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Association between reported help and subsequent functional status for the same activity among older adults in China: a three-wave CHARLS study

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Research Article

Keywords: activities of daily living, care receipt, functional disability, functional transitions, older adults, CHARLS

Posted Date: November 4th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-11121629/v1

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Additional Declarations: No competing interests reported.

Abstract

Background

Functional limitation in later life is dynamic, but studies of care receipt commonly use person-level measures that cannot determine whether help reported for a specific activity is associated with the subsequent course of that same activity. We examined the activity-specific association between reported help and subsequent transition out of severe functional limitation among older adults in China.

Methods

We conducted a three-wave longitudinal analysis of the China Health and Retirement Longitudinal Study using data from 2015, 2018, and 2020. Adults aged ≥ 60 years contributed one record for each of ten basic or instrumental activities rated in 2018 as difficulty requiring help or inability to perform. The exposure was the 2018 report that anyone had ever helped with the same activity, and the outcome was transition to no or mild difficulty by 2020. Participant-clustered logistic regression adjusted for activity, baseline severity, sociodemographic characteristics, functional burden, and health characteristics. A secondary analysis additionally adjusted for the four-level same-activity functional response in 2015. The primary estimand was conditional on survival, participation, and an observed 2020 functional outcome.

Results

Among 5,676 person–activity observations with observed outcomes, crude transition to no or mild difficulty occurred in 71.5% of activities without reported help and 45.1% of those with reported help. The primary adjusted analysis included 5,651 observations from 2,177 participants. Model-standardised probabilities were 59.5% (95% CI 55.8–63.3) without reported help and 47.8% (95% CI 46.0–49.7) with reported help, corresponding to a risk difference of − 11.7 percentage points (95% CI − 15.6 to − 7.8) and an adjusted odds ratio of 0.530 (95% CI 0.429–0.654). Among observations with 2015 functional history, prior severe limitation was more common with reported help than without it (33.7% vs 18.1%). Additional adjustment for 2015 same-activity status modestly attenuated the association (adjusted odds ratio 0.552, 95% CI 0.447–0.684). A mortality-inclusive composite analysis yielded a similar estimate (adjusted odds ratio 0.537, 95% CI 0.440–0.655).

Conclusions

Severe activity-specific limitation remained dynamic, but activities with reported help were less likely to transition to no or mild difficulty. Reported help may mark more established functional dependence and a less favourable subsequent functional course.

Background

Functional limitations in basic activities of daily living (BADLs) and instrumental activities of daily living (IADLs) are common in later life and are major determinants of independence and long-term care needs. A recent global meta-analysis estimated that approximately one quarter of older adults had BADL limitations and nearly half had IADL limitations [1]. In China, population ageing is expected to substantially increase the number of older adults living with functional dependence and requiring assistance with daily activities [2], while recent evidence indicates marked variation in ADL impairment across age, period, and birth cohort [3]. Maintaining functional ability is a central goal of healthy ageing and reflects not only an individual's physical and mental capacities but also the environmental support available to enable everyday functioning [4].

Functional limitation in later life is not a fixed or uniformly progressive state. Longitudinal studies have documented transitions between independence, mild difficulty, severe limitation, and death, with both deterioration and improvement occurring over time [5–10]. Studies of Chinese older adults have likewise identified heterogeneous patterns and transitions in ADL and IADL function [11]. This dynamic course is clinically important because the degree of dependence observed at a single assessment does not necessarily define an older person's subsequent functional trajectory. Moreover, functional change may differ across activities within the same individual, reflecting differences in physical and cognitive demands, environmental context, habitual roles, and available support.

Most longitudinal research nevertheless characterises disability at the person level, using the number of affected activities or composite BADL/IADL scores. Such measures are useful for describing overall disability burden but may obscure variation in the course of individual activities. This distinction is particularly relevant when care receipt is also measured at the person level. A previous CHARLS study reported that receipt of informal care was associated with slower progression of overall functional limitation, although the association varied by follow-up duration and care intensity [12]. Because both care receipt and functional limitation were summarised at the person level, however, that analysis could not determine whether help received for a particular activity was associated with the subsequent functional status of the same activity. An older person may, for example, require help with bathing while remaining relatively independent in shopping or medication management. Whether activity-specific help identifies a distinct subsequent functional trajectory therefore remains unclear.

The interpretation of reported help is further complicated by the way assistance is mobilised in everyday life. Receipt of help depends not only on functional difficulty but also on living arrangements, family resources, recognition of need, and the availability of informal or formal support [13–16]; correspondingly, functional need and actual receipt of assistance are often imperfectly aligned [17–21]. Chinese evidence has shown that even among older adults with functional limitations, assistance may be unavailable for specific activities such as bathing or toileting. Reported help may therefore reflect both the severity and persistence of the underlying limitation and the social mobilisation of care. This creates an important problem of confounding by indication: activities for which help is provided may

already have a poorer functional prognosis before help is reported. Earlier same-activity functional status is consequently important for distinguishing more persistent limitations from those that are more recent or potentially reversible. At the same time, assistance ranges from compensatory support that enables safe task completion to rehabilitation, reablement, or restorative care intended to maintain or improve functional performance [22–24]. A binary survey report of help cannot distinguish among these forms of support and should not be interpreted as a standardised measure of care delivery or treatment exposure.

Against this background, we used three waves of the China Health and Retirement Longitudinal Study to examine the longitudinal association between reported help and subsequent function at the level of the individual activity. Among activities that were severely limited in 2018, we linked the report of help for each activity to the functional status of that same activity in 2020 and examined whether the association persisted after accounting for the corresponding activity-specific functional status in 2015. Because assistance is likely to be mobilised preferentially for more severe or persistent limitations, We therefore examined whether reported help was associated with the probability of subsequent transition from severe limitation to no or mild difficulty. By aligning help, prior functional history, and subsequent outcome within the same activity, the study aimed to clarify what survey-reported help signifies for the subsequent functional course of severe activity limitation in older adults.

Methods

Study design and data source

The China Health and Retirement Longitudinal Study (CHARLS) is a national longitudinal study of Chinese adults aged 45 years or older [25]. We used the 2015, 2018 and 2020 Health Status and Functioning modules, relevant 2018 demographic and depression variables, and the 2020 exit module [26–28]. The 2020 survey overlapped with the COVID-19 pandemic and included pandemic-related data collection [28]. Because interview conditions, service access and opportunities to perform activities may have differed from earlier waves, the pandemic context was considered in interpretation. This secondary analysis used de-identified data and was reported in accordance with STROBE [29].

Participants and analytic unit

Participants were aged 60 years or older in 2018 and reported severe limitation in at least one of ten activities, defined as level 3 (difficulty and need for help) or level 4 (unable to perform). The activities were dressing, bathing, eating, getting into or out of bed, using the toilet, household chores, preparing hot meals, shopping for groceries, managing money and taking medications. Telephone use was excluded because performance is especially dependent on technology access, sensory function and customary household roles.

The analytic unit was the person–activity observation; each participant contributed one record for every eligible activity. The primary estimand was therefore averaged across eligible activities, and was

conditional on survival, participation, and an observed 2020 functional response. Participant clustering accounted for within-person correlation.

Exposure, outcomes and earlier functional history

For each eligible activity, response 1 to the harmonised 2018 help item was classified as reported help and response 2 as no reported help. Structural missing values outside the severe-limitation pathway were not reclassified. Cross-wave variable mappings are provided in Additional file 1: Table S1; the original item wording is available in the CHARLS questionnaire [30].

The primary outcome was transition from severe limitation in 2018 (level 3, difficulty and need for help, or level 4, unable to perform) to no or mild difficulty in the same activity in 2020 (level 1 or 2). Levels 3 and 4 in 2020 were classified as continued severe limitation. Secondary functional outcomes were transition to no difficulty (level 1) and any improvement by at least one level on the four-level functional scale between 2018 and 2020. Deaths were not assigned a functional response in the primary analysis. In a secondary composite outcome, a favourable outcome was defined as being alive in 2020 and having transitioned to level 1 or 2 in the corresponding activity; participants who had died were classified as not meeting this composite outcome. Extreme-case sensitivity analyses assigned alternative outcomes to person–activity observations with an unknown 2020 functional outcome among participants not known to have died.

In a history-adjusted secondary analysis, the corresponding four-level 2015 response was included with a separate category for unavailable status. Supporting analyses were restricted to observations with complete 2015 history, stratified by prior severe limitation, and included an interaction between reported help and prior severe limitation.

Covariates and missing data

A priori covariates were age, sex, education, partnered status, agricultural hukou, self-rated health, number of physician-diagnosed chronic conditions, body pain, CES-D-10 status, activity, 2018 response level and functional burden. Functional burden comprised the total number of severely limited activities, the number of severely limited BADLs and the number of activities that could not be performed. The chronic-condition count included 14 constructed diagnosis indicators. An extended model additionally adjusted for stroke, self-reported memory-related disease, arthritis, near and distance vision, and hearing.

CES-D-10 items were scored 0–3, with positive items reverse-scored. Scores were prorated only when at least eight items were answered; scores of 12 or higher indicated elevated depressive symptoms [31–34]. Missing self-rated health and unusable CES-D-10 scores were retained as categories in the primary analysis. Twelve participants with missing agricultural hukou were excluded. Multiple imputation by sequential stochastic regression generated 20 participant-level datasets; imputed variables were re-

expanded to person–activity observations and estimates were combined using Rubin's rules. Complete-case analysis provided an alternative missing-data analysis. Further specifications are reported in Additional file 1: Table S2.

Statistical analysis

Analyses were conducted using R 4.5.2. Participant characteristics were summarised at the participant level, whereas transition patterns and exposure-group characteristics were summarised at the person-activity level. The primary analysis used multivariable logistic regression with participant-level cluster-robust standard errors and adjustment for prespecified covariates. Age and functional-burden measures were modelled as continuous variables; categorical specifications were examined in sensitivity analyses. Marginal standardisation over the empirical covariate distribution was used to estimate adjusted probabilities, the risk difference and the standardised risk ratio. Corresponding 95% confidence intervals were derived using the delta method based on the participant-clustered covariance matrix. A modified Poisson model with participant-level cluster-robust variance provided an alternative adjusted risk-ratio estimate.

Sensitivity analyses included participant-normalised weighting, within-participant conditional logistic regression adjusted for activity and baseline functional level, multiple imputation, complete-case analysis, inverse-probability-of-censoring weighting (IPCW), response-mode restrictions, alternative functional forms, an alive-and-transitioned composite outcome, and extreme-case assumptions for unknown outcomes. Response-mode analyses used the four-category DB032 variable in 2018 and DB045 variable in 2020, distinguishing no assistance, occasional assistance, assistance most or all of the time, and complete proxy response [30]. IPCW addressed non-death loss to follow-up under the assumption of conditional exchangeability given measured covariates. Stabilised weights were estimated at the participant level, applied to all eligible person–activity observations, and based on predicted observation probabilities truncated to the interval 0.02–0.98. Model convergence, dispersion, leverage and influential observations were assessed. Secondary-outcome and interaction analyses were considered supportive, and no adjustment for multiple comparisons was applied.

Results

Study flow and participant characteristics

Among 11011 participants aged 60 years or older in 2018, 2714 (24.6%) had severe limitation in at least one eligible activity and contributed 7994 person–activity observations. The unweighted proportion meeting this criterion increased from 17.9% among participants aged 60–69 years to 50.2% among those aged 80 years or older. It was also higher among women, participants with lower educational attainment, those who were not married or partnered, and those with agricultural hukou (Additional file 1: Table S3).

Participants in the baseline severe-limitation cohort had a mean of 2.95 (SD 2.46) affected activities. IADL limitations predominated: 93.0% had at least one IADL limitation, whereas 39.8% had at least one BADL limitation. Overall, 82.7% reported help for at least one severely limited activity, 67.2% reported help for all such activities, and 32.8% had at least one severely limited activity for which no help was reported (Additional file 1: Table S4).

By 2020, 2,189 participants contributed 5,676 observed same-activity functional outcomes; 341 had a death exit interview, and 184 were lost to follow-up or had unknown vital or participation status. After exclusion of 12 participants and 25 observed-outcome records with missing agricultural hukou, the primary analytic sample comprised 2,177 participants and 5,651 person–activity observations (Fig. 1). Participants in this sample had a mean age of 71.8 years (SD 7.9); 62.7% were women, 71.0% were married or partnered, 85.5% had agricultural hukou, and they contributed a mean of 2.60 (SD 2.13) severely limited activities to the primary analysis (Table 1).

Table 1
Baseline characteristics of participants in the primary analysis

Characteristic	Total (N = 2177)	Characteristic	Total (N = 2177)
Age, years	71.8 (7.9)	Self-rated health	
60–69	1019 (46.8)	Very good/good	168 (7.7)
70–79	766 (35.2)	Fair	586 (26.9)
≧ 80	392 (18.0)	Poor/very poor	1096 (50.3)
Women	1365 (62.7)	Missing	327 (15.0)
Education		Depressive symptoms	
No formal education	997 (45.8)	Not elevated	747 (34.3)
Primary school	890 (40.9)	Elevated	898 (41.2)
Middle school	186 (8.5)	Missing/unusable	532 (24.4)
High school or above	104 (4.8)	Activities with severe limitation, number	2.60 (2.13)
Married or partnered	1545 (71.0)	BADL activities with severe limitation, number	0.64 (1.12)
Agricultural hukou	1861 (85.5)	IADL activities with severe limitation, number	1.96 (1.37)
Physician-diagnosed chronic conditions, number	2.26 (1.79)	Activities the participant could not perform, number	1.46 (1.74)
Any body pain	1687 (77.5)		

Values are n (%) unless stated as mean (SD). CES-D-10 scores were prorated only when at least eight items were answered. BADL, basic activities of daily living; IADL, instrumental activities of daily living.

Observed functional transitions

Among the 5676 person–activity observations with an observed 2020 functional outcome, 4674 had reported help in 2018 and 1002 did not. Crude transition to no or mild difficulty occurred in 45.1% of observations with reported help and 71.5% of those without reported help. The four-level transition matrix likewise showed that transitions to either no difficulty or mild difficulty were less frequent among activities with reported help, whereas persistence at level 4 was more frequent (Table 2).

Table 2
Crude 2018–2020 same-activity transition distributions according to the 2018 help report

2018 help status	2018 level	Total, n	2020 level 1, n (%)	2020 level 2, n (%)	2020 level 3, n (%)	2020 level 4, n (%)
With reported help	3	2047	938 (45.8)	222 (10.8)	490 (23.9)	397 (19.5)
With reported help	4	2627	819 (31.2)	127 (4.8)	391 (14.9)	1290 (49.1)
Without reported help	3	429	245 (57.1)	103 (24.0)	45 (10.5)	36 (8.4)
Without reported help	4	573	274 (47.8)	94 (16.4)	64 (11.2)	141 (24.6)

Level 1, no difficulty; Level 2, difficulty but can still perform; Level 3, difficulty and need for help; Level 4, unable to perform. Percentages were calculated within strata defined jointly by 2018 reported-help status and 2018 functional level.

Primary adjusted association

After adjustment for prespecified covariates, the model-standardised probability of transition to no or mild difficulty was 59.5% (95% CI 55.8–63.3%) among observations without reported help and 47.8% (95% CI 46.0–49.7%) among those with reported help. The corresponding adjusted risk difference was −11.7 percentage points (95% CI − 15.6 to − 7.8), the standardised risk ratio was 0.803 (95% CI 0.751–0.860), and the odds ratio was 0.530 (95% CI 0.429–0.654) (Table 3).

Table 3
Adjusted association between reported help and transition to no or mild difficulty in the same activity by 2020

Measure	Estimate	95% CI
Adjusted probability without reported help, %	59.5	55.8–63.3
Adjusted probability with reported help, %	47.8	46.0-49.7
Adjusted risk difference, percentage points	-11.7	-15.6–7.8
Standardised risk ratio	0.803	0.751–0.860
Adjusted odds ratio	0.530	0.429–0.654

Estimates were derived from the primary multivariable logistic regression model using 5651 person–activity observations from 2177 participants. Adjusted probabilities were obtained by marginal standardisation over the empirical covariate distribution. The risk difference was calculated as the adjusted probability among observations with reported help minus that among observations without reported help. The standardised risk ratio was calculated as the corresponding ratio of adjusted probabilities. Odds ratios compare person–activity observations with reported help with those without reported help. Confidence intervals for adjusted probabilities, the risk difference, and the standardised risk ratio were obtained using the delta method with the participant-clustered robust covariance matrix. CI, confidence interval.

Earlier same-activity functional history

Same-activity functional status in 2015 was available for 5239 of the 5651 primary-analysis observations (92.7%), contributed by 2053 participants. Among observations with available history, severe limitation in 2015 was more common among person–activity observations with reported help than among those without reported help (33.7% [1447/4291] vs 18.1% [172/948]). Transition proportions were lower among activities with prior severe limitation and among those with reported help. Additional adjustment for the four-level 2015 response modestly changed the OR from 0.530 to 0.552 (95% CI 0.447–0.684) (Table 4).

Table 4
Prior same-activity functional history and history-adjusted associations with transition to no or mild difficulty Panel A. Crude transition according to prior same-activity functional status

2015 same-activity status	2018 reported-help status	person–activity observations, n (%)	Transitioned to no or mild difficulty, %
No prior severe limitation, levels 1–2	Without reported help	776(81.9)	75.9
	With reported help	2844(66.3)	55.5
Prior severe limitation, levels 3–4	Without reported help	172(18.1)	52.9
	With reported help	1447(33.7)	25.3
Panel B. Adjusted analyses accounting for prior same-activity status			

Analysis	person–activity observations, n	Participants, n	OR	95% CI
Reference model without adjustment for 2015 status	5651	2177	0.530	0.429-0.654
Additional adjustment for four-level 2015 status, including an unavailable-status category	5651	2177	0.552	0.447-0.684
Complete-history analysis restricted to observations with available 2015 status	5239	2053	0.546	0.438-0.681
No severe limitation in 2015 (levels 1-2)	3620	1781	0.576	0.451-0.735
Prior severe limitation in 2015 (levels 3-4)	1619	699	0.420	0.270-0.654

Prior severe limitation was defined as level 3 or 4 in the same activity in 2015, and transition as level 1 or 2 in 2020. Panel A includes observations with available 2015 status, with percentages calculated within each reported-help group. Panel B ORs compare observations with versus without reported help; the

reference model did not adjust for 2015 status. The interaction OR was 0.674 (95% CI 0.427–1.064; P = 0.090). Participant counts across 2015-status strata may overlap. CI, confidence interval; OR, odds ratio.

Sensitivity and secondary analyses

The association was broadly consistent across alternative model specifications and approaches to missing data and censoring, with ORs ranging from 0.517 to 0.592 and all corresponding 95% confidence intervals excluding 1 (Additional file 1: Table S5). Estimates were also similar after categorical specification of age and functional burden and after additional adjustment for prognostic covariates.

For the composite outcome of being alive and having transitioned to no or mild difficulty, with deaths classified as not meeting the composite, the OR was 0.537 (95% CI 0.440–0.655). In the intentionally help-favouring extreme-case analysis, the association was attenuated and the confidence interval included 1 (OR 0.877, 95% CI 0.730–1.055) (Additional file 1: Table S5).

Response-mode restrictions produced estimates broadly similar to the primary result. ORs ranged from 0.524 to 0.585 after excluding complete proxy responses, progressively restricting assisted responses in 2018, or excluding complete proxy responses across waves. In the most restrictive analysis, limited to unassisted self-responses in 2018, the OR was 0.585 (95% CI 0.445–0.768) (Additional file 1: Table S6).

Reported help was also associated with lower odds of transition to no difficulty (level 1) (OR 0.778, 95% CI 0.643–0.942), and lower odds of improvement by at least one level on the four-level functional scale (OR 0.562, 95% CI 0.450–0.703). Subgroup estimates were directionally consistent across BADL and IADL activities, baseline functional levels, and sex, and interaction tests did not provide clear evidence of heterogeneity (Additional file 1: Table S7).

Discussion

Among activities that were already severely limited in 2018, reported help was associated with a less favourable subsequent functional course. The model-standardised probability of transition to no or mild difficulty by 2020 was 47.8% for activities with reported help and 59.5% for those without reported help, corresponding to an adjusted risk difference of − 11.7 percentage points. The pattern was supported by secondary outcomes: reported help was associated with higher odds of persistent severe limitation and lower odds of both complete recovery and improvement on the four-level functional scale. These associations were also broadly consistent across analyses using alternative weighting schemes, approaches to missing data and censoring, response-mode restrictions, and alternative model specifications. At the same time, substantial improvement occurred in both exposure groups, indicating that severe activity-specific limitation in later life is neither uniformly persistent nor synonymous with irreversible dependence.

The observed improvement is consistent with the broader literature describing late-life disability as a dynamic and often recurrent process rather than a unidirectional progression [5–11, 35–36].

Longitudinal studies with frequent functional assessments have shown that older adults may move repeatedly between independence and disability and that recovery can occur even after substantial functional loss, although it may not always be sustained [35]. In the present study, nearly half of severely limited activities with reported help and more than two thirds of those without reported help transitioned to no or mild difficulty in the crude analysis. Because CHARLS assessed function at widely spaced survey waves, these transitions cannot be distinguished as sustained recovery, temporary improvement, or part of a fluctuating course. Nevertheless, the findings reinforce the importance of viewing severe functional limitation as a state with heterogeneous trajectories rather than as a permanent classification. This perspective is particularly relevant to geriatric care, in which changes in residual capacity and task performance may remain clinically meaningful even after assistance has become necessary.

Earlier functional history provided additional insight into this heterogeneity. Severe limitation in the same activity in 2015 was more common among activities with reported help in 2018 than among those without reported help (33.7% vs 18.1%), and prior severe limitation was associated with substantially lower crude probabilities of subsequent transition out of severe limitation. Adjustment for the complete four-level 2015 same-activity response only modestly attenuated the association between reported help and the 2020 outcome. Associations below the null were also observed within both strata of prior severe limitation, although the interaction estimate was imprecise. These findings suggest that current dependence carries different prognostic information according to its preceding course. A limitation that has persisted or recurred over several years may differ substantially from one that has only recently reached the same level of observed severity. A single cross-sectional assessment of dependence is therefore unlikely to capture the full potential for recovery or persistence. At the same time, the 2015 assessment was three years before baseline and could not identify onset, duration, intervening episodes, aetiology, or reversibility; it should therefore be regarded as partial information on prior prognosis rather than a complete representation of functional history.

The activity-specific approach also helps place the present findings in the context of previous studies of care receipt and functional change. An earlier CHARLS analysis reported that receipt of informal care was associated with slower progression of overall functional limitation [12], whereas a more recent longitudinal analysis using HRS, SHARE, and CHARLS data reported poorer subsequent ADL/IADL status among some groups receiving formal or combined formal and informal help [37]. These findings need not be regarded as contradictory. Person-level studies generally characterise the overall care environment and aggregate disability burden of an individual, whereas the present analysis was restricted to activities that were already severely limited and linked help for a specific activity directly to the subsequent status of that activity. At the person level, care receipt may reflect broader family and service resources across daily life; at the activity level, reported help may preferentially identify tasks for which dependence is already more established. The different analytic scales therefore describe related but distinct dimensions of the relationship between functional limitation and care.

Confounding by indication is likely to contribute substantially to the inverse association observed here. Assistance is more likely to be mobilised when a limitation is severe, persistent, readily apparent, or perceived by the older person or family as unlikely to resolve, and these characteristics are themselves associated with poorer subsequent functional outcomes. The study eligibility criterion also included a response category indicating difficulty accompanied by a need for help, creating conceptual overlap between baseline functional severity and subsequent classification of reported help. Thus, help was not an exposure occurring independently of prognosis, but part of the clinical and social response to an existing functional problem. Adjustment for baseline response level, total functional burden, health characteristics, and earlier same-activity status addressed several measured components of this process, but could not fully account for duration of limitation, underlying pathology, residual capacity, caregiver judgement, environmental barriers, or access to rehabilitative resources. Therefore, reported help appears to capture both the underlying functional need and the mobilisation of support in response to that need. Help may range from prompting or supervision to hands-on assistance or complete task substitution, whereas no reported help may reflect greater residual capacity, intermittent difficulty, personal preference, limited recognition of need, unavailable support, or unmet need. Previous evidence similarly indicates that care receipt is only imperfectly aligned with functional need [13–21]. Assistance received, care needs met, and functional capacity restored should therefore be regarded as related but distinct constructs.

This distinction has implications for geriatric assessment and for the evaluation of long-term care. Assistance may preserve safety, dignity, participation, and the ability to remain in the community even when independent task performance does not improve. Conversely, the fact that help is available does not establish how much residual capacity remains, whether support is appropriately matched to need, or whether potentially modifiable barriers have been identified. Structured rehabilitation, reablement, and restorative care differ from routine compensatory assistance because they explicitly aim to maintain or improve functional performance and participation and vary considerably in content, intensity, and delivery [22–24]. The binary CHARLS item cannot distinguish these forms of care and therefore cannot evaluate their effectiveness. The findings instead support the value of activity-specific reassessment of functional capacity and care needs when assistance is already being provided. This is consistent with person-centred approaches such as WHO ICOPE, which emphasise assessment of intrinsic capacity, social care and support needs, and individualised care planning rather than relying on a single indicator of dependency [38].

The same distinction is relevant at the health-service and policy level. Measures of whether help is received are useful for documenting care mobilisation, but they should not be used alone as indicators that functional needs have been adequately addressed. Service evaluations and population surveillance would be more informative if they distinguished care receipt from unmet need and recorded the source, frequency, intensity, duration, purpose, and perceived adequacy of assistance. Such information is particularly relevant in ageing populations in which long-term care systems must address both the consequences of persistent loss of capacity and opportunities to maintain remaining function. The present findings indicate that interpreting receipt of help without information on underlying functional

trajectory can obscure differences in both prognosis and care need. The main association was broadly consistent across alternative analytic and missing-data approaches. A mortality-inclusive composite yielded a directionally similar estimate, although it addressed a different outcome and does not eliminate potential selection related to survival. However, the help-favouring extreme-case analysis attenuated the association and produced a 95% confidence interval that included 1, indicating that sufficiently strong differential missingness could materially weaken the observed pattern.

The 2020 assessment also occurred during the COVID-19 pandemic, which may have altered opportunities to perform particular activities, household division of labour, access to health and social services, and availability of assistance [17]. These influences are especially relevant to IADLs such as household chores, preparing meals, shopping, and managing money, which reflect customary roles and environmental opportunities as well as individual capacity. The questionnaire did not provide a consistent category for activities that respondents did not usually perform, creating potential for role-related misclassification. Estimates were directionally consistent across BADL and IADL domains, baseline severity levels, and sex; however, the corresponding interaction estimates were imprecise and do not exclude clinically meaningful heterogeneity. These subgroup findings should therefore be interpreted as supportive evidence of a broadly similar pattern rather than as demonstrating equivalence across groups.

The study has several strengths. The person–activity design ensured that the reported-help exposure and subsequent functional outcome referred to the same activity, thereby reducing the mismatch that can arise when aggregate care and disability measures are analysed at the person level. The three-wave structure provided information on earlier same-activity functional status and allowed the observed association to be considered in the context of prior functional history. The analysis distinguished transition out of severe limitation from complete recovery and improvement by at least one response level, capturing clinically distinct dimensions of functional change. Reporting model-standardised probabilities, absolute risk differences, and risk ratios alongside odds ratios improved interpretation on clinically meaningful scales. Finally, the consistency of findings across a broad range of sensitivity analyses provides evidence that the main association was not dependent on a single analytic specification.

Several limitations should be considered. Residual confounding is likely because reported help was closely related to baseline functional need and because the onset, duration, cause, and reversibility of each limitation were incompletely observed. The help item lacked a recent, standardised recall period and did not characterise the source, intensity, purpose, or adequacy of assistance. Functional status was assessed only at widely spaced waves, preventing observation of intermediate transitions or confirmation that improvement was sustained. Missing data, response mode, and unmeasured cognitive impairment may have introduced additional selection or information bias, although relevant sensitivity analyses yielded similar estimates. Some activity-specific comparisons were imprecise because relatively few observations lacked reported help. Future studies could address these limitations through more frequent activity-specific assessment and more detailed measurement of both residual functional

capacity and the timing, content, and adequacy of assistance, thereby helping to distinguish underlying functional prognosis from the effects of specific care strategies.

Conclusions

Severe activity-specific functional limitation in later life remained dynamic, with substantial improvement observed over two years. Nevertheless, reported help was associated with a lower probability of transition to no or mild difficulty, and earlier same-activity functional status accounted for only part of this association. Reported help therefore appears to identify activities with more established dependence and a less favourable functional trajectory, underscoring the value of incorporating prior functional history, residual task capacity, and current care needs into activity-specific functional assessment of older adults.

Abbreviations

BADL
basic activities of daily living
CES-D-10
10-item Center for Epidemiologic Studies Depression Scale
CHARLS
China Health and Retirement Longitudinal Study
CI
confidence interval
IADL
instrumental activities of daily living
IPCW
inverse-probability-of-censoring weighting
OR
odds ratio
RR
risk ratio.

Declarations

Authors' contributions

WZ & WL ZHU extracted and verified the data used in the study. YY planned the study, performed statistical analyses and drafted the manuscript. QZ supervised the study and revised the manuscript. All authors have read and approved the final version of the manuscript.

Funding

The research received no funding.

Data availability

CHARLS data are available to registered researchers through the official CHARLS data-access process from http://charls.pku.edu.cn/en.

Clinical trial number

Not applicable.

Acknowledgements

Not applicable.

Ethics approval and consent to participate

CHARLS received approval from the Biomedical Ethics Review Committee of Peking University (IRB00001052-11015), and participants provided informed consent. This secondary analysis of de-identified CHARLS data was reviewed by the authors' institutional ethics committee, which granted an exemption from additional ethical review.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

References

1. Amlak BT, Getinet M, Getie A, Kebede WM, Tarekegn TT, Belay DG. Functional disability in basic and instrumental activities of daily living among older adults globally: a systematic review and meta-analysis. BMC Geriatr. 2025;25:413. 10.1186/s12877-025-06056-8.
2. Gong J, Wang G, Wang Y, Chen X, Chen Y, Meng Q, et al. Nowcasting and forecasting the care needs of the older population in China: analysis of data from the China Health and Retirement Longitudinal Study (CHARLS). Lancet Public Health. 2022;7:e1005–13. 10.1016/S2468-2667(22)00203-1.
3. Zhang X, Li X, Zhao L, Fan R, Dong J, Shen X, Li Y. Trends of impairment of the activities of daily living in Chinese older adults: an age-period-cohort analysis. BMC Geriatr. 2025;25:168. 10.1186/s12877-025-05821-z.
4. Beard JR, Officer A, de Carvalho IA, et al. The World report on ageing and health: a policy framework for healthy ageing. Lancet. 2016;387(10033):2145–54. 10.1016/S0140-6736(15)00516-4.

5. Hardy SE, Gill TM. Recovery from disability among community-dwelling older persons. JAMA. 2004;291:1596–602. 10.1001/jama.291.13.1596.
6. Gill TM, Allore HG, Hardy SE, Guo Z. The dynamic nature of mobility disability in older persons. J Am Geriatr Soc. 2006;54:248–54. 10.1111/j.1532-5415.2005.00586.x.
7. Khalili G, Zargoush M, Huang K, Ghazalbash S. Exploring trajectories of functional decline and recovery among older adults: a data-driven approach. Sci Rep. 2024;14:6340. 10.1038/s41598-024-56606-0.
8. Guo T, Zhang Y, Xu G, Liu W, Ding H, Chen S. Activities of daily living disability transition patterns in older adults with chronic diseases: a four-year cohort study in China. Healthcare. 2024;12:2088. 10.3390/healthcare12202088.
9. Oh E, Moon S, Hong GRS. Longitudinal trends and predictors of limitations in activities of daily living in community-dwelling older adults: evidence from the KLoSA study. Front Public Health. 2024;12:1485732. 10.3389/fpubh.2024.1485732.
10. Yang S, Zhong P, Shen X, Su B, Talifu Z, Guo S, Zheng X. A multi-state model study of the disability-free life expectancy among older adults with chronic multimorbidity based on CHARLS-China, 2011–2020. China CDC Wkly. 2024;6:695–8. 10.46234/ccdcw2024.156.
11. Wang Y, Xu X, Liu J, et al. Latent transition analysis of instrumental activities of daily living in Chinese elderly: based on the 2014–2018 wave of the Chinese Longitudinal Healthy Longevity Survey. BMC Geriatr. 2024;24:83. 10.1186/s12877-023-04631-5.
12. Hu B, Li L, Carr D. The protective effects of informal care receipt against the progression of functional limitations among Chinese older people. J Gerontol B Psychol Sci Soc Sci. 2020;75:1030–41. 10.1093/geronb/gby107.
13. Hu B, Ma S. Receipt of informal care in the Chinese older population. Ageing Soc. 2018;38:766–93. 10.1017/S0144686X16001318.
14. Yang W, Tan SY. Is informal care sufficient to meet the long-term care needs of older people with disabilities in China? Evidence from the China Health and Retirement Longitudinal Survey. Ageing Soc. 2021;41:980–99. 10.1017/S0144686X1900148X.
15. Hu B, Chou YC. Care poverty among older adults in East Asia: a comparison of unmet care needs between China and Taiwan. Arch Gerontol Geriatr. 2022;102:104738. 10.1016/j.archger.2022.104738.
16. Zhang J, Shen Z, Tong X, Sun X, Yao N. Availability of family care resources, bathing assistance and toileting assistance among older adults with functional limitations: an evidence-based study from China. BMC Geriatr. 2024;24:419. 10.1186/s12877-024-05047-5.
17. Chen S, Jones LA, Jiang S, Jin H, Dong D, Chen X, et al. Difficulty and help with activities of daily living among older adults living alone during the COVID-19 pandemic: a multi-country population-based study. BMC Geriatr. 2022;22:181. 10.1186/s12877-022-02799-w.
18. Lin Z, Qian Y, Gill TM, Hou X, Allore H, Chen S, Chen X. Absence of care among community-dwelling older adults with dementia and functional limitations. Nat Aging. 2025;5:548–57. 10.1038/s43587-

025-00836-y.

19. Zhang L, Shen S, Zhang W, Fang Y. What determines informal care need among community-dwelling older adults in China? Results from a longitudinal study. BMC Geriatr. 2024;24:597. 10.1186/s12877-024-04843-3.
20. Zhang J. Temporal dynamics of unmet long-term care needs in China: an age-period-cohort analysis. Ageing Soc. 2025;45:1848–70. 10.1017/S0144686X24000370.
21. Huang J, Qian X, Choi EPH, Chau PH. The consequences of unmet needs for assistance with daily life activities among older adults: a systematic review. Med Care Res Rev. 2024;81:295–310. 10.1177/10775587241233798.
22. Buma LE, Vluggen S, Zwakhalen S, Kempen GIJM, Metzelthin SF. Effects on clients' daily functioning and common features of reablement interventions: a systematic literature review. Eur J Ageing. 2022;19:903–29. 10.1007/s10433-022-00693-3.
23. Gough C, Damarell RA, Dizon J, Ross PDS, Tieman J. Rehabilitation, reablement, and restorative care approaches in the aged care sector: a scoping review of systematic reviews. BMC Geriatr. 2025;25:44. 10.1186/s12877-025-05680-8.
24. Clotworthy A, Kusumastuti S, Westendorp RGJ. Reablement through time and space: a scoping review of how the concept of reablement for older people has been defined and operationalised. BMC Geriatr. 2021;21:61. 10.1186/s12877-020-01958-1.
25. Zhao Y, Hu Y, Smith JP, Strauss J, Yang G. Cohort profile: the China Health and Retirement Longitudinal Study (CHARLS). Int J Epidemiol. 2014;43:61–8. 10.1093/ije/dys203.
26. China Health and Retirement Longitudinal Study. 2015 CHARLS Wave 3 data documentation. https://charls.charlsdata.com/pages/Data/2015-charls-wave3/en.html. Accessed 20 Jul 2026.
27. China Health and Retirement Longitudinal Study. CHARLS Wave 4 User's Guide. https://charls.charlsdata.com/Public/ashelf/public/uploads/document/2018-charls-wave4/application/CHARLS_2018_Users_Guide.pdf. Accessed 20 Jul 2026.
28. China Health and Retirement Longitudinal Study. CHARLS Wave 5 User Guide. https://charls.charlsdata.com/Public/ashelf/public/uploads/document/2020-charls-wave5/application/CHARLS_2020_User_Guide_English.pdf. Accessed 20 Jul 2026.
29. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology statement: guidelines for reporting observational studies. PLoS Med. 2007;4:e296. 10.1371/journal.pmed.0040296.
30. China Health and Retirement Longitudinal Study. CHARLS 2018 Household Questionnaire. https://charls.charlsdata.com/Public/ashelf/public/uploads/document/2018-charls-wave4/application/CHARLS_2018_Household_Questionnaire.pdf. Accessed 20 Jul 2026.
31. Cheng ST, Chan ACM. The Center for Epidemiologic Studies Depression Scale in older Chinese: thresholds for long and short forms. Int J Geriatr Psychiatry. 2005;20:465–70. 10.1002/gps.1314.
32. Chen H, Mui AC. Factorial validity of the Center for Epidemiologic Studies Depression Scale short form in older population in China. Int Psychogeriatr. 2014;26:49–57. 10.1017/S1041610213001701.

33. Resseguier N, Verdoux H, Giorgi R, Clavel-Chapelon F, Paoletti X. Dealing with missing data in the Center for Epidemiologic Studies Depression self-report scale: a study based on the French E3N cohort. BMC Med Res Methodol. 2013;13:28. 10.1186/1471-2288-13-28.
34. Zhu X, Wang Y, Luo Y, Ding R, Shi Z, He P. Bidirectional, longitudinal associations between depressive symptoms and IADL/ADL disability in older adults in China: a national cohort study. BMC Geriatr. 2024;24:659. 10.1186/s12877-024-05248-y.
35. Hardy SE, Allore HG, Guo Z, Dubin JA, Gill TM. The effect of prior disability history on subsequent functional transitions. J Gerontol Biol Sci Med Sci. 2006;61(3):272–7. 10.1093/gerona/61.3.272.
36. Hardy SE, Gill TM. Recovery from disability among community-dwelling older persons. JAMA. 2004;291:159–1602.
37. Hofbauer LM, Rodriguez FS. Help Received and Functional Decline in Older Adults: A Longitudinal Analysis of (I)ADL Difficulties Across Europe, the US, and China. J Appl Gerontol. 2026. 10.1177/07334648261416580.
38. World Health Organization. Integrated care for older people (ICOPE): guidance for person-centred assessment and pathways in primary care. 2nd ed. Geneva: WHO; 2025.

Figures

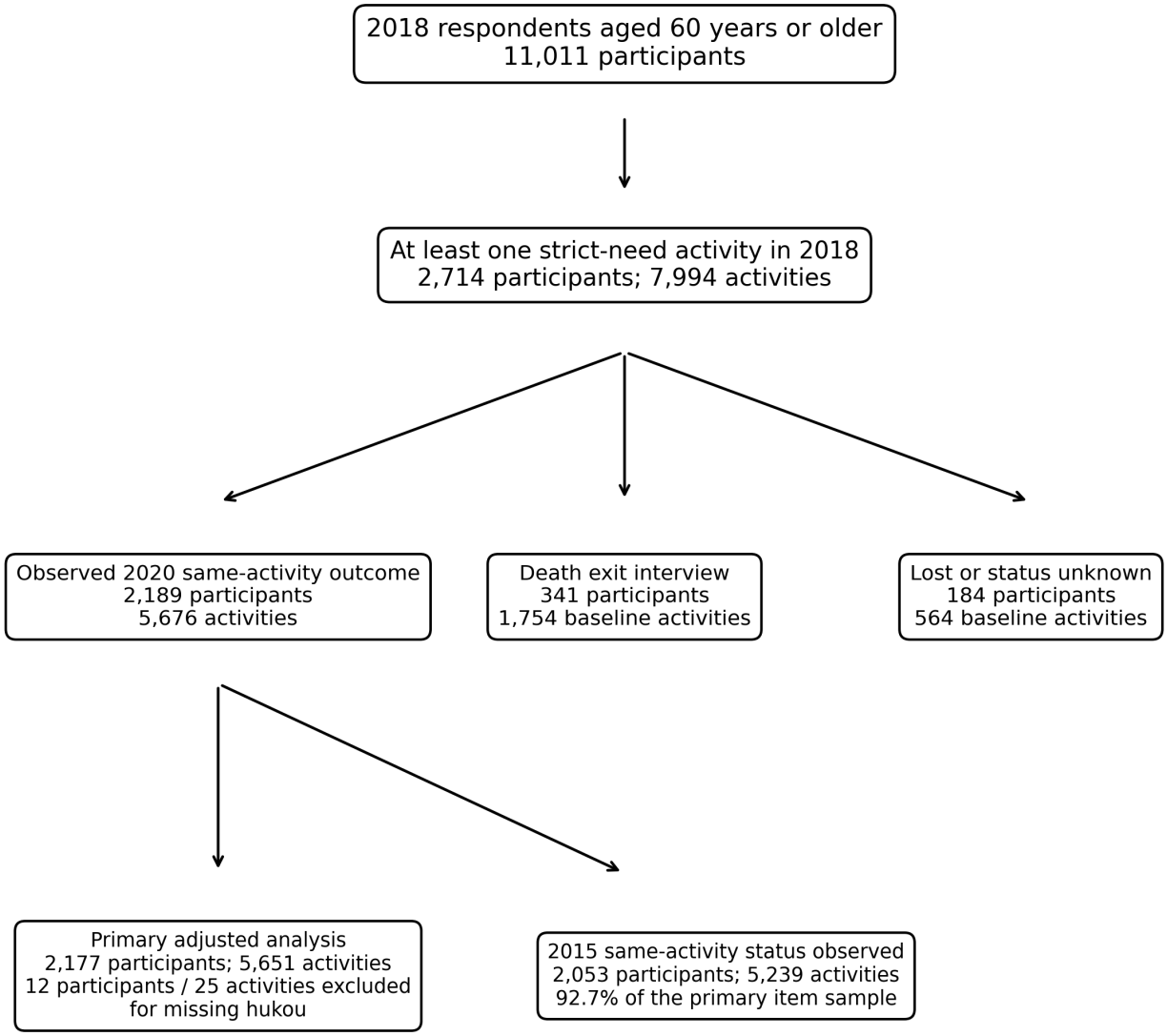


Figure 1

Study flow and analysis-specific exclusions. Deaths and participants lost to follow-up or of unknown status are shown separately. Same-activity status in 2015 was available for 92.7% of observations in the primary analysis.

Supplementary Files

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