targeted policies which should be made or modified for disabled seniors of different genders.

INTRODUCTION

Unmet need for assistance with activity of daily living (ADL), which occurs when assistance is insufficient or unavailable to satisfy needs to complete an ADL task, has been considered as one indicator of long-term care and quality of life in many studies. Unmet need for ADL assistance is always related to heavy psychological stress, more hospitalisations or hospital readmissions and higher mortality rate. With the coming of ageing society, the proportion of seniors living with disabilities will be on the rise as a result of longer lifespans and wide spread of chronic diseases. Due to the deterioration of physical functions and chronic diseases, the probability of suffering from unmet need for assistance with ADL among disabled seniors is significantly higher than others. Accordingly, more and more long-term care, which refer to services provided by formal or informal caregivers to ensure the quality of life and functional ability, are needed to meet the surge in demand for assistance with ADL. Consequently, the issue of unmet need is considered as a priority for global research in geriatrics, especially for disabled seniors. Understanding influential factors of unmet need for ADL assistance is not only vital for optimising long-term care policy, but also essential to improve efficiency and outcome of health service.

Previous studies have identified influential factors related to unmet need for ADL assistance, such as socioeconomic status, living arrangement, non-communicable diseases (NCDs), social support and number of ADL difficulties.
Furthermore, there are many evidences certificated that gender is a significant influential factor of unmet need for ADL assistance in developed countries.\textsuperscript{14} However, little studies have investigated the unmet need for ADL assistance in low/middle-income countries,\textsuperscript{12} especially among disabled seniors. Even less studies focus on gender difference where there are great disparities existing in physical-mental health-related quality of life,\textsuperscript{15} attachment patterns and relational self-construal\textsuperscript{16} among Chinese disabled seniors. To the best of our knowledge, none study analysis whether influential factors of unmet need for ADL assistance are similar between disabled male and female seniors in China.

Given unmet need as a significant factor affecting long-term care and quality of life, it is an important gerontological research field. There are few studies on gender difference in unmet need for ADL assistance among the disabled elderly in developed countries, our study aims to investigate gender difference and identify influential factors associated with unmet need for ADL assistance in female and male disabled seniors in China with a relatively large sample.

METHODS
Survey design
Data were drawn from the most recent wave of the Chinese Longitudinal Healthy Longevity Survey (CLHLS) in 2014, which was proved to be of good quality.\textsuperscript{17} The CLHLS was conducted in half of the cities/counties in 23 provinces throughout China and followed up every 3 years since 1998. Most importantly, it was the only national survey that collects unmet need for ADL assistance as an important index in China.

We focused our analysis on disabled seniors who had difficulty in performing at least one of the following six ADLs measured by Katz Activity of Daily Living Scale,\textsuperscript{18} 19 including feeding, dressing, bathing, toileting, walking inside, bladder and bowel control. Consequently, 1700 disabled seniors were drawn from 7192 subjects in the 2014 wave of CLHLS, which included 619 males and 1081 females.

Variables and measures
Dependent variable
The dependent variable was unmet need for ADL assistance, which was considered as the presence of any unavailable need for ADL assistance, measuring by the question, ‘Does the assistance meet your needs?’ There were three possible answers: (1) not met, (2) partially met and (3) fully met. Based on the practice of previous researches,\textsuperscript{2} 6 we divided responses into two categories: (1) met need (answered ‘fully met’) and (2) unmet need (answered ‘partially met’ or ‘not met’).

Independent variables
As guided by Andersen-Nyman model,\textsuperscript{20} 21 we classified explanatory factors into three categories: (1) Predisposing variables, including gender (male, female), age (60–74, 75–89, 90+), marital status (couple or single) and education (illiterate or literate); (2) Enabling variables, including residence (rural or urban), living arrangements (living with children or others, living alone) and household income (Q1, Q2 and Q3). Quartile 1 (Q1) is the poorest and quartile 3 (Q3) is the richest; (3) Need variables, including no of NCDs (0, 1 or 2+), no of ADL disability (1–2, 3–4, 5–6) and loneliness (often or seldom). Furthermore, we modified the model by adding family factors (family care resources and primary caregiver’s willingness) and community factors (community service for health or life) as enabling factors in accordance with China’s national context.\textsuperscript{22}

Statistical analysis
Statistical analysis was performed individually among male and female subgroups using statistical package SPSS V.20.0.$\chi^2$ test was conducted to examine differences in categorical variables. Logistic regression with an enter method was applied to assess the association of unmet need for ADL assistance with gender, and to identify influential factors for disabled male and female seniors, respectively. All reported CIs were calculated at the 95% level. Statistical significance was set at the 5% level.

RESULTS
Basic characteristics of the participants
Table 1 shows basic characteristics of 1700 samples. The overall proportion of unmet need for ADL assistance among the disabled elderly was 60.6%, within 63.3% for males and 59.0% for females, respectively. Generally, majority of disabled seniors were female (63.6%), at the ages of 90+ (64.3%), single (76.9%), illiterate (67.6%), from urban area (53.1%), living with children or others (89.6%), belonging to the middle class (70.4%), having sufficient family care resources (90.4%), having primary caregiver who was willing to take care of them (97.5%), having no community service for daily life (69.4%), having community medical service (51.6%), having difficulties in 1–2 ADL (50.8%) and often feeling lonely (52.6%). Furthermore, age (p<0.001), education (p<0.001), marital status (p<0.001), residence (p=0.004), household income (p<0.001), family care resources (p=0.021) and loneliness (p<0.001) were significantly different between disabled male and female seniors.

Association of gender and unmet need for ADL assistance among disabled seniors
To better understand the association between gender and unmet need for ADL assistance among disabled seniors, we adopted two models in table 2. Results from model
| Characteristics                              | Total |             | Disabled male elderly | Disabled female elderly | P value |
|---------------------------------------------|-------|-------------|-----------------------|-------------------------|---------|
|                                             | n     | %           | n                     | %                       |         |
| Observation                                 | 1700  | 100         | 619                   | 36.4                    | 1081    | 63.6    |
| Unmet need for ADL assistance               | 1030  | 60.6        | 392                   | 63.3                    | 638     | 59.0    |
| Predisposing factors                        |       |             |                       |                         |         |
| Age                                         |       |             |                       |                         | <0.001  |
| 60–74                                       | 69    | 4.1         | 36                    | 5.8                     | 33      | 3.1     |
| 75–89                                       | 538   | 31.6        | 257                   | 41.5                    | 281     | 26.0    |
| 90+                                         | 1093  | 64.3        | 326                   | 52.7                    | 538     | 31.6    |
| Marital status                              |       |             |                       |                         | <0.001  |
| Couple                                      | 393   | 23.1        | 273                   | 44.1                    | 120     | 11.1    |
| Single                                      | 1307  | 76.9        | 346                   | 55.9                    | 961     | 88.9    |
| Education                                   |       |             |                       |                         | <0.001  |
| Illiterate                                  | 1149  | 67.6        | 222                   | 35.9                    | 927     | 85.8    |
| Literate                                    | 551   | 32.4        | 397                   | 64.1                    | 154     | 14.2    |
| Enabling factors                            |       |             |                       |                         |         |
| Residence                                   |       |             |                       |                         | 0.004   |
| Urban                                       | 902   | 53.1        | 357                   | 57.7                    | 545     | 50.4    |
| Rural                                       | 798   | 46.9        | 262                   | 42.3                    | 536     | 49.6    |
| Living arrangements                         |       |             |                       |                         | 0.934   |
| With children or others                     | 1524  | 89.6        | 556                   | 89.8                    | 968     | 89.5    |
| Alone                                       | 176   | 10.4        | 63                    | 10.2                    | 113     | 10.5    |
| Household income*                           |       |             |                       |                         | <0.001  |
| Q_1                                         | 267   | 15.7        | 123                   | 19.9                    | 144     | 13.3    |
| Q_2                                         | 1197  | 70.4        | 400                   | 64.6                    | 797     | 73.7    |
| Q_3                                         | 236   | 13.9        | 96                    | 15.5                    | 140     | 13.0    |
| Family care resources                       |       |             |                       |                         | 0.021   |
| Insufficient                                | 163   | 9.6         | 73                    | 11.8                    | 90      | 8.3     |
| Sufficient                                  | 1537  | 90.4        | 546                   | 88.2                    | 991     | 91.7    |
| Willingness of primary caregiver            |       |             |                       |                         | 0.379   |
| Yes                                         | 1658  | 97.5        | 601                   | 97.1                    | 1057    | 97.8    |
| Others                                      | 42    | 2.5         | 18                    | 2.9                     | 24      | 2.2     |
| Community daily life service                |       |             |                       |                         | 0.382   |
| No                                          | 1180  | 69.4        | 438                   | 70.8                    | 742     | 68.6    |
| Yes                                         | 520   | 30.6        | 181                   | 29.2                    | 339     | 31.4    |
| Community medical service                   |       |             |                       |                         | 0.920   |
| No                                          | 822   | 48.4        | 298                   | 48.1                    | 524     | 48.5    |
| Yes                                         | 878   | 51.6        | 321                   | 51.9                    | 557     | 51.5    |
| Need factors                                |       |             |                       |                         |         |
| No of ADL disability                        |       |             |                       |                         | 0.128   |
| 1–2                                         | 863   | 50.8        | 334                   | 54.0                    | 529     | 48.9    |
| 3–4                                         | 345   | 20.3        | 120                   | 19.4                    | 225     | 20.8    |
| 5–6                                         | 492   | 28.9        | 165                   | 26.7                    | 327     | 30.2    |
| No of NCDs                                  |       |             |                       |                         | 0.415   |
| 0                                           | 661   | 38.9        | 228                   | 36.8                    | 433     | 40.1    |

Continued
regression analysis showed that disabled female seniors from rural area, whose household income were corresponding to Q2 or Q1, whose primary caregivers were willing to take care of them, whose community could provide daily life service were more likely to have unmet need (OR=1.401, OR=1.891, OR=4.892, OR=4.268 and OR=1.605, respectively). The female group who had sufficient family care resources, whose community could provide medical service, who seldom felt lonely were less likely to report unmet need (OR=0.491, OR=0.650 and OR=0.547, respectively).

**DISCUSSION**

To the best of our knowledge, fewer studies focus on the gender difference in unmet need for ADL assistance among disabled seniors in developed countries. Consistent with other studies,2 3 the finding showed that there was a significant difference of unmet need between disabled male and female subgroup, which was 63.3% for males and 59.0% for females. However, another study14 indicated that female seniors were more likely to have unmet need among community-dwelling New Zealanders 75 years and over. The possible explanation may be different respondents and context. The status of ADL among females are better than males in China.25 Moreover, females are more likely to take care of others even if they are disabled.24 Similarly, the role of female seniors is always connected with caregivers for a long time in China, resulting in lower expectations for caring by others,2 as well as less likely to report unmet need for ADL assistance compared with male group.

Our study indicated that family care resources, economic status and loneliness were influential factors of unmet need for disabled seniors regardless of genders. The risk of having unmet need decreased when family care resources was sufficient, which was in agreement with previous studies.25 26 Family members are still best caregivers because of traditional filial piety and inadequate social care system for disabled seniors in China.2 Furthermore, disabled seniors with better economic status, having more access to daily life and medical service, were less likely to experience unmet need for ADL assistance, who seldom felt lonely were less likely to experience unmet need for ADL assistance, who seldom felt lonely were less likely to experience unmet need for ADL assistance among disabled female seniors was significantly lower than that among male group (OR=0.834, 95 CI 0.680 to 1.022, p=0.049). Model 2 identified that when controlling for other variables, the likelihood of unmet need for ADL assistance among the disabled female elderly was still statistically lower than that among male group (OR=0.728, 95 CI 0.559 to 0.948, p=0.019).

### Factors associated with unmet need for ADL assistance among disabled male seniors

Table 3 demonstrates influential factors of unmet need for ADL assistance among disabled male seniors. Univariate analysis showed that the possibility of unmet need among disabled male elders whose household income were corresponding to Q2 (p<0.001) or Q1 (p<0.001), who had difficulties in 5–6 ADL (p<0.001) was significantly higher than other subgroups. It also indicated the likelihood of unmet need for ADL assistance among those who had sufficient family care resources (p=0.001), who seldom felt lonely (p<0.001) and OR=0.680, respectively. Multilogistic regression analysis presented that disabled male seniors whose household income were corresponding to Q2 or Q1 were more likely to have unmet need (OR=1.867 and OR=3.891, respectively). The disabled male elders who had sufficient family care resources and who seldom felt lonely were less likely to experience unmet need (OR=0.333 and OR=0.680, respectively).

### Factors associated with unmet need for ADL assistance among disabled female seniors

As shown in Table 4, univariate analysis indicated that the possibility of unmet need for ADL assistance among those disabled female seniors from rural area (p=0.003), whose household income were corresponding to Q2 (p<0.001) or Q1 (p<0.001), whose primary caregivers were willing to take care of them (p=0.010), whose community could provide daily life service (p=0.024), who had difficulties in 5–6 ADL (p=0.006) were significantly higher than other subgroups. It also demonstrated the possibility of unmet need for ADL assistance among those who had sufficient family care resources (p=0.009), whose community could provide medical service (p=0.005), who seldom felt lonely (p<0.001) might decrease statistically. Multilogistic regression analysis showed that disabled female seniors whose community could provide medical service (p=0.005), who seldom felt lonely were less likely to experience unmet need for ADL assistance among disabled female seniors.
Table 2: Association of gender and unmet need for ADL assistance among disabled seniors in China, CLHLS 2014 (n=1700)

| Characteristics                  | Model 1 (no covariates) | OR (95% CI) | P value | Model 2 (covariates) | OR (95% CI) | P value |
|----------------------------------|-------------------------|-------------|---------|----------------------|-------------|---------|
| Gender                           |                         |             |         |                      |             |         |
| Male                             | 1.0                     |             |         | 1.0                  |             |         |
| Female                           | 0.834 (0.680 to 1.022)  | 0.049       |         | 0.728 (0.559 to 0.948) | 0.019       |         |
| Age                              |                         |             |         |                      |             |         |
| 60–74                            | 1.0                     |             |         |                      |             |         |
| 75–89                            | 0.709 (0.394 to 1.275)  | 0.251       |         |                      |             |         |
| 90+                              | 0.586 (0.322 to 1.064)  | 0.079       |         |                      |             |         |
| Marital status                   |                         |             |         |                      |             |         |
| Couple                           | 1.0                     |             |         |                      |             |         |
| Single                           | 1.062 (0.785 to 1.437)  | 0.694       |         |                      |             |         |
| Education                        |                         |             |         |                      |             |         |
| Illiterate                       | 1.0                     |             |         |                      |             |         |
| Literate                         | 0.898 (0.684 to 1.181)  | 0.898       |         |                      |             |         |
| Residence                        |                         |             |         |                      |             |         |
| Urban                            | 1.0                     |             |         |                      |             |         |
| Rural                            | 1.181 (0.952 to 1.465)  | 0.131       |         |                      |             |         |
| Living arrangements              |                         |             |         |                      |             |         |
| With children or others          | 1.0                     |             |         |                      |             |         |
| Alone                            | 1.057 (0.745 to 1.502)  | 0.755       |         |                      |             |         |
| Household income*                |                         |             |         |                      |             |         |
| Q3                               | 1.0                     |             |         |                      |             |         |
| Q2                               | 1.867 (1.402 to 2.486)  | <0.001      |         |                      |             |         |
| Q1                               | 4.426 (2.918 to 6.715)  | <0.001      |         |                      |             |         |
| Family care resources            |                         |             |         |                      |             |         |
| Insufficient                     | 1.0                     |             |         |                      |             |         |
| Sufficient                       | 0.449 (0.299 to 0.673)  | <0.001      |         |                      |             |         |
| Willingness of caregiver         |                         |             |         |                      |             |         |
| Yes                              | 1.0                     |             |         |                      |             |         |
| Others                           | 3.251 (1.328 to 7.959)  | <0.001      |         |                      |             |         |
| Community daily life service     |                         |             |         |                      |             |         |
| No                               | 1.0                     |             |         |                      |             |         |
| Yes                              | 1.467 (1.152 to 1.870)  | 0.002       |         |                      |             |         |
| Community medical service        |                         |             |         |                      |             |         |
| No                               | 1.0                     |             |         |                      |             |         |
| Yes                              | 0.666 (0.534 to 0.832)  | <0.001      |         |                      |             |         |
| No of ADL disability             |                         |             |         |                      |             |         |
| 1–2                              | 1.0                     |             |         |                      |             |         |
| 3–4                              | 1.213 (0.921 to 1.598)  | 0.170       |         |                      |             |         |
| 5–6                              | 1.277 (0.987 to 1.651)  | 0.063       |         |                      |             |         |
| No of NCDs                       |                         |             |         |                      |             |         |
| 0                                | 1.0                     |             |         |                      |             |         |
| 1                                | 1.001 (0.780 to 1.286)  | 0.991       |         |                      |             |         |
| 2+                               | 1.065 (0.820 to 1.383)  | 0.635       |         |                      |             |         |
| Loneliness                       |                         |             |         |                      |             |         |
| Often                            | 1.0                     |             |         |                      |             |         |
| Seldom                           | 0.563 (0.452 to 0.702)  | <0.001      |         |                      |             |         |

*Quartile 3 (Q3) is the richest and quartile 1 (Q1) is the poorest.

ADL, activity of daily living; CLHLS, Chinese Longitudinal Healthy Longevity Survey; NCD, non-communicable disease.
Table 3  Factors associated with unmet need for ADL assistance among disabled male seniors in China, CLHLS 2014 (n=619)

| Characteristics                  | Unmet need for ADL assistance | OR_c (95% CI) | P value | OR_a (95% CI) | P value |
|----------------------------------|------------------------------|---------------|---------|---------------|---------|
|                                  | No (%)                       | Yes (%)       |         |               |         |
| n=619                            | 227 (36.7)                   | 392 (63.3)    |         |               |         |
| Age                              |                              |               |         |               |         |
| 60–74                            | 8 (22.2)                     | 28 (77.8)     | 1.0     | NA            |         |
| 75–89                            | 94 (36.6)                    | 163 (63.4)    | 0.495 (0.217 to 1.131) | 0.096 |         |
| 90+                              | 125 (38.3)                   | 201 (61.7)    | 0.459 (0.203 to 1.040) | 0.062 |         |
| Marital status                   |                              |               |         |               |         |
| Couple                           | 108 (39.6)                   | 165 (60.4)    | 1.0     | NA            |         |
| Single                           | 119 (34.4)                   | 227 (65.6)    | 1.249 (0.899 to 1.735) | 0.186 |         |
| Education                         |                              |               |         |               |         |
| Illiterate                       | 83 (37.4)                    | 139 (62.6)    | 1.0     | NA            |         |
| Literate                         | 144 (36.3)                   | 253 (63.7)    | 1.049 (0.747 to 1.474) | 0.782 |         |
| Residence                         |                              |               |         |               |         |
| Urban                            | 130 (36.4)                   | 227 (63.6)    | 1.0     | NA            |         |
| Rural                            | 97 (37.0)                    | 165 (63.0)    | 0.974 (0.700 to 1.356) | 0.877 |         |
| Living arrangements              |                              |               |         |               |         |
| With children or others          | 208 (37.4)                   | 348 (62.6)    | 1.0     | NA            |         |
| Alone                            | 19 (30.2)                    | 44 (69.8)     | 1.384 (0.787 to 2.435) | 0.259 |         |
| Household income*                |                              |               |         |               |         |
| Q1                               | 67 (54.4)                    | 56 (45.5)     | 1.0     | 1.0           |         |
| Q2                               | 141 (35.3)                   | 259 (64.8)    | 2.198 (1.459 to 3.311) | <0.001 | 1.867 (1.219 to 2.858) | 0.004 |
| Q3                               | 19 (19.8)                    | 77 (80.2)     | 4.849 (2.622 to 8.967) | <0.001 | 3.891 (2.062 to 7.343) | <0.001 |
| Family care resources             |                              |               |         |               |         |
| Insufficient                     | 13 (17.8)                    | 60 (82.2)     | 1.0     | 1.0           |         |
| Sufficient                       | 214 (39.2)                   | 332 (60.8)    | 0.336 (0.180 to 0.627) | 0.001 | 0.333 (0.175 to 0.634) | 0.001 |
| Willingness of primary caregiver  |                              |               |         |               |         |
| Yes                              | 224 (37.3)                   | 377 (62.7)    | 1.0     | NA            |         |
| Others                           | 3 (16.7)                     | 15 (83.3)     | 2.971 (0.851 to 10.375) | 0.088 |         |
| Community daily life service      |                              |               |         |               |         |
| No                               | 163 (37.2)                   | 275 (62.8)    | 1.0     | NA            |         |
| Yes                              | 64 (35.4)                    | 117 (64.6)    | 1.084 (0.755 to 1.555) | 0.663 |         |
| Community medical service        |                              |               |         |               |         |
| No                               | 99 (33.2)                    | 199 (66.8)    | 1.0     | NA            |         |
| Yes                              | 128 (39.9)                   | 193 (60.1)    | 0.750 (0.540 to 1.042) | 0.086 |         |
| No of ADL disability             |                              |               |         |               |         |
| 1–2                              | 144 (43.1)                   | 190 (56.9)    | 1.0     | 1.0           |         |
| 3–4                              | 40 (33.3)                    | 80 (66.7)     | 1.516 (0.979 to 2.346) | 0.062 | 1.325 (0.840 to 2.091) | 0.226 |
| 5–6                              | 43 (26.1)                    | 122 (73.9)    | 2.150 (1.428 to 3.239) | <0.001 | 1.516 (0.977 to 2.355) | 0.064 |
| No of NCDs                        |                              |               |         |               |         |
| 0                                | 77 (33.8)                    | 151 (66.2)    | 1.0     | NA            |         |
| 1                                | 85 (42.7)                    | 114 (57.3)    | 0.684 (0.462 to 1.013) | 0.058 |         |
| 2+                               | 65 (33.9)                    | 127 (66.1)    | 0.996 (0.664 to 1.495) | 0.986 |         |
| Loneliness                       |                              |               |         |               |         |
| Often                            | 81 (28.0)                    | 208 (72.0)    | 1.0     | 1.0           |         |
| Seldom                           | 146 (44.2)                   | 184 (55.8)    | 0.491 (0.351 to 0.687) | <0.001 | 0.680 (0.422 to 0.875) | 0.007 |

*Quartile 3 (Q3) is the richest and quartile 1 (Q1) is the poorest.
ADL, activity of daily living; CLHLS, Chinese Longitudinal Healthy Longevity Survey; NA, not applicable; NCDs, non-communicable diseases; OR_c, crude OR; OR_a, adjusted OR.
**Table 4**  Factors associated with unmet need for ADL assistance among disabled female seniors in China, CLHLS 2014 (n=1081)

| Characteristics          | Unmet need for ADL assistance | OR_c (95% CI) | P value | OR_a (95% CI) | P value |
|--------------------------|-------------------------------|---------------|---------|---------------|---------|
|                          | No (%) | Yes (%) |              |         |              |         |
|                          | n=1081 | 443 (41.0) | 638 (59.0) |         |              |         |
| Age                      |        |          |              |         |              |         |
| 60–74                    | 11 (33.3) | 22 (66.7) | 1.0 | NA |         |         |
| 75–89                    | 107 (38.1) | 174 (61.9) | 0.813 (0.379 to 1.743) | 0.595 |         |         |
| 90+                      | 325 (42.4) | 442 (57.6) | 0.880 (0.325 to 1.422) | 0.306 |         |         |
| Marital status           |        |          |              |         |              |         |
| Couple                   | 45 (37.5) | 75 (62.5) | 1.0 | NA |         |         |
| Single                   | 398 (41.4) | 563 (58.6) | 0.847 (0.574 to 1.255) | 0.411 |         |         |
| Education                |        |          |              |         |              |         |
| Illiterate               | 369 (39.8) | 558 (60.2) | 1.0 | NA |         |         |
| Literate                 | 74 (48.1) | 80 (51.9) | 0.715 (0.508 to 1.007) | 0.055 |         |         |
| Residence                |        |          |              |         |              |         |
| Urban                    | 247 (45.3) | 298 (54.7) | 1.0 | 1.0 |         |         |
| Rural                    | 196 (36.6) | 340 (63.4) | 1.438 (1.127 to 1.834) | <0.003 | 1.401 (1.079 to 1.820) | 0.011 |
| Living arrangements      |        |          |              |         |              |         |
| With children or others  | 397 (41.0) | 571 (59.0) | 1.0 | NA |         |         |
| Alone                    | 46 (40.7) | 67 (59.3) | 1.013 (0.681 to 1.506) | 0.950 |         |         |
| Household income*        |        |          |              |         |              |         |
| Q_3                      | 89 (61.8) | 55 (38.2) | 1.0 | 1.0 |         |         |
| Q_2                      | 304 (40.7) | 473 (59.3) | 2.362 (1.640 to 3.402) | <0.001 | 1.891 (1.289 to 2.773) | 0.001 |
| Q_1                      | 30 (21.4) | 110 (78.6) | 5.933 (3.509 to 10.033) | <0.001 | 4.892 (2.837 to 8.433) | <0.001 |
| Family care resources    |        |          |              |         |              |         |
| Insufficient             | 25 (27.8) | 65 (72.2) | 1.0 | 1.0 |         |         |
| Sufficient               | 418 (42.2) | 573 (57.8) | 0.527 (0.327 to 0.850) | 0.009 | 0.491 (0.297 to 0.811) | 0.006 |
| Willingness of primary caregiver | | | | | | |
| Yes                      | 440 (41.6) | 617 (58.4) | 1.0 | 1.0 |         |         |
| Others                   | 3 (12.5) | 21 (87.5) | 4.992 (1.480 to 16.839) | 0.010 | 4.268 (1.232 to 14.790) | 0.022 |
| Community daily life service | | | | | | |
| No                       | 321 (43.3) | 421 (56.7) | 1.0 | 1.0 |         |         |
| Yes                      | 122 (36.0) | 217 (64.0) | 1.356 (1.040 to 1.768) | 0.024 | 1.605 (1.189 to 2.168) | 0.002 |
| Community medical service | | | | | | |
| No                       | 192 (36.6) | 332 (63.4) | 1.0 | 1.0 |         |         |
| Yes                      | 251 (45.1) | 306 (54.9) | 0.705 (0.552 to 0.900) | 0.005 | 0.630 (0.478 to 0.830) | 0.001 |
| No of ADL disability     |        |          |              |         |              |         |
| 1–2                      | 238 (45.0) | 291 (55.0) | 1.0 | 1.0 |         |         |
| 3–4                      | 89 (39.6) | 136 (60.4) | 1.250 (0.910 to 1.717) | 0.169 | 1.096 (0.779 to 1.543) | 0.599 |
| 5–6                      | 116 (35.5) | 211 (64.5) | 1.488 (1.120 to 1.976) | 0.006 | 1.138 (0.833 to 1.553) | 0.417 |
| No of NCDs               |        |          |              |         |              |         |
| 0                        | 187 (43.2) | 246 (56.8) | 1.0 | NA |         |         |
| 1                        | 125 (37.4) | 209 (62.6) | 1.271 (0.949 to 1.702) | 0.108 |         |         |
| 2+                       | 131 (41.7) | 183 (58.3) | 1.062 (0.791 to 1.425) | 0.689 |         |         |
| Loneliness               |        |          |              |         |              |         |
| Often                    | 195 (32.2) | 411 (67.8) | 1.0 | 1.0 |         |         |
| Seldom                   | 248 (52.2) | 227 (47.8) | 0.434 (0.339 to 0.556) | <0.001 | 0.547 (0.417 to 0.718) | <0.001 |

*Quartile 3 (Q3) is the richest and Quartile 1 (Q1) is the poorest.
ADL, activity of daily living; CLHLS, Chinese Longitudinal Healthy Longevity Survey; NA, not applicable; NCDs, non-communicable diseases; OR, adjusted OR; OR_c, crude OR.
which was in line with previous studies. In addition, loneliness was an influential factor to increase the likelihood of experiencing unmet need among disabled seniors, which was also consistent with other studies. Loneliness is a negative state, expressed as someone perceives herself/himself as socially isolated, which is a risk predictor of malnutrition, illness in later life, and low satisfaction among seniors in nursing homes. These findings suggest that targeted policies on ADL assistance should be made for disabled seniors, especially for those who are lonely, with insufficient family care resources or poor economic conditions.

Our results demonstrated that residence, the primary caregiver’s willingness, community daily life and medical service were associated with unmet need for ADL assistance among disabled female but not male seniors. Consistent with previous studies, rural older females are more likely to experience unmet need compared with urban counterparts. One possible explanation is that socioeconomic status and availability of healthcare service in urban is much better than that in rural areas in China. Another explanation may be the strongly entrenched traditional norm of filial piety in the mind of rural female seniors than male ones, contributing to more dependence on family members, thereby increasing the possibility of unmet need for ADL assistance. The finding indicates that it is imperative to reduce urban–rural socioeconomic differences and renewal conception of pension among rural female seniors.

Parallel to other studies, we also found that willingness of primary caregiver and community service influenced the likelihood of unmet need of ADL assistance among disabled female seniors. The willingness of primary caregiver might have an impact not only on quality of caring but also on satisfaction of seniors, ultimately influencing the possibility of reporting unmet need for ADL assistance. Furthermore, many researchers agreed that community service contributed to increasing positive attitudes toward individuals with disabilities. Furthermore, community service also negatively affects the development of depression in new immigrant women significantly. In addition, women’s unique attachment patterns and relational self-construal lead to increased sensitivity of primary caregiver’s willingness and community service. The finding, therefore, gives an impetus to propose targeted countermeasures, including providing social supports for primary caregivers and strengthening community medical services for different genders.

Interestingly, community service for daily life didn’t decrease the possibility of having unmet need, which was inconsistent with previous study. The possible reason may be an imbalance status of supply and demand of community service for daily life in China. Online supplemental data analysis indicated that the gap between supply and demand of household care, daily shopping, organising social activity is 51.9%, 46.5%, 42.7%, respectively. The finding shows that it is urgent to optimise capabilities of community service for daily life to realise the equilibrium of supply and demand.

This study had several limitations. First, the information of social-demographic characteristics, health status and unmet need were based on self-reported, leading to the possibility of bias. Second, causal relationship cannot be confirmed through cross-sectional studies. Thus, longitudinal researches are required to test whether the link between gender and unmet need for ADL assistance could be cause-and-effect.

CONCLUSION

This study found that disabled male seniors were more likely to report unmet need for ADL assistance compared with disabled female ones in China. Family care resources, economic status and loneliness were influential factors among disabled seniors regardless of genders. Moreover, residence, willingness of primary caregiver, community daily life and medical service were influential factors of unmet need for ADL assistance among disabled female seniors. Pertinent policies should be made or modified to decreasing the possibility of experiencing unmet need among disabled male and female seniors in a targeted manner.

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Patient consent for publication Not required.

Ethics approval The CHLS study was approved by the research ethics committees of Duke University and Peking University (IRB00001052-13074). Each respondent provided written informed consent before inclusion in the study. In addition, for the respondent who was considered cognitively impaired, the proxy consent procedure would be adopted to ensure high reliability and validity of the data.

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Data availability statement Data are available in a public, open access repository. The datasets used and/or analysed during the current study are available from the https://opendata.pku.edu.cn/dataset.xhtml?persistentId=doi:10.18170/DVN/XRV2ZN. The database is accessible to researchers.

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