

<https://doi.org/10.48047/AFJBS.6.Si2.2024.5612-5623>**African Journal of Biological Sciences**Journal homepage: <http://www.afjbs.com>

Research Paper

Open Access

Functional Competence Decline in the Elderly

Subramanyam.V¹, Kalavathi, P.², and, Jamuna.D.³¹The Apollo University Saketa, Murukambattu, Chittoor, Andhra Pradesh, India.²Assistant Professor, Department of Sociology, Mount Carmel college, Bengaluru, India³Professor of Psychology, Former Vice Chancellor, Sri Padmavati Mahila Visvavidyalayam (Women's University), Tiruapati, India.

Article Info

Volume 6, Issue Si2, 2024

Received: 15 May 2024

Accepted: 10 June 2024

doi:10.48047/AFJBS.6.Si2.2024.5612-5623

Abstract

Foremost indicator of aging is a decline in functional competence in the elderly. In addition to limiting mobility, low functional competence promotes dependency in old age, which can result in low self-esteem, anxiety, and despair. The purpose of this study is to evaluate the functional competency of 300 elderly men and women who reside in the rural and urban districts of Chittoor, Kadapa, and Kurnool. Instruments of activities of daily living (ADL) and Instrumental activities of daily living (IADL) were used to measure patterns of functional competence in the elderly. Results show that functional competence in ADLS and IADLS has declined with age. The study's findings demonstrate the necessity of rehabilitation services for the elderly to overcome disability in old age.

Keywords: Functional Competence, Elderly, ADLs, and IADLs.

Introduction

Almost every country expects this trend to continue, as the proportion of elder individuals in the population has been continuously increasing since the turn of the twenty-first century. By 2021, there will be around 700 million people worldwide who are 65 years of age or older, making up about 10% of the world's population, according to the United Nations (United Nations, 2022). The health concerns of the elderly population are among the most important issues related to population aging. Nonetheless, a lifetime of accumulated disease, incapacity, functional deficits, and other health issues tends to exacerbate elder persons' health state (National Bureau of Statistics 2021). Promoting healthy aging and improving the health of elder persons is essential to reducing the social cost and mitigating the negative effects of an aging population. It is possible to ensure that elder adults can maintain independent living without the support and assistance of others and reach a state of healthy ageing, provided that their intrinsic capacity is maintained at a high level and they are able to adapt well to their environment (Zhai and Liu ,2019). In other words, elder adults' functional ability is not necessarily diminished as they age. The primary goal of healthy aging, according to the WHO is to maintain an individual's functional capacity as they age (WHO 2015).

The ability to continue living independently as one ages is a crucial component of functional competence. The ability refers to take care of oneself, handle one's affairs, and live freely in the community is sometimes referred to as functional competence. The ability of elderly people to live freely worries society, not just the elderly themselves (Siegel & Tauber, 1986). Determining the essential functional ability domains linked to independent living is a

significant challenge to individuals engaged in competence evaluation and assessment. It may be especially helpful to review earlier studies on instrumental activities of daily living (IADLs). The way elderly people perform on a test of everyday cognition is related to their own behaviour as well as the behavioural observations of others engaging in comparable activities at home.

The rates of functional disability for ADL, IADL, and mobility in the general sample were equivalent to those found by Millán et al., (2010) and by Parahyba et al., (2006). It was noted that IADL had the highest prevalence, followed by ADL and mobility. This fact is corroborated by the hierarchy of losses, which shows that simpler activities (ADL) are impacted later in the impairment process, whereas more complicated activities (IADL) are hindered at the beginning. One classifies loss of mobility as an intermediate loss. Conversely, the general sample's high proportion of independent seniors is noted for ADL (58.0%), IADL (43.0%), and mobility (76.0%). This further supports the need to prevent functional disability and its negative effects and is consistent with earlier research (Den et al., 2013).

In many nations, the number of old people in need of care is rising quickly in their homes, even if the size of families and their capacity to support them is decreasing. Saito et al., (2014) In their study, determined the household composition-based risk variables for functional disability in elder adults living in communities. The risk variables for functional impairment differed depending on the household group. Over time, Japan has seen a progressive rise in the number of elderly residents in need of care living in vulnerable families. Assessing functional incompetence appropriately necessitates the use of resources for evaluation that take household composition into account.

According to Maringoni et al., (2009) functional competence serves as the cornerstone of an efficient geriatric assessment by providing a comprehensive and multidisciplinary approach to health status. The various factors that affect elder people's life are thus covered, including their physical environment, social interactions, socioeconomic position, health, and cultural and psychological aspects. These people are part of a framework that uses an interdisciplinary and holistic approach to gradually understand public health (Maciel & Guerra, 2007). According to Millán et al., (2010), functional competence evaluations for senior citizens should continue to consider a continuous decline with age.

Previous research findings indicate that the main risk variables associated with functional disability among elder persons in China include old age, gender, poor health, and loneliness. Rural elder persons have a higher overall risk of functional incompetence, despite the fact that urban senior people are more likely to have it. Whether functional incompetence rates rise, fall, or stay the same in the future will not matter; the sheer number of elderly people with disabilities and the proportion of these individuals to potential caretakers will only grow, especially in rural areas. The development of functional incompetency in old age is significantly influenced by the quality and quantity of social support (Mendes, 1999; Everard, 2000; Koukoulis, 2002). Low social contact has been linked to worse or worse physical functioning because individuals with strong social ties have a higher chance of surviving and recovering from functional incompetency than those with weak social ties (Berkman, 2000). Marital status was found to be another key factor associated with impairment in western countries, as a measure of social support; the likelihood of functional incompetence is higher for elderly people living alone. Studies that have been conducted suggest that living with family and engaging in social activities are two more ways to demonstrate social support in addition to marital status (James, 2011).

Elder persons frequently experience functional impairment. It is linked to a significant risk of ensuing health decline and is frequently episodic. Disability severity is influenced by the environment, social support, financial assistance, and physical disabilities resulting from underlying medical issues. The presence of numerous health disorders can typically lead to

higher disability than anticipated since comorbid illnesses may make it more difficult for the patient to compensate for one issue. The most efficient way to evaluate a functional disability is for a doctor to ascertain the patient's coping strategies, the nature of the disability, its impact on activities, and its course. Validated screening procedures should be used to identify underlying health issues, impairments, and contextual factors (e.g., money, social support). The goals of interventions should be to lessen the demands of the work itself and to increase the patient's ability to handle task demands. Since functional decline in elder persons must address various conditions, impairments, and contextual variables, interventions for this condition are nearly always multifactorial (Cathleen Colon et al., 2023). Background given that it is more common in rural India than in urban areas, the elderly are becoming increasingly concerned about disability in activities of daily living (ADL) and instrumental activities of daily living (IADL) (Manik et al., 2023).

To maintain independence and lessen handicap while promoting active and healthy aging, it is imperative to identify the elements that influence functional competence. Though one of the biggest scientific discoveries of the century has been the extension of human longevity, comparable improvements in quality of life have not been made during this extended era (Ramamurti & Jamuna 2007).

Objective:

Objective is to evaluate the decline of functional competence among an aged community-dwelling population.

Method

Participants for the study

A sample of 300 community dwelling elderly men and women of rural and urban areas of Rayalaseema region (of Chittoor, Kadapa, and Kurnool) from the age groups of 50-59, 60-69, and 70-79 years were drawn by using a multi-stage random sampling technique. The subjects were identified based on census reports and by house-to house survey. The subjects without cognitively intact were included in the study. The subjects in the study were individually contacted and tests were administered in one session after taking willingness to participate.

Measures Used in the Study

For the present study, the subtests of disability scale (Ramamurti & Jamuna 1996) were used to assess different facets of functional capability viz., activities of daily living and instrumental activities of daily living. The Test-retest reliability for these subtests was 0.88, 0.86, 0.76, and 0.89 respectively.

Results and Discussion

The extent of functional competence in activities of daily living experienced by the elderly was examined further to draw clear profiles on each ADL i.e., by scrutinizing item-wise performance in basic activities of daily living (ADL) and instrumental activities of daily living (IADL) sub scales. The extent of functional competence in each activity on ADL and IADL scales was categorized into three levels viz., mild, moderate and severe, considering the scores within each activity. Accordingly, functional competence levels were classified as having low functional competence in ADL and IADL when their score is above 4 (range from 4 to 5), as moderate functional competence if score ranges between 3 and 4 and better functional competence if score ranges between 1 and 2 on each ADL and IADL. The levels of functional competence in each activity (basic and instrumental activities) in terms of age, gender and locality groups reported in Table - 1 through 7.

Functional competence or disability of elder persons is usually measured by activities of daily living (ADLS) that are basic for independent personal care, such as eating and bathing. The "activities of daily living" or ADLS are the basic tasks of everyday life. There are various definitions of ADL disability viz., (i) having difficulty in performing an activity,

(ii) inability to perform an activity, or (iii) needing assistance to perform an activity.

Firstly, levels of functional competence in each basic activities of daily living (ADLs) among middle aged (50-59), young-old (60-69) and old-old (70-79) groups were analyzed (Table - 1). The data indicates that in the 50-59 age group, subjects reported high functional competence in almost all basic personal activities (ADLs). In the 60-69 age group good to moderate functional competence levels were reported by almost all of the subjects. In the 70-79 age group, moderate levels of functional competence were reported by the subjects in all ADLs except in climbing stairs where very few persons have low functional competence. However, in the 70-79 age group, higher incidence of low functional competence was evident compared to 50-59 and the 60-69 age groups.

Sl. No.	Activity	50-59 (N=100)					60-69(N=100)					70-79(N=100)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	Getting into Bed / out of Bed	78	22	-	-	-	57	43	-	-	-	28	62	10	-	-
2	Sitting in/out of chair	79	21	-	-	-	65	32	-	-	-	33	60	7	-	-
3	Climbing stairs	68	31	1	-	-	40	46	5	-	-	22	46	21	5	6
4	Walking normal on a level ground	86	14	-	-	-	65	35	-	-	-	37	62	1	-	-
5	Moving inside the house	86	14	-	-	-	65	35	-	-	-	37	62	1	-	-
6	Bathing	73	27	-	-	-	51	43	6	-	-	22	70	8	-	-
7	Dressing	90	10	-	-	-	68	28	4	-	-	37	63	-	-	-
8	Eating	90	10	-	-	-	72	22	6	-	-	47	45	8	-	-
9	Toileting	72	28	-	-	-	51	49	-	-	-	27	73	-	-	-

1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.

Table - 1: Levels of Functional Competence in Activities of Daily Living (ADLs) in Different Age Groups

Table - 2: Levels of Functional Competence in Activities of Daily Living (ADLs) in Two Gender Groups

Sl. No.	Activity	Male(N=150)					Female(N=150)				
		1	2	3	4	5	1	2	3	4	5
1.	Getting into Bed / out of Bed	91	59	-	-	-	60	90	-	-	-
2.	Sitting in / out of Chair	98	48	4	-	-	67	82	1	-	-
3.	Climbing Stairs	101	48	1	-	-	69	80	1	-	-
4.	Walking on a normal ground	76	64	9	-	1	48	69	22	5	6
5.	Moving inside the house	103	46	1	-	-	75	74	1	-	-
6.	Bathing	78	48	4	-	-	54	93	3	-	-
7.	Dressing	104	46	-	-	-	71	79	-	-	-
8.	Eating	113	37	-	-	-	82	61	7	-	-
9.	Toileting	80	70	-	-	-	53	97	-	-	-
1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.											

Table - 3: Levels of Functional Competence in Activities of Daily Living (ADLs) in Two Locality Groups

Sl. No.	Activity	Rural (N=150)					Urban(N=150)				
		1	2	3	4	5	1	2	3	4	5
1.	Getting into Bed / out of Bed	76	74	-	-	-	87	63	-	-	-
2.	Sitting in / out of Chair	85	62	3	-	-	92	57	1	-	-
3.	Claiming Stairs	68	59	15	5	3	69	68	10	-	3
4.	Walking on a normal ground	96	54	-	-	-	92	56	2	-	-
5.	Moving inside the house	99	51	-	-	-	94	55	1	-	-
6.	Bathing	70	80	-	-	-	81	65	4	-	-
7.	Dressing	97	53	-	-	-	98	52	-	-	-
8.	Eating	110	40	-	-	-	103	42	5	-	-

9.	Toileting	70	80	-	-	-	80	70	-	-	-
1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.											

The data on levels of functional competence in each ADL in gender groups (Table - 2) indicate that the incidence of functional in competence in an activity viz., climbing stairs was high in female elderly than male. Majority of male elderly (in higher age groups) reported that sitting in and out of chair and bathing (by using bucket and lifting mug) activities were moderately difficult to perform. From the above data it is clear that the frequency of functional competence was high in almost all the activities among the male elderly. But the frequency of cases show that moderate level of functional competence was evident in some activities among female elderly (e.g., sitting in and out of chair, climbing stairs, bathing, dressing and toileting). The frequency of moderate level functional competence was high in women in the activity of walking on normal ground (22 females against 9 males); the reverse was true with the other activities viz., sitting in and out of chair (4 female against 1 male), bathing (4 female against 1 male) and eating (7 female against 0 male). The levels of functional competence in the performance of some activities getting in to bed / out of bed, moving inside the house was almost similar in both the gender groups. The levels of functional competence (Table - 3) in locality groups indicate that the frequency of cases in levels of functional competence was high in almost all activities in rural and urban elderly and the frequency of cases in moderate level of functional competence was high among the elderly living in urban areas (except climbing stairs). Both rural and urban elderly reported high (better) functional competence in almost all activities (except climbing stairs).

According to various studies, limitations in activities of daily living (ADL) are prevalent problem in elder populations. About 20% of community dwelling persons, 65 years of age and elder in the United States reported having some difficulty with ADLS. The prevalence doubles for those over the age 85 years. Reported estimates of the size of the elderly population with ADL disabilities differ substantially across National Surveys. Difference in which ADL items are being measured and in what constitute a disability account for much of the valuation. Other likely explanations are difference in (1) sample designs (2) sample size (3) survey methodology and (4) age structure of the population to which the sample refers. When essentially equivalent ADL measures are compared, estimates for the community-based population vary by upto 3.1%; and for institutionalized population, with exception of toileting, by not more than 3.2%. As small as these differences are in absolute terms, can be large in percent difference across surveys. For example, the National Medical Expenditure Survey estimates of elderly people with ADL problems are 60% higher than those of supplement on aging (Weiner, 1990).

Some studies in the review show that as age advances, walking, bathing, and transferring were the first ADL abilities to decline followed by dressing, toileting, and grooming (Bould et al., 1997; Dunlop, Hughes, & Manheim, 1997) and these tasks provide a basic descriptive profile of person with differing levels of disability among elder persons. Two new questions are available in the censuses concerning a self-care limitation and a mobility limitation, as well as the usual questions concerning a work limitation. In addition to extent of care which is potentially available in the household together with the economic characteristics of this age

group. It is also profiled in terms of relevant personal characteristics, including age, gender, marital status, race, ethnicity, rural residence, education, and employment. A key question addressed here is the need for help or care among the oldest-old and how various long-term care proposals would meet such needs. Haga et al., (1991) examined predictors of incompetence in ADL in 9-10 years follow-up study among a sample of community dwelling Japanese elderly (69-71 years) in 1976. Among all the items of ADL i.e., walking, eating, toileting, bathing and dressing the most remarkable decline was found in walking. The incompetent those who suffered loss of independence in one or more items of ADL at follow-up, accounted for 32.4% of men and 25.6% of women. Similar observation is evident in the results of the present study.

Nextly, an attempt was made to analyze the data pertaining to the levels of functional competence in each instrumental activities of daily living (IADL) among the sub groups viz., age, gender, and locality (Table - 4 through 6). The instrumental activities mostly reported in this IADL sub scale refer to daily household chores. Age trends in levels of functional competence in IADL (Refer Table - 4) show that the frequency of good functional competence was high in 50-59 age group (except in cooking and using transport) whereas the frequency of moderate IADL functional competence was high in the young-old (60-69, except getting groceries and taking medicine) and frequency of poor IADL functionality was high in old-old 70-79 age group. The trend is similar in many IADLs. Level of difficulty in functional competence reported in each IADL in young-old and old-old suggest that cooking, washing, house work and using transport were the most difficult to perform in 60-69 and 70-79 age groups.

In the old-old category severe limitations were reported in most of the IADLs by some of the subjects (eg., taking medicine, getting groceries and money management). Performance of these IADLs is mostly culture bound. For some subjects, certain tasks e.g., kitchen work, washing, cleaning, laundering are reported to be difficult to perform among other tasks. In case if there is any difficulty in performing such activities, it is customary for the other family members to extend assistance to the elderly (as reported by the subjects in the present study). Since a majority of old- old live with their adult sons/daughters, the adult children generally assist their elderly to perform these activities without much difficulty.

Table – 4: Levels of Functional Competence in Instrumental Activities of Daily Living (IADLs) in Three Age Groups.

Sl. No.	IADL Activity	50-59 (N=100)					60-69					70-79				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	Taking Medicine	90	10	-	-	-	76	21	-	-	-	55	40	5	-	-
2	Cooking	54	45	1	-	-	25	42	23	55	11	40	38	6	5	
3	Washing / Cleaning, Laundering	60	40	-	-	-	18	58	17	43	11	36	37	5	6	
4	House work	65	35	-	-	-	29	51	16	43	13	48	23	5	1	

5	Shopping	7 9	2 1	-	-	-	5 1	4 6	3	-	-	3 1	5 9	7	3	-
6	Money Manageme n t	7 8	2 2	-	-	-	5 7	3 4	8	1	-	2 9	5 5	1	1	-
7	Difficulty in Using Transport	6 8	2 3	3	-	6	3 1	3 3	2 9	5	2	2 1	4 5	1	7	1 1
1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.																

Table - 5: Levels of Functional Competence in Instrumental Activities of Daily Living (IADLs) in Gender Groups

Sl. No.	Activity	Male (N=150)					Female (N=150)				
		1	2	3	4	5	1	2	3	4	5
1.	Taking Medicine	115	32	3	-	-	94	50	6	-	-
2.	Cooking	45	68	26	3	8	24	63	49	7	7
3.	Washing / Cleaning, Laundering	52	69	23	1	5	23	66	43	7	11
4.	House Work	57	73	13	2	5	31	74	29	5	11
5.	Shopping	86	58	-	-	-	58	81	8	3	-
6.	Money Management	88	55	6	-	1	58	72	15	2	3
7.	Difficulty in Using Transport	77	48	12	3	10	4	64	32	17	13
1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.											

Table - 6: Levels of Functional Competence in Instrumental Activities of Daily Living (IADLs) in Two Locality Groups

Sl. No.	Activity	Rural (N=150)					Urban (N=150)				
		1	2	3	4	5	1	2	3	4	5
1.	Taking Medicine	111	38	1	-	-	111	34	5	-	-
2.	Cooking	49	57	34	4	6	40	74	25	4	7

3.	Washing Cleaning, Laundering	/44	68	28	2	8	47	68	26	3	6
4.	House Work	52	64	23	2	9	54	71	16	3	6
5.	Shopping	80	63	6	-	1	81	63	4	2	-
6.	Money Management	83	54	11	-	2	82	57	8	2	1
7.	Difficulty in Using Transport	41	42	39	10	11	65	58	8	1	9
1=Don't need help. Can easily do without any special effort; 2=Can do by oneself with some difficulty; 3=Can do with some degree of assistance; 4=Can do with a good degree of assistance; 5=Can't do by myself even with assistance.											

The fact is that many elderly are not habituated to these IADLs and due to certain cultural sanctions towards the performance of these tasks. Probably this could be one of the reasons why they reported low levels of functional competence in these IADLs compared to that of ADLs (Personal care activities) which are obligatory.

The data on gender groups on levels of functional competence in each IADL (Table - 5) shows that the poor levels of functional competence was noticed in almost all IADLs in male elderly. Poor / low level of functional competence was evident in female elderly in almost all IADLs (except in Kitchen work, getting groceries and taking medicine). Majority of elderly male reported better (Higher frequency) levels of functional competence in all IADLs eg., taking medicine (147 male against 144 female), kitchen work (113 male against 87 female), washing (121 male against 89 female); house work (130 male against 105 female); getting groceries (144 male against 139 female); handling money (143 male against 130 female); and using transport (137 male against 105 female). On the other hand, elderly women reported severe limitations in certain IADLs (except getting groceries and taking medicine) viz., house work (11 female against 5 male); washing (11 female against 5 male); handling money (3 female against 1 male) and using transport (13 female and 10 male). The trends on rural and urban differences on functional competence on each IADL (refer Table - 6) indicates that the incidence of higher level of functional competence was noticed in urban elderly moderate and lower levels of functional competence was observed in rural elderly (except in taking medicine).

Previous studies have shown that whereas IADL disability was steady in the early years, the prevalence of ADL disability grew slowly. Then, over time, the prevalence of these disabilities tended to rise quickly, particularly in those who were 75 years of age or older. There was a statistically significant rising trend for both ADL and IADL disability. According to earlier research (Liang et al.,2006; Feng et al.,2013), the findings of disability trends were consistent. This study's ability to demonstrate how impairment trends in elder persons developed over time was one of its strongest points. On the other hand, prior research with a brief follow-up only revealed noteworthy patterns in the initial phases of the development of disabilities. To provide a better significance test in such a distinct setting, the GEE model (Hardin & Hilbe, 2003; Geepack, 2022) was applied. According to our research, governments should focus on elder persons, particularly those who have functional

disabilities, and develop a long-term plan to monitor and care for them from a young age in order to reduce the substantial rise in functional disability that occurs with aging. Trends for IADL disability were different from those for ADL disability because the ADL and IADL scales examined distinct components of functional disability while still identifying it (Liang, Welmer, & Möller 2017). Even with the limitations in interpretation, more research is required to validate the results.

Declaration of Competing Interest:

The author declares that there is no conflict of interest.

Acknowledgement:

The authors wish to acknowledge all study participants.

References:

1. Bould, S., Mark, H.S., & Charles, F.L. (1997). Ability, disability and the oldest old. *Journal of Aging and Social Policy*, 9(1), 13-31.
2. Cathleen Colon-Emeric., Heather E Whitson., Juliessa Pavon., & Helen Hoenig. (2013), Functional Decline in Elder Adults. *American Family Physician* 88(6), 388-94.
3. den Ouden, M. E., Schuurmans, M. J., Brand, J. S., Arts, I. E., Mueller-Schotte, S., & van der Schouw, Y. T. (2013). Physical functioning is related to both an impaired physical ability and ADL disability: a ten-year follow-up study in middle-aged and elderpersons. *Maturitas*, 74(1), 89–94. <https://doi.org/10.1016/j.maturitas.2012.10.011>
4. Dunlop, D.P., Hughes, S.L., & Manheim, L.M. (1997). Disability of activities of daily living: Patterns of change and a hierarchy of disability. *American Journal of Public Health*, 87, 378-383.
5. Everard, K.M., Lach, H.W., Fisher, E.B., & Baum, M.C. (2000). Relationship of activity and social support to the functional health of elderadults. *J Gerontol Soc Sci*, 55B: S2, 08-12.
6. Feng, Q., Zhen, Z., & Gu, D. (2013). Trends in ADL and IADL disability in community-dwelling elderadults in Shanghai, China, 1998-2008. *J Gerontol B Psychol Sci Soc Sci*, 68, 476–85.
7. Feng, Q., Zhen, Z., Gu, D., Wu, B., Duncan, P.W., & Purser, J.L. (2013). Trends in ADL and IADL disability in community-dwelling elderadults in Shanghai, China, 1998–2008. *J Gerontol B Psychol Sci Soc Sci*, 68(3), 476–85. doi: 10.1093/geronb/gbt012.
8. Geepack. (2022). Generalized Estimating Equation Package. CRAN. <https://cran.r-project.org/web/packages/geepack/index.html>.
9. Haga, H., Shibata, H., Kumagai, S., Watanabe, S., Suzaki, T., & Yesumura, S. (1997). Factors contributing to longitudinal changes in high level of functional capacity of the elderly living in a community. Longitudinal Interdisciplinary Study on Aging, *TMIG*, 184.
10. Hardin, J.W., Hilbe, J.M. (2003) *Generalized Estimating Equations*. London: Chapman and Hall/CRC; 30, 7-4.
11. James, B.D., Boyle, P.A., Buchman, A.S., & Bennett, D.A. (2011). Relation of late-life social activity with incident disability among community-dwelling elderadults. *The Journals of Gerontology Series A, Biological Sciences and Medical Sciences*. 66, 467–473
12. Koukouli, S., Vlachonikolis, I.G., & Philalithis A. (2002). Socio-demographic factors and self-reported functional status: the significance of social support. *BMC Health Serv Res*, 2(1), 20
13. Liang, Y., Song, A., & Du, S. (2015). Trends in disability in activities of daily living among Chinese elderadults, the China Health and Nutrition Survey. *J Gerontol A Biol Sci*

Med Sci 70 (7,) 39–45.

14. Liang, Y., Welmer, A.K., Möller, J., & Qiu, C. (2017). Trends in disability of instrumental activities of daily living among elderchinese adults, 1997–2006: population based study. *BMJ Open*. 7(8),e016996. doi: 10.1136/bmjopen-2017-016996.
15. Maciel, A.C., & Guerra, R.O. (2007). Influence of biopsychosocial factors on the functional capacity of the elderly living in Brazil's Northeast. *Rev Bras Epidemiol*,10(2),178-89.
16. Manik Halder., Jay Saha., & Avijit Roy. (2023). Functional disability and its associated factors among the elderly in rural India using LASI Wave 1 data. *Journal of Public Health* 31(18),1-13
17. Marengoni, A., von Strauss, E., Rizzuto, D., Winblad, B., & Fratiglioni, L. (2009). The impact of chronic multimorbidity and disability on functional decline and survival in elderly persons. A community-based, longitudinal study. *Journal of internal medicine*, 265(2), 288–295. <https://doi.org/10.1111/j.1365-2796.2008.02017.x>.
18. Mendes de Leon, C.F., Glass, T.A., Beckett, L.A, Seeman, T.E., Evans, D.A., & Berkman, L.F. (1999). Social networks and disability transitions across eight intervals of yearly data in the New Haven EPESE. *J Gerontol Soc Sci*, 54B: S1, 62-72.
19. Millán-Calenti, J.C., Tubío, J., Pita-Fernández ,S., González-Abraldes, I., Lorenzo, T., Fernández-Arruty, T., Maseda, A.(2010). Prevalence of functional disability in activities of daily living (ADL), instrumental activities of daily living (IADL) and associated factors, as predictors of morbidity and mortality. *Arch Gerontol Geriatr*, 50(3):306-10. doi: 10.1016/j.archger.
20. Moreno-Agostino, D., Prina, M., Chua, K.C., Jotheeswaran, A.T., Sadana, R., Officer, A., Kamenov, K., & Cieza, A. (2021) Measuring functional ability in healthy ageing: a nationwide cross-sectional survey in the Philippine elderpopulation. *BMJ Open* 11:1, 11. <https://doi.org/10.1136/bmjopen-2021-050827>.
21. National Bureau of Statistics. (2021). *Seventh National Population Census Bulletin*. National Bureau of Statistics China, Xicheng, Bei jing. [http:// www. gov. cn/ guoqi ng/05/13/cont ent_5606149.htm](http://www.gov.cn/guoqi ng/05/13/cont ent_5606149.htm).
22. Ramamurti, P.V. & Jamuna, D. (2007). *Health behavior in the elderly: Efficacy of Interventions*. Project Report, ICMR, New Delhi (Unpublished).
23. Saito, E., Ueki, S., Yasuda, N., Yamazaki, S., & Yasumura, S. (2014). Risk factors of functional disability among community-dwelling elderly people by household in Japan: a prospective cohort study. *BMC geriatrics*, 14, 93. <https://doi.org/10.1186/1471-2318-14-93>
24. Siegel, J. S., & Taeuber, C. M. (1986). Demographic perspectives on the long-lived society. *Daedalus*, 115(1), 77–117.
25. United Nations (2022) World Population Prospects. (2022). *Department of Economic and Social Affairs, Population Division, New York*. <https://population.un.org/wpp/>
26. Wei Zhang., & Ai-ping Wang. (2023). Functional ability of elderadults based on the World Health Organization framework of healthy ageing: a scoping review. *Journal of Public Health*, DOI: 10.1007/s10389-023-02121-x
27. Weiner, J.M. (1990). Measuring the activities of daily living comparisons across national surveys. *Journal of Gerontology : Social Sciences*, 45(6), 229-237
28. World Health Organization. (2015). *World Report on Ageing and Health*. World Health Organization, Geneva. [https:// www. who. int/ publi cations/i/item/9789241565042](https://www.who.int/publications/i/item/9789241565042).
29. Yan ,M., Qin, T., & Yin, P.(2019). Disabilities in activities of daily living and in instrumental activities of daily living among elderadults in China, 2011–15: a longitudinal cohort study. *Lancet*. ;394:82. doi: 10.1016/S0140-6736(19)32418-3.
30. Zhai, ZW.,& Liu, W.L. (2019) The discussion on the definition of “Elderly” and the

health measurement: from the perspective of functional ability. *China Sport Sci Technol* 55:3–9. <https://doi.org/10.16470/j.csst.2019180>