

Association Between Community Environment and Dependency Among the Elderly From a Service Provision Perspective

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Abstract

Background: The prevalence of dependency is high among the elderly worldwide and increases with increasing life expectancy. The objective of this study was to explore from the perspective of resource demand the association between community environmental resources and dependency among the elderly.

Methods: The study was designed as a population-based cross-sectional study. A total of 950 participants aged ≥ 60 years from 22 locations in China were selected using a complex multistage sampling design. All data were collected using questionnaires and face-to-face interviews. The dependency was assessed using the Chinese version of the Minnesota Multiphasic Personality Inventory-II. The community environment was assessed using 43 items. Logistic regression analysis was used to evaluate the association between the community environment and dependency. Cluster analysis was used and demonstrated that dependency was mainly associated with community primary preventive care service resources.

Results: In the analysis result, both age-specific and social support levels-stratified results showed that the dependency associated with community environmental resources differed among the elderly by age group and level of social support.

Conclusions: The levels of dependency were significantly associated with community environment resources. Our results suggest that the dependent on local environment resources may consider as the resource needs among elderly.

Background

Owing to the accelerating aging of the global population, the realization of healthy active aging has become a common concern worldwide [1, 2]. As the elderly age and their physical function declines, the increasing prevalence of their dependency leads to increasing demand for medical care and social services, substantially challenging the individual and social service system and becoming an urgent problem requiring immediate solutions [3–5].

Traditional dependency is a personality disorder in which individuals are highly dependent on others to fulfill their emotional and physical needs, resulting in the gradual loss of autonomy [6, 7]. The causes of dependency are not very clear, and its classification and consequences are complex. A recent study demonstrated that markers of biological age, such as leukocyte telomere length, are associated with dependency, but health and the consequences of poor health and dependency are more intimately linked with social, economic, and environmental factors, especially for the elderly [8–10]. Many studies have demonstrated the adverse outcomes caused by different dependency objects such as people, substances, and behaviors, which can lead to nursing dependency, alcohol dependency, and sleep dependency. Dependency can also lead to increases in the consequences of diseases such as depression, heart disease, and all-cause mortality [11–14].

The theory of place dependency was proposed more than 30 years ago, but quantitative studies on the association between person and place dependency have rarely been conducted [15]. Because the performance of dependency is multifaceted, and it is difficult to measure and evaluate, and the consequences of dependency are also complex, which may be positive or negative [16]. Place dependency is usually understood as follows: an individual experiencing a place becomes dependent on the place because the place can fulfill his or her needs, creating identification, belonging, and other emotional aspects of the performance. Place dependency is a type of functional dependency, reflecting the importance of the resources and facilities provided. Some studies have shown that place dependency is positively associated with the service quality of the place [17].

Recently, the interest in resource dependency among fields of community psychology, environmental psychology, and gerontology to explore the provision of community service resources has been increasing [18–20]. The theory of resource dependency emphasizes that the survival of an organization needs to absorb resources from the surrounding environment and needs to depend on and interact with the surrounding environment to achieve survival or improve the quality of life. Research has demonstrated that in the past two decades, the number of nursing homes in the world has decreased significantly, and an increasing number of elderly individuals are living in their homes, leading to complex nursing needs for families and community services [21, 22].

The World Health Organization suggests that the best way to support the elderly in the community is to integrate all types of resources, adapt to the actual social environment of the elderly, and provide targeted health services; these integrated services should be prioritized over other services [23]. However, how to achieve or solve the complex problem, including improving the understanding of community needs, remains unclear. According to our review of the literature, the complex association between dependency and the community environment has not been investigated through complete data analysis. Therefore, the purpose of answering the research questions in this study was to provide evidence for further research into and development of effective strategies to improve the community environment and services on the basis of the needs of the elderly, to improve community resources.

Methods

Study design

This study used a cross-sectional design based on the project “Accessibility Evaluation of Health-Related Resources for the Elderly.”

Setting

Sampling was conducted in 22 locations in four provinces (Zhejiang, Heilongjiang, Xinjiang, and Sichuan) in China from July 2019 to November 2019.

Participants

A total of 950 general residents aged ≥ 60 years were selected using a multistage sampling design by calculation. A population-based survey was conducted to assess the health and health-related resources of accessibility of the elderly from multiple aspects: social, economic, behavioral and psychological, medical, and environmental.

We excluded subjects who were unable to complete the questionnaire. All participants provided written informed consent before participation in this study. The study was approved by the institutional review board at the School of Medicine, Zhejiang University.

Data collection

Data were collected using questionnaires provided to the participants during face-to-face interviews. The nine-part questionnaire comprised 428 items. The main content comprised demographic characteristics, general health status and behavior habits, environmental and community health service resources, psychological resources, and activities of daily living assessment. The duration of the interview was supposed to be approximately 45 to 60 minutes for the majority of participants.

The general characteristics were the participants' age, gender, ethnicity, income, education level, self-reported chronic disease status, disease history, daily habits, and physical activity level. Environmental assessment is generally conducted from three aspects: physical, social, and psychological. In this study, the environmental assessment was determined by assessing the housing environment, surrounding housing environment, and community environment. The community environmental resources were assessed using 44 items.

The Chinese version of the dependency scale used in this study was validated by the standardized Minnesota Multiphasic Personality Inventory-II. The dependency scale comprised 57 items. The raw score was converted into a standardized T-score. Dependency was defined as a standardized T-score greater than or equal to 60 points. Social resource status was assessed using the Chinese version of the questionnaires of the Older American Resources and Services (OARS) social resource scale, which comprised three dimensions: social interaction, availability of social support and practical assistance, and interpersonal relation. The ratings were summed to yield a total score. A high level of social support was defined as an OARS score greater than or equal to 11 points. Participants' personality characteristics were identified using the Eysenck Personality Questionnaire (EPQ).

Statistical analysis

Statistical analysis was restricted to the 913 participants with complete questionnaires and dependency assessment data. Descriptive statistics were used to describe the general characteristics of the study participants.

We performed cluster analysis for the community environmental variables using the oblique principle component method to analyze the association between dependency and community environmental factors. Univariate analyses were performed to determine whether the variable was added into the cluster

analysis model with a power of 80% at a significance level of 0.05. The R-squared with own cluster and R-squared with 1-R² ratio were used to determine the number of clusters. The cluster trees is output by the program “proc tree.”

The logistic regression model was used to evaluate the association between dependency and community environment resources and the associated risk factors. The dependency score was treated as a binary variable. If a participant’s T-score on the dependency scale was greater than or equal to 60 points, then they will be regarded as a dependent individual in the binary dependent variable of the logistic regression model, expressed by “1,” and “0” was used for scores lower than 60 points. The model included all the community environment variables that were significant in the univariate analysis, adjusted for important confounding factors such as age, gender, income satisfaction, alcohol use, smoking status, physical activity, chronic disease status, social support level, and EPQ scores.

We conducted two separate logistic regression models by the age and levels of social support, to compare the association between dependency and community environment resources in different age groups and levels of social support. The age was divided into two categories: under 70 years and over or equal to 70 years. The levels of social support were divided into two categories: less than 11 points and greater or equal to 11 points by the median. Models were also adjusted for gender, income satisfaction, alcohol use, smoking status, physical activity, chronic disease status, and EPQ scores. All analyses were performed using SAS for Windows (version 9.4).

Results

The characteristics of the study participants are presented in Table 1, and the highlights are as follows: 37.7% were aged over 70 years, 58.4% were female, 41.6% were male, approximately 19.6% were non-married, and 66.7% had been diagnosed with one or more chronic diseases. 12.8% of the participants were assessed as having dependency, and no significant difference between males and females was observed.

Table 1
 Characteristics of study participants in the study

Variable categories	n	%
Characteristic variables (n, %)		
Sex		
Male	380	41.6
Female	533	58.4
Age (yr)		
60–69	569	62.3
≥70	344	37.7
Marital status		
Married	734	80.4
Non-married	179	19.6
Education levels (yr)		
0–6	176	19.3
7–9	353	38.7
10–12	211	23.1
13+	173	18.9
Individual income		
¥0 to 1,999	550	60.2
¥2,000 to 3,999	230	25.2
¥4,000 to 5,999	87	9.5
¥6,000 and Over	46	5.1
Smoking status		
Yes	126	13.8
No	787	86.2
Alcohol use		
Yes	186	20.4
GDS-15: the 15-item Geriatric Depression Scale		
EPQ: the Eysenck Personality Questionnaire		

Variable categories	n	%
No	727	79.6
Physical activity		
Yes	360	39.4
No	553	60.6
Chronic disease status		
Yes	611	66.9
No	302	33.1
Measured Variables (Mean, SD)		
Dependency scores	43.4	12.8
GDS-15 scores	3.4	3.0
EPQ scores	22.3	4.1
GDS-15: the 15-item Geriatric Depression Scale		
EPQ: the Eysenck Personality Questionnaire		

The tree graph by cluster analysis is presented in Fig. 2. The 34 variables of the community environment that were significantly associated with dependency were divided into six categories. The first category can be summarized as follows: community primary preventive care service resources (e.g., diet and health guidance for elderly and chronic patients), contracted family doctor services, screening for common diseases, regular home visits for the elderly living alone and disabled, the utilization of electronic health records, and holding regular lectures on general health knowledge. Other community environment variables can be classified into the following categories: utilization of and satisfaction with community services, community culture, and basic living facilities; psychological, cognitive, and comprehensive nursing resources; employment and caregiver guidance organizations; and home living support services. We put the score of dependency into the cluster analysis model to investigate the association between the score of dependency and the environmental resources of the community. The score of dependency was classified into the category of community primary preventive care service resources, and no significant change in those variables in another category was observed.

Table 2 presents the odds ratios (ORs) of the community environment resources for dependency using logistic regression models. The participants who responded “yes” to “Do you think it is necessary for community medical staff to assess your health status” and “if there is a short-term care home for the elderly in your community” were compared with the participants who responded “no” to the same items. The result was as follows: these community environment variables were significantly positively

associated with levels of dependency in the logistic regression analysis, namely the OR was 2.10 (95% CI, 1.33–3.34, $P = 0.001$) and 2.40 (95% CI, 1.40–4.09, $P = 0.001$). Other community environmental resources such as the community geriatric ward, regular lectures on health knowledge, and screening for common diseases were also positively associated with levels of dependency: the OR was 1.97 (95% CI, 1.23–3.18, $P = 0.005$), 1.50 (95% CI, 1.06–2.14, $P = 0.023$), and 1.56 (95% CI, 1.05–2.34, $P = 0.029$), respectively. The community cultural activity center, supermarket or agricultural market, and volunteer service were negatively associated with levels of dependency: the OR was 0.50 (95% CI, 0.34–0.69, $P < 0.001$), 0.57 (95% CI, 0.38–0.86, $P = 0.007$), and 0.56 (95% CI, 0.40–0.79, $P = 0.001$), respectively.

Table 2

The odds ratios of community environment resources and other related risk factors for dependency by logistic regression models

Variables	Multivariable adjusted		
	Odds Ratios	95% CI	<i>P</i> value
Received community health services (times)	1.27	1.08 1.48	0.004
The need for health assessment (n/y)	2.10	1.33 3.34	0.001
Community geriatric ward (n/y)	1.97	1.23 3.18	0.005
Short-term care home (n/y)	2.40	1.40 4.09	0.001
Regular lectures on health knowledge (n/y)	1.50	1.06 2.14	0.023
Screening for common diseases (n/y)	1.56	1.05 2.34	0.029
Community cultural activity center (n/y)	0.49	0.34 0.69	<0.001
Volunteer Service (n/y)	0.57	0.38 0.86	0.007
Supermarket and agricultural market (n/y)	0.56	0.40 0.79	0.001
Age (y)	1.03	1.01 1.06	0.004
Social support (score)	0.86	0.82 0.91	<0.001
Chronic disease status (y/n)	0.71	0.52 0.96	0.027
Income satisfaction (n/y)	1.61	1.39 1.87	<0.001
EPQ scores (points)	1.13	1.09 1.17	<0.001

The age-specific results by separated logistic regression models are shown in Table 3. In the group aged under 70 years, the utilization of electronic health records and the need for health assessments, rehabilitation equipment rentals, and community nursing homes were significantly associated with the levels of dependency scores: the OR was 2.81 (95% CI, 1.90–4.14, $P < .0001$) and 2.25 (95% CI, 1.24–4.06, $P =$

0.007) and 2.13 (95% CI, 1.02–4.43, $P = 0.043$), and 1.90 (95% CI, 1.12–3.24, $P = 0.018$), respectively. The community cultural activity center and supermarket or agricultural market were negatively associated with levels of dependency.

Table 3
The odds ratios of community environment resources for dependency by the age-specific

Variables		Multivariable adjusted Odds Ratios	95% CI		P value
Age < 70	Received community health services	1.26	1.03	1.55	0.024
	Utilization of electronic health records	2.81	1.90	4.14	< 0.001
	The need for health assessment	2.25	1.24	4.06	0.007
	Rehabilitation equipment rental	2.13	1.02	4.43	0.043
	Community nursing home	1.90	1.12	3.24	0.018
	Community cultural activity center	0.35	0.22	0.56	< 0.001
	Supermarket and agricultural market	0.57	0.38	0.85	0.006
	Age \geq 70	Received community health services	1.49	1.18	1.88
Age \geq 70	Short-term care home	4.01	1.64	9.80	0.002
	Day care and nursing service	2.41	1.13	5.17	0.024
	Transportation service	1.86	1.03	3.36	0.040
	Regular lectures on health knowledge	1.93	1.21	3.08	0.006
	Canteens for the elderly	0.30	0.13	0.71	0.006
	Volunteer Service	0.38	0.21	0.70	0.002
	Cafe or tea room	0.50	0.26	0.95	0.034
	Library	0.46	0.24	0.87	0.018

In the group aged 70 years and over, a short-term care home was strongly associated with levels of dependency: the OR was 4.01 (95% CI, 1.64–9.80, $P = 0.002$). The daycare and nursing service, transportation service, and regular lectures on health knowledge were associated with levels of dependency: the OR was 2.41 (95% CI, 1.13–5.17, $P = 0.024$), 1.86 (95% CI, 1.03–3.36, $P = 0.040$), and 1.93 (95% CI, 1.21–3.08, $P = 0.006$), respectively. The canteens for the elderly, volunteer service, libraries, and cafes or tea rooms were negatively associated with levels of dependency. The received community health services were positively associated with levels of dependency in the groups aged under as well as over 70 years.

The social support levels-stratified results using the separated logistic regression models are shown in Table 4. The number of times that community health services were received was significantly associated with levels of dependency in both the high level of social support group and the low level of social support group. In the group with a low level of social support, the following were significantly associated with levels of dependency: an emergency call or monitoring system, transportation services, the need for health assessment, and regular lectures on health knowledge: the OR was 2.42 (95% CI, 1.29–4.52, $P = 0.006$), 2.19 (95% CI, 1.18–4.07, $P = 0.013$), 1.89 (95% CI, 1.06–3.36, $P = 0.031$), and 1.98 (95% CI, 1.29–3.02, $P = 0.002$), respectively. The volunteer service and cafe or tea room were negatively associated with levels of dependency.

Table 4

The odds ratios of community environment resources for dependency by the social support levels-specific

Variables	Multivariable adjusted	95% CI		P value	
	Odds Ratios				
LSS*	Received community health services	1.28	1.02	1.60	0.036
	Emergency call or monitoring system	2.42	1.29	4.52	0.006
	Transportation service	2.19	1.18	4.07	0.013
	The need for health assessment	1.89	1.06	3.36	0.031
	Regular lectures on health knowledge	1.98	1.29	3.02	0.002
	Volunteer Service	0.44	0.25	0.76	0.004
	Cafe or tea room	0.30	0.17	0.51	< 0.001
HSS*	Received community health services	1.54	1.25	1.89	< 0.001
	Community geriatric ward	2.37	1.24	4.53	0.009
	Short-term care home	2.93	1.37	6.25	0.006
	Regular lectures on health knowledge	1.82	1.15	2.89	0.011
	System of regular visits	1.95	1.25	3.06	0.004
	Emergency call or monitoring system	0.40	0.21	0.77	0.006
	Elder university	0.50	0.30	0.86	0.011
	Supermarket and agricultural market	0.52	0.33	0.80	0.003
* LSS: Low levels of social support					
* HSS: High levels of social support					

In the group with a high level of social support, community geriatric ward, short-term care home, regular lectures on health knowledge, and regular home visits for the elderly who were living alone and disabled were associated with the levels of dependency: the OR was 2.37 (95% CI, 1.24–4.53, $P=0.009$), 2.93 (95% CI, 1.37–6.25, $P=0.006$), 1.82 (95% CI, 1.15–2.89, $P=0.011$), and 1.95 (95% CI, 1.25–3.06, $P=0.004$), respectively. An emergency call or monitoring system, elder universities, and a supermarket or agricultural market were negatively associated with levels of dependency.

Discussion

In this study, based on the resource dependence theory, we explored the association between dependency and community environmental resources. Our results showed that the community environment resources were significantly associated with dependency among the elderly. The association between dependency and community environmental resources differed among the elderly by age group and social support level.

The prevalence of dependency steadily increases because of population aging, chronic health conditions, and changes in society [24]. In traditional countries, the family is the main healthcare resource. However, with the change in the world's population structure and social economy, the family is no longer the main healthcare resource [25, 26]. In addition, studies have shown that dependency can lead to prolonged hospital stays, increases in unnecessary medical costs, and excessive dependence on caregivers that adversely affect their physical and mental health [27]. Although these studies have revealed that dependency can lead to adverse outcomes and consequences, they have not yet explored the improvement strategy by considering the dependency object as the resource demand. The increasing demand from the elderly for complex care requires sustained input from family caregivers or community health or social services to support independent living [28]. Even in resource-rich countries, the demand for home care services has increased. Alternative services have been developed to enable individuals to remain independent in terms of personal care activities if possible or can be provided through the improvement of services. Such services may enhance independence, reduce dependency, and lead to cost reductions [29, 30].

In addition, the elderly are usually considered a vulnerable group that is likely to be affected by a poor community environment. A number of studies have reported that the elderly group spends a lot of time in the community and is more dependent on local resources and services than other groups [31]. Community environments might play a major role in supporting healthy aging, and the provision of friendly living environments for the elderly is a public health concern that should be on the agenda of local governments [32]. However, an evidence-based approach is necessary to understand the interactions between community environmental and health demands among the elderly. Therefore, based on the theory of resource dependency, this study used the logistic regression model to quantitatively evaluate the association between community environmental resources and dependency. This analysis showed that a resource-rich community environment was associated with the reduced risk of dependency among the elderly. These resources, such as community cultural activity centers, libraries, cafes or tea rooms, universities for the elderly, supermarkets and agricultural markets, canteens for the elderly, volunteer services, and emergency call or monitoring systems, were negatively associated with dependency.

Several studies have assessed the association between the community environment and the health of the elderly who reside in it but more focused on behaviors, satisfaction with living, and depression [33]. However, the measurements of community environment considerably varied between different research fields. The U.S. Department of Housing and Urban Development developed the Healthy Communities Assessment Tool to assess the community environment from the following three aspects: physical,

social, and economic roots of community health [34]. The Public Health Agency of Canada established the Age-Friendly Communities Evaluation Guide to evaluate their age-friendly community initiatives [35]. Age-friendly communities help their older residents remain healthy, active, and independent and enable them to make important contributions as they age. The measurable indicators applicable to the eight domains of community life include the 43 items being addressed in age-friendly programming. Studies have shown that physical, social, and psychological environments may affect an individual's mental health and have suggested that the environment may play a particularly important role in the mental health of older adults compared with younger adults. However, studies focusing on dependency and the community environment have paid little attention to other environmental factors or have weak research designs, often without control for confounding variables. In this study, we used the EPQ scale to assess the personality characteristics of the participants, and the association between community environmental factors and dependency was adjusted using the EPQ score, to remove the effect of the important risk factor. Notably, studies have not comprehensively explored this association.

Studies have shown that a high level of social support may reduce the dependency of the elderly [36]. We divided the participants into two groups according to the score of social support. In the low level of social support group, the emergency call monitoring system was significantly associated with a high level of dependency. The common characteristics of the elderly with a low level of social support are that they do not live with their families, have fewer social interactions and outings, have a sense of loneliness, and are often left unattended when ill. Therefore, they must be provided with a system or service to make them feel safe and secure in their own homes. For the elderly with a high level of social support, dependency was associated with short-term care homes. This group prefers to live at home with their families and only uses short-term care temporarily when they are sick or need treatment. Studies have shown that older individuals prefer to live in their homes as their age increases. These results are supported by our findings, that is, with the increasing number of elderly individuals in the community, the demand for short-term care homes and daycare and nursing services will increase.

Few studies have discussed the association between dependency and community environmental resources from the perspective of resource dependency. One study demonstrated that the understanding of dependency on community services usually has negative characteristics [37]. However, dependency was not a totally negative or positive concept; instead, a gradient exists between negative and positive understandings. Dependency on health services can be described as a positive condition for patients because it helps them feel as if they are in a safe and comfortable place. More recently, dependency on community services has been seen as being on a continuum of more or less autonomy. Moreover, the situation might be an often necessary and helpful temporary phase toward full autonomy. It is the transitory and ever-changing state of dependency on community services that contrasts with a static form of institutional dependency and makes dependency not an entirely negative phenomenon.

With aging, the elderly become more vulnerable to environmental challenges. Additionally, dependency and depression increase with age and are mainly caused by social factors, mostly in vulnerable groups and the elderly with a low social support level [38]. The community environment is particularly important

for the well-being of the elderly, especially for their mental health [39], for example, living among peers of a similar age. Therefore, based on the resource dependency theory, our study's discussion was on the demand for resources. We used quantitative analysis to evaluate the association between dependency and community environmental resources. These results also verify the association between community environmental resources and the mental health of the elderly, and provide a scientific basis for improving community resources and dependency intervention.

This study has several limitations. The association between dependency and community environmental was based on a cross-sectional design; thus, the causality could not be discussed. This complex and changing trend of environmental factors and the change in the association of dependency over time cannot be evaluated and observed. For example, whether the elderly reduce their utilization of and dependency on community primary preventive care service resources by increasing the allocation of elderly-friendly facilities in the community (e.g., community cultural activity centers, elder universities, and cafes or tea rooms) was not confirmed by our study design. In addition, although our study fully considered the community environmental resources' variables and important risk factors, our sample size was too small to evaluate the interactions between the community environment and dependency. Thus, further research is necessary to explore the strategies and effects of improving community environmental dependence.

Conclusions

This study applied the theory of resource dependence to examine whether the community environment was significantly associated with dependency among elderly individuals. The community primary preventive care service resources were associated with increased levels of dependency, and the community cultural and living facilities were associated with reduced levels of dependency among the elderly in the community. Our results suggest that dependency on community environment resources leads to a combination of negative and positive experiences. Additionally, our results might guide future evaluations of community resources provided by such services, to improve the understanding of what interventions must be implemented to further support the elderly in the community in their lives and promote their autonomy. Through improving the environment, a positive community for the elderly can be created, enabling them to extend the amount of time they can remain in their residence.

Abbreviations

OARS: Older American Resources and Services

EPQ: Eysenck Personality Questionnaire

ORs: Odds Ratios

Declarations

Ethics approval and consent to participate

All participants provided informed consent before participation. The study was approved by the institutional review board at the School of Public Health, Zhejiang University (No: ZGL201909-10).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no conflict of interest.

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Authors' contributions

YL: Conceptualization and design, Funding acquisition, Supervision, Formal analysis, Writing - original draft, YYP: Conceptualization and design, Formal analysis, Writing - original draft, Data collection, YC: Writing - review & editing, Data collection, PYC: Writing - review & editing, Data collection, NWL: Writing - review & editing, Data collection.

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Figures



Figure 1

Distribution of study area in China. Resources from: <https://www.tocreating.com/ppt/a7kn3.html> Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

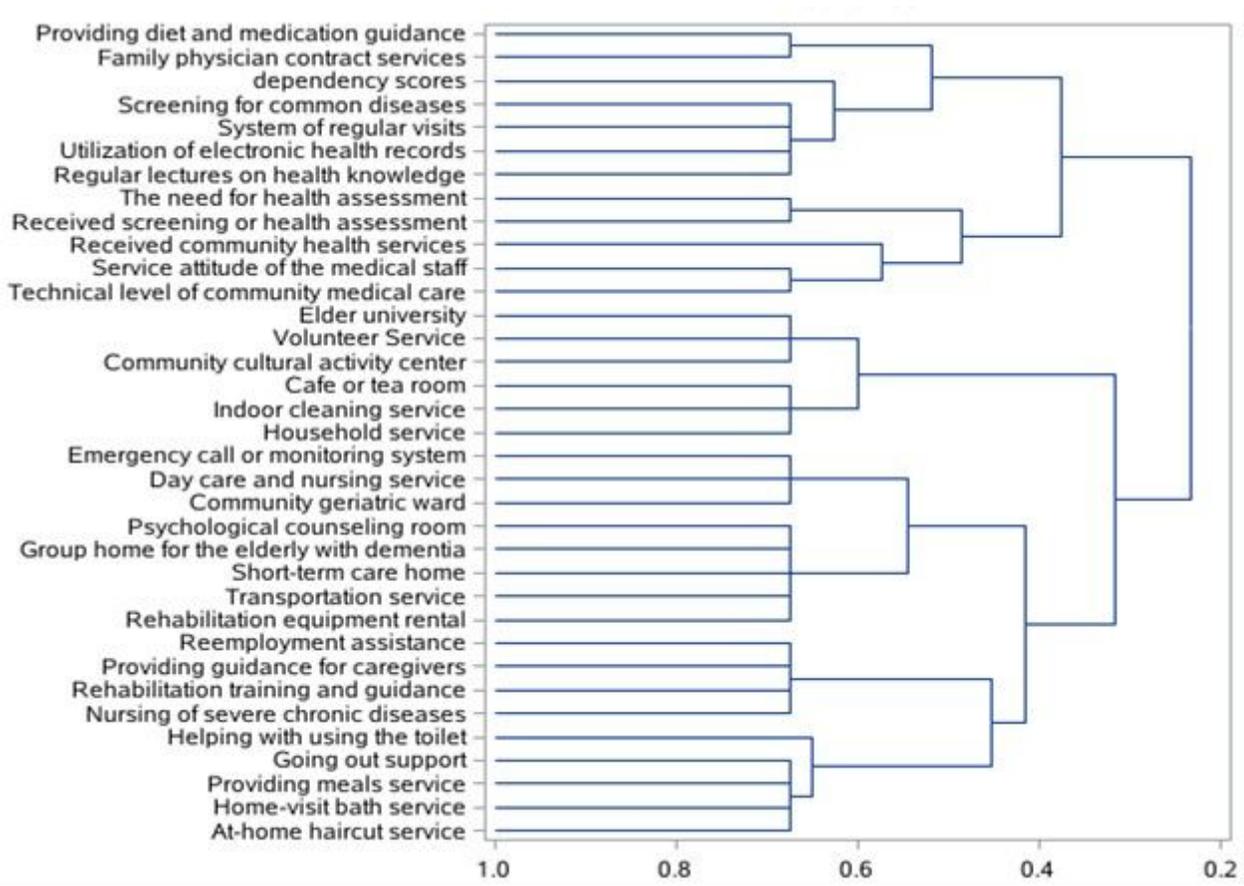


Figure 2

The tree graph of community environment resources by cluster analysis.

Supplementary Files

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- [Questionnaire.doc](#)
- [STROBEchecklistv4crosssectional.pdf](#)
- [DatainBrief.csv](#)