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Community Facilities and the Health of Older Adults in China

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COMMUNITY FACILITIES AND THE HEALTH OF OLDER ADULTS IN CHINA

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ABSTRACT

Previous research has indicated that there is an association between community characteristics and health status among older adults, but the mechanisms underlying this relationship, and what factors may moderate this relationship are unclear. This study attempts to fill this gap by assessing whether physical/social activities mediate the relationship between community facilities and the health of older adults using CHARLS 2011 survey including 6,651 older adults in China. In addition, this study tests gender differences in this relationship. Communities are primarily operationalized using government-defined boundaries. Health status is characterized by overall self-rated health and functional limitation. As predicted, this study found out older adults who live in the community with more of a variety of community facilities are healthier. The current study shows that physical activity and social activity are significantly positively associated with self-rated health and negatively associated with functional limitation, but they do not mediate the relationship between variety of community facilities and health outcomes. This study also found out positive effects of variety is more evident on women than men.

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INTRODUCTION

The relationship between place and health has long been recognized as an important topic in several disciplines for over three decades. From a geographic perspective, scholars have been interested in the characteristics of places and regions. Tuan (1974) pointed out the importance of a sense of place, which was developed by targeting special consciousness of places holding for people. Eyles (1997) further extended this idea. He argued that we experience a world of subjective pieces and we are what we experience. In other words, places of residence impact a person's opportunities for activity and experience. Several scholars suggested that future research should emphasize social, economical, cultural, and other "population factors" (Pearce, 1996; Diez-Roux, 1998). In addressing the relationship between micro-level and macro-level factors, Macintyre, Maciver, & Sooman (1993) conducted a systematic review on the association between area and health. They confirmed that successful improvements in public health should include populational as well as individual factors. At the same time, Kearns (1993) engaged public health concerns through social theory, and contributed a reformed medical geography in the medical field.

Sociologists have also proposed their perspectives about the impact of geographic location on health (Ross, 2000; Wen, Browning, & Cagney, 2007). Cattell (2001) conducted interviews with more than 100 respondents from two neighborhoods including 70-74 residents and 30 workers. He argued that both individual's experiences and neighborhood factors could have an impact on social capital and poor health chances.

Macintyre, Ellaway, and Cummins (2002) suggested future research should focus on the potential impact of features of the local social and physical environment on human health. Recently, increasing studies are focusing on resolving community-related problems (Witten, Exeter, & Field, 2003). Different communities vary in different health-related behaviors that are partially due to community characteristics, such as community social economic status and residential instability. Ross (2000) discovered that residents in neighborhoods with higher average levels of education were more likely to walk, and poor neighborhood residents were more likely to smoke. Later, Wen et al. (2007) examined the impact of structural characteristics on physical activity and suggested that future research should pay more attention to incorporate local environmental features.

With a lot of academic exploration and development done in the past decades, the study of place and health has evolved into a meaningful research field. First, the relationship between place and health is a multi-disciplined topic that involves great possibilities for future research (Tuan, 1974; Diez-Roux, 1998; Macintyre, 2002; Smith, et al., 2013). Second, on the community level, well-built communities have a positive impact on the relationship between residents' perceptions and satisfaction level, and overall health (Leslie, & Cerin, 2008). On a more general social level, this set of research can serve as an important indicator of the success of community building implementation (Frumkin, Frank, & Jackson, 2004; Shen, 2014).

In addition, studying place and health in China is particularly important. As we all know, China is the largest developing country with more than 5,000 years of culture, which is quite different from the United States, especially in terms of culture and lifestyle

(Kim, Popkin, Siega-Riz, Haines, & Arab, 2004). Older adult Chinese populations have been increasing at an extraordinary speed (Zeng, & Wang, 2014). At the same time, improved social mobility and massive opporpunities, like urbanization, have changed old stratification rapidly with arising problems (Chen, & Qin, 2014). As a result, older Chinese adults are experiencing great shifts, physically and socially. Public and social service functions have transferred from individual entities to communities since the 1980s, like the health facility system (Zhang, & Zhang, 2009). As with most social policies in China, community building itself was done differently among communities which didn't provide uniformed implementation (Shen, 2014). Under these circumstances, there is an urgent need to develp a general guideline for community building for residents, especially for the older adults living in a large number of different communities. Therefore, the study of place and health is of great importance for an individual well-being and for societal harmony.

The current study employs the 2011 National Baseline Survey of the China Health and Retirement Longitudinal Study (CHARLS) to examine the relationship between community facilities and health status involving gender perspectives. Health status is characterized by overall self-rated health and functional limitation. This research is designed to further clarify the mechanisms of the impacts from community level on the health status of older adults, specifically focusing on community facilities. The use of community facilities is directly associated with physical activity among older adults which impacts health status. This paper intends to answer three research questions: (1) whether the variety of community facilities is an influential factor in older adults' health

in China; (2) whether activity participation mediates the association between community facilities and health; and (3) whether gender moderates the association between community facilities and health.

Despite a large amount of research suggesting the noticeable influence of place on individuals' health, there are some limitations in previous research. First, the mechanisms underlying these relationships and what factors may moderate these relationships are unclear. Second, there is a lack of utilization of up-to-date and reliable results in previous place and health studies in China. Although more recent studies on China have used national data, a more detailed update is still needed, as China is still experiencing rapid change. The current study will use a national survey of older adults -- China Health and Retirement Longitudinal Study (CHARLS), and will focus more on specific built facilities around communities. Therefore, these results can be generalized to the larger population with specific focus on older adults. Understanding specific effects of community facilities will contribute to a full picture of contextual impact of place, and will also provide clear instructions for area-based health policy interventions. Third, previous research has not sufficiently addressed the gender difference on the relationship between community facilities and health functioning, although many previous studies have addressed gender differences when they studied health functioning (Verbrugge, 1984; Yi, Liu, & George, 2003). Considering gender as a social force, this paper will also examine the gender gap among older adults in terms of using community facilities, and in the level of activity participation. This may explain the differential impact of community facilities and activity participation on health status for men and women.

LITERATURE REVIEW

Community and Health

There are a lot of determinants of health in the public health field. And health problems have been investigated by scholars from various perspectives, including the impacts of community characteristics (MacQueen, McLellan, Metzger, Kegeles, Strauss, Scotti, Blanchard, & Trotter, 2001; Sharma, 2003; Robinson, 2005). Previous analyses have also confirmed the importance of place in China. According to Smith, Tian and Zhao (2013), communities have been the central distributing centers for service delivery and social interactions among residents. Scholars have also argued that the impacts from community-level characteristics can explain a significant part of health outcomes of residents (Strauss, et al., 2010; Smith, et al., 2012). There is a need to include macro-level variables in explaining health variations.

Throughout the history of public health, we can see that this field essentially originated from ecology, by relating environmental and community characteristics to health. This also implied an essential link between place and health (Brockington, 1979; Fee, 1991; Diez-Roux, 1998). In terms of ecological models of health behavior, this emphasizes both environmental and policy contexts of behavior, and the core concept is behavior with multiple levels of influences (Sallis, Owen, & Fisher, 2008). Those levels often include personal, community, physical environmental, and policy aspects (Sallis, et al., 2008). More importantly, ecology models of health behavior can be one effective way

to develop a comprehensive approach towards targeting mechanisms between health behavior and environment.

Firstly, what is a community? As we can see from the literature, the term community has been used frequently in the social sciences, especially during community-based participatory research in recent decades. MacQueen et al. (2001) conducted qualitative interviews across US communities. They confirmed the validity of the common definition of community, which he defined as "community emerged as a group of people with diverse characteristics who are linked by social ties, share common perspectives, and engage in joint action in geographical locations or settings" (2001:1929). Distinguishing a community from a geographic place is one of the major contributions of this definition. That is, a community is more than a location, which involves many social implications. Secondly, this definition provides a link between community as a group and social outcomes. As long as we acknowledge the sociological meaning behind communities, we can discover a lot of phenomena that were previously unnoticed.

City planning sectors have done a great amount of work on community wellbeing. One of the significant segments is the community facility. However, what are community facilities? In the city comprehensive plan from Faribault, MN, community facilities were named for housing services and activities that were provided by the government or other similar entities. Those facilities were intended to be established upon a strong base of social, cultural and recreational purposes, including indoor swimming pools, fitness centers, senior centers, and libraries. In particular, Colchester Borough Council (UK 2013)

defined it as a building or space for community benefits, managed and used voluntarily by the community. They further explained that those facilities could promote health, welfare, education, and training. More importantly, those facilities could also prevent anti-social behaviors. Many diverse activities could take place in community facilities, like IT training, bingo, and dance. Community facilities are infrastructures built for promoting residents' wellbeing in social, physical, and mental aspects.

What is the possible mechanism of the community effect on health status? The provision of community facilities with an imply provides the opportunity for forming and maintaining social relationships (Oldenberg, 1997). Townsend (1987) argued that material and social deprivation included a lack of access to material goods as well as customs, activities, and social relationships. Regarding the interactive effects between place and routine activities in daily life, Macintyre and Sooman (1993) concluded that different provisions of material resources affected residents' perception and satisfaction of their neighborhood. Similarly, Macintyre and Ellaway (2000) further described the resurgence of an interest of the impact of place on health, that is, the impact of different types of neighborhoods of residents' health. They conceptualized opportunity structure as: "Socially constructed and socially patterned features of the physical and social environment which may promote or damage health either directly or indirectly through the possibilities they provide for people that live healthy lives (2000:343)." That is, community resources have the potential to promote improved health.

Furthermore, previous research has observed that the impacts from community-level characteristics play a significant role in explaining health outcomes among residents

(Ross, & Mirowsky, 2001; Strauss, et al., 2010; Smith, et al., 2012). Smith, Tian, and Zhao (2013) argued community characteristics had strong associations with individual health and social-economic status. Understanding specific effects of community facilities will contribute to a full picture of the contextual impact of place, and will also provide a clear approach for area-based health policy interventions. As community-health research has gained more attention, more scholars have tried to understand these underlying mechanisms. Some scholars argued that such mechanisms could differ among populations (Yen, Michael, & Perdue, 2009). Yen et al. (2009) conducted a literature review focusing on older adults in particular. They argued that a neighborhood environment was an influential factor on older adults' health that highlighted the need for specific analysis on mechanisms of the impact of place on health.

Activity and Health

Recent research has begun to assess the association between the availability of facilities/settings and activity level (Roux, Evenson, McGinn, Brown, Moore, Brines & Jacobs, 2007; Moore, Roux, Evenson, McGinn, & Brines, 2008). Moore et al. (2008) suggested that improving the types and quality of resources could be an important strategy to increase physical activity. They specifically focused on the differences in availability of recreational resources, like the variety of different facilities in parks as well as the quality of those facilities. In the meantime, Roux et al. (2007) examined the association between the density of recreational resources and physical activity levels from 2,723 adult residents aged 45 to 84 years old. They discovered that residents having the highest density (differences in availability) of resources were more likely to report

physical activity than those from lower areas. This effect was stronger among minority and low-income residents. As a result, Roux et al. (2007) concluded that differences in availability of resources could be one of the environmental health determinants.

Lev Vygotsky -- a Soviet psychologist in the late 1920's, first inaugurated activity theory (Kaptelinin, & Nardi, 1997). It has been popular and useful in psychology, geography, education, and information technology. In terms of the human science field, activity theory emphasizes that objective tools mediate human activity. A tool is an accumulation and transmission of cultural-historical knowledge, which in turn has an impact on the nature of human behavior (Kaptelinin, & Nardi, 1997). According to activity theory, people with more frequent social interactions and engagement in society have a greater possibility to attain better life satisfaction, enhanced self-image, and positive adjustment when getting old. Alexei Leontiev (2014) further clarified the theory by distinguishing activity from action. He emphasized that a community undertook activity with an "object" and a "motive" (Leontiev, 2014). Lemon, Bengtson, and Peterson (1972) more formally developed activity theory by specifying the nature of the relationship between activity and life satisfaction. They classified activity into three realms: formal, informal, and solitary. Jenkins, Pient, & Horgas (2002) further analyzed the impact from different types (active, passive, outside community, and inactive) of discretionary activity on health-related quality of life. They discovered that time spent in active, passive, and outside community types of discretionary activities were significantly associated with a higher level of quality of life. As we can see, those classifications have overlaps.

In order to understand the mechanism of combined effects of informal activities on health, we focused on examining everyday activities. There are several ways to classify them. Horgas, Wilms, and Baltes (1998) conceptualized everyday activities as obligatory activities (e.g. IADLs, shopping, and banking) and discretionary activities (e.g. socializing). Some scholars divided them into three classes: physical (e.g. walking, acitive sports, and Taiji), social (attending temple, joining social group activities, and day trips), and productive (shopping, community work, and preparing meals) (Menec, 2003; Niti, Yap, Kua, Tan, and Ng, 2008). This approach classify everyday activities is different in nature from the former two. That is, these are not mutually exclusive. As Niti et al. (2008) argued, both social and physical domains are embedded in dancing. There is no exclusive approach to distinguish physical activity from social activity. However, we can classify those from each other by their predominant meaning. On the one hand, periodical exercise can be grouped into physical activity. All other activities embedded with interactions during leisure time can be grouped into social activities, which can include attending temple, joining social group activities, day trips, and volunteer work.

For several decades, scholars have drawn consistent attention to activity in the field of public health. Dating back to July 1994, the office of the Surgeon General guided researchers to synthesize existing literature concerning the impact of physical activity on health and approaches to increase physical activity. With rapid urbanization taking place in China, scholars had confirmed that there was a strong association between physical inactivity and adverse health disease risk, cardiovascular disease risk, and hypertension among Chinese residents (Yu, et al., 2000; Gu, et al., 2002; Hong, et al., 1994). Physical

activity is considered to be as beneficial for all age groups in terms of overall wellbeing. Chad, Reeder, Harrison, Ashworth, Sheppard, Schultz, Bruner, Fisher, and Lawson (2005) examined the association bewteen physical activity level and health factors among older adults (mean age = 77.4 +/- 8.6 yr) of all ranges. The results confirmed that lower physical activity levels were associated with depreciating health status. Physical inactivity, smoking, and heavy drinking all had negative effects on health, especially for older adults (45 years old+) (Chatterji, Kowal, Mathers, Naidoo, Verdes, Smith, and Suzman 2008). Also, Matthews et al. (2007) confirmed the importance of physical activity among Chinese women (40-70 years old) in terms of longevity determinants.

However, physical activity alone is insufficient to achieve recommended levels of overall health (Giles-Corti, & Donovan, 2002; Bauman, Allman-Farinelli, Huxley, and James, 2008). Bauman et al. (2008) argued that physical activity alone was not sufficient for preventing obesity in China. They suggested promoting "active living". In other words, social activity is needed. Social activity can be characterized as enjoyable parts of everyday life, which have a great impact on health status in general (Graney and Zimmerman 1980; Giles-Corti, & Donovan, 2002). Graney and Zimmerman (1980) found that social participation-activity measures were directly correlated to elders and their self-reported health. Those social participation-activity measures included general activity, sexual activity, hobbies, organizations, and friends, which were embedded in social interactions. Zimmer, Hickey, and Searle (1995) tested the association between activity participation and wellbeing among elders. The results showed that those who

maintained higher levels of participation in social activity were less likely to experience a decline in wellbeing.

Giles-Corti and Donovan (2002) also included individual factors, social factors, as well as physical environmental determinants. Their results suggested that positive individual factors and positive social environmental factors had a great influence on the recommended level of being active. More importantly, the study found that social environmental factors (i.e. club membership; frequency of participation in physical activity by five significant others; frequency of a significant other doing physical activity with a respondent) outweighed the influence from physical environmental determinants of exercising. For older adults, scholars confirmed the importance of social activities by examining the relationship between everday activities and indicators of well-being (Menec, 2003; Niti, et al., 2008). Among those, Niti et al. (2008) focused on 1,635 older Chinese adults (55 yd +). The results showed that increased levels of leisure activity, including social actvity, was associated with a lowered risk of cognitive decline. In terms of gender difference in physical activity, Azevedo et al. (2007) interviewed 1,344 men and 1756 women in Brazil and found out men were more likely to participate in organized activities as guided by specific instruction.

Gender and Health

Relational theory is a popular approach to explain the relationships inside of physical systems. It posits that positions and properties of objects are only meaningful when they are relative to other objects (Goldner, 1991). From relational theory perspective, gender is a multidimensional concept –embracing economic relations, power

relations, affective relations, and symbolic relations. It operates on intrapersonal, interpersonal, institutional and social levels at the same time (Connell, 2009). Connell (2012) further posited that gender changes might occur in one dimension at a different pace, or even a different direction. Gender is one dimension of everyday life, but has a different impact on male and female, because of gender structure. These practices are embedded in dense and active social tissues among intimate relationships. At the same time, it supported activity theory. Kaptelinin & Nardi (1997) argued tool is an accumulation and transmission of cultural-historical knowledge, which in turn has an impact on the nature of human behavior. Given the multidimensional nature of gender, the complex effects of gender on health have been studied a lot.

It has long been recognized that women universally live longer than men at all ages, and it is also well documented that women experience generally worse health than men (Verbrugge, 1984; Oksuzyan, 2010). Gender gaps also existed in China. Yi, Liu and George (2003) found out that the oldest females in China were more disadvantaged than males in terms of health status. Kaneda, Zimmer, Fang, and Tang (2009) further proved that Chinese women were more likely to survive but with higher level of functional limitations. Since the start of the Reform and Opening Up Policy in 1978 in China, social inequalities have been increased substantially, including gender inequalities. However, there is a sufficient amount of information about the gender health gap among Chinese people. Besides that, Chinese women are always considered seriously disadvantaged compared to women in western countries (high illiteracy rate among women, female infant mortality rate). Thus, there is a need to focus on the Chinese context.

Regarding the reason for gender differences, some researchers have argued that those were attributed from behavioral and psychosocial determinants (Denton, Prus, and Walters, 2004). On the one hand, Courtenay (1998) argued that the college health disadvantage of men could be explained by masculinity and stereotypes based on a multidisciplinary overview. He found out that men who adopt traditional attitudes of manhood were more likely to be less healthy than those who adopt less traditional attitudes. On the other hand, in the field of gender and health, a significant number of studies focused on the power of social context (Vanwesenbeeck, 2009 ; Gochfeld, 2010). They argued gender could only be understood within social meanings through interrelated biological, social, and cultural processes. Another example is from Bird and Rieker's multi-level model (2008), they contextualized people's "constrained (health) choices" as influenced by the communities they live in and the range of social factors that directly impact their lives. They argued that an ideal community was the place that had the possibility to encourage social interactions and spending time outdoors.

More specifically, some scholars have also tried to explain the gender gap from a group level, which included not only individual attributes but also community level determinants. Some researchers have discussed the level of community embedded-ness among women (Papanek, 1994; Howard-Hassmann, 2002). Women were more likely to achieve their identity from their family roles, which were also more often characterized by various degrees of embedded-ness in their families and communities (Howard-Hassmann, 2002:237). Abrahams (1996) emphasized that community participation was especially good for the women's betterment, family, and community. Lee (2005)

confirmed that women were more involved in household-related activities. Kennedy (2010) also tried to understand the reason for higher degrees of embedded-ness for women. He clearly posited that women were more embedded than men in local networks because of their domestic roles. And schoalrs have found that women's networks were more multifaceted in that they served more functions than men's networks (Antonucci, & Akiyama, 1987). Besides that, scholars have confirmed the positive association between involvement in activities and health among women who both received and used all types of support. For instance, Denton and Walters (1999) explored the gender differences in structual and behavioral determinants of health and found out social-related factors had more influence on women's health. Agahi and Parker (2008) also argued that social activities had the strongest effects among women, whereas men were more likely benefit from solitary activities, in terms of mortality risk. Overall, social participation is more affective to women than men. With each additional dose in social activity, women were less likely to be in the higher level of mortality risk.

HYPOTHESES

A diagram based on the literature review can be seen below in Figure I. According to the ecology model, community facilities have a direct impact on health. Physical/ Social activity could possibly be the mediator between community facilities and health. Gender could possibly moderate the relationship between community facilities and activity, community facilities and health, as well as activity and health. Based on

previous theories and research, the following three hypotheses about older adults living in China are proposed.

Hypothesis one*:* older adults who live in the community with more of a variety of community facilities are healthier. The provision of community facilities with an imply provides the opportunity for forming and maintaining social relationships (Oldenberg, 1997). Further, Cohen (1988) argued that the provision of tangible resources also had direct or indirect influence on health behaviors. Many diverse activities could take place in community facilities, like IT training, bingo, and dance. Community facilities are infrastructures built for promoting residents' wellbeing in social, physical, and mental aspects. They usually provide a variety of facilities in order to promote overall wellbeing. Previous analyses have also confirmed the importance of place in China. According to Smith, Tian and Zhao (2013), communities have been the central distributing centers for service delivery and social interactions among residents. Various facilities could hold diverse activities, in which, they can serve all kinds of needs under the implication - more of a variety of facilities support healthy lifestyle. As a result, I propose that there is a positive association between the variety of community facilities and health.

Hypothesis two: Activity (physical and social activity) participation mediates the relationship between community facilities and health. Regarding the interactive effects between place, routine and activities in daily life, Macintyre and Sooman (1993) concluded that different provisions of material resources affected residents' perception and satisfaction of their neighborhood. Moore et al. (2008) suggested that improving the types and quality of resources could be an important strategy to increase physical activity.

In the meantime, Roux et al. (2007) found out that residents having the highest density of resources were more likely to report physical activity compared to those from lower areas. As a result, Roux et al. (2007) concluded that availability of resources could be one of the environmental health determinants. Halla, Victora, Azevedo and Wells (2006) conducted a systematic review of the literature between 2000 and 2004, which showed consistent evidence that physical activity provided both short-term and long-term benefits on health. Also, White, Wójcicki, and McAuley (2009) further analyzed the relationship between physical activity, self-efficacy, and quality of life with 321 older participants (Mean Age = 63.8). They learned that there was a direct effect of physical activity on self-efficacy and confirmed the positive impact of physical activity. For older adults, Scholars confirmed the importance of social activities by examining the relation between everday activities and indicators of well-being (Menec, 2003; Niti, et al., 2008). Among those, Niti et al. (2008) focused on 1635 Chinese older adults (55 yd +). The results showed increased levels of leisure activity, including social actvity, which was associated with a lowered risk of cognitive decline. Based on these empirical findings, I propose that physical/social activity can mediate the relationship between community facilities and health.

Hypothesis three: The positive effect of community facilities on health is stronger for women than men. Some scholars have also tried to explain the gender gap from a group level, which included not only individual attributes but also community level determinants. Scholars have discussed the community embeddiness level for women (Papanek, 1994; Howard-Hassmann, 2002). Women were more likely to achieve their

identity from their family roles, which were also more often characterized by various degrees of embedded-ness in their families and communities (Howard-Hassmann, 2002:237). Lee (2005) confirmed that women were more involved in household-related activities. In other words, women are more likely to use household-related facilities, including community facilities. Kennedy (2010) tried to understand the reason for higher degrees of embedded-ness for women. He clearly posited that women were more embedded than men in local networks because of their domestic roles. One important approach they could involve in local networks is through community facilities. Crimmins et al. (2010) examined gender differences in health among older adults across 13 countries, including 11 European countries, England and the USA, to see whether different countries have different gender gaps. They compared three surveys in terms of similar gender differences on health based on health similarities but also cultural dissimilarities. They found out that the gender differences in health were consistent in terms of the direction among those countries. As we can see, there are also differences among 13 countries in terms of culture and lifestyle. Thus, I expect similar trajectory in terms of gender difference in China. I propose here that women are more likely to be influenced by the positive effect of community facilities.

DATA AND METHODS

Data

The current study uses data from the China Health and Retirement Longitudinal Study (CHARLS) 2011, which is the first baseline survey conducted by Peking University, the National Natural Science Foundation of China, and the Behavioral and Social Research Division of the National Institute on Aging and the World Bank. It is a nationally representative longitudinal survey of the middle-aged and elderly population (45+) in China along with their spouses, which includes demographics, family, health status, health care, employment, household economy, and community level modules. The baseline survey of CHARLS was conducted between June 2011 and March 2012 covering 28 provinces, 150 countries/districts, 450 communities, 17,587 respondents, across the country.

CHARLS used a multi-stage stratified sampling design and divided the whole country into four sampling stages: county, neighborhood, household, and respondent. Firstly, they stratified county-level units by region, by district and GDP per capita with the exception of Tibet. Secondly, they randomly selected 3 primary sampling units: administrative villages in rural areas and neighborhoods in urban areas within each county-level unit. After verifying the accurate sample frame of households in each community, they randomly selected 80 households per PSU and sent a letter to the residents inviting them to participate. The subscription rate is 30%. Finally, they interviewed all age-eligible (40+ yd) sample households who were willing to participate

in the survey. If there were multiple households living in one dwelling, they would randomly choose one of them. If a household has more people older than 40, then they would randomly choose one of them that had an age-eligible member. If the chosen person is older than 45, then he/she would be the main respondent, and his/her spouse would also be interviewed. If the chosen person is between 40 and 44 years old, he/she would be reserved as a refresher sample for future rounds of surveys. They did not interview households without members older than 45. Selected respondents and those respondents who are between 40 and 44 years old will be followed every two years using a face-to-face computer-aid-personal interview (CAPI).

The data used in this study was taken from demographic background, household roster, health status and functioning levels, household income, PSU (primary sampling unit), and community data. The original sample size is 17,587. The set of physical activity questions were only presented to a random subsample of households (about half). To be noted, there were just half of the respondents (N=6,910) who were asked about physical activities. Among the respondents who were selected for physical activity questions, there are 2 missing on self-rated health. There is 1 missing on functional limitation. There are 26 missing on variety, 37 missing on social activity, 3 missing on age, 2 missing on male, 3 missing on each education level, 1 missing on current drink, as well as 37 missing on community SES. After deleting missing values on health, the variety of community facilities, physical activity, social activity, control variables, and excluding those who were younger than 45 years old (N=6755), there were 6,651 respondents included. There are missing on self-rated health. There is 1 missing on

functional limitation. There are 25 missing on variety, 36 missing on social activity, 2 missing on male, 3 missing on each education level, 1 missing on current drinking, as well as 36 missing on community SES. Therefore, the sample size in this study is 6,651, including 3,065 men and 3,586 women.

Measurement

Dependent variables

Health is measured by questions asking for *Self-rated Health* (DA001, DA002) and *Functional Limitation* (DB001-DB009). Scholars have verified the validity of self-rated health and have suggested that self-rated health includes both physical and emotional dimensions of health (Idler, & Benyamini, 1997). Two scales are used to measure self-reported health. After random selection, half of the respondents were asked to rate their health: "Would you say your health is 1) excellent, 2) very good, 3) good, 4) fair, or 5) poor?" The other half of respondents were asked to rate within the following scales: 1) very good, 2) good, 3) fair, 4) poor or 5) very poor. I combine two scales into one scale and use reversed-coding, which is 1) poor/very poor, 2) fair, 3) good, 4) excellent/very good. In this way, higher values are associated with better self-rated health.

Another health measure is *Functional Limitation* (DB001-DB015), which is measured by a set of questions including: "Do you have any difficulty with (1) running or jogging 1Km/ (2) walking about 1Km/ (3) walking about 100 Meters; (4) getting up from a chair after sitting for a long period;(5) climbing several flights of stairs without resting; (6) stooping, kneeling, or crouching; (7) reaching or extending your arms above shoulder level; (8) lifting or carrying weights over 10 jin; (9) picking up a small coin from a

table?" Respondents are given four choices, which are: 1) No, I don't have any difficulty; 2) I have difficulty but can still do it; 3) Yes, I have difficulty and need help; 4) I can not do it. I recode 0="No difficulty", and leave others as 1="Difficult". Those who skipped these questions are already classified as "no functional limitation" by previous questions. Thus, I code system missing as 0, indicating no difficulty. For the first three questions above, those who indicated no difficulty were skipped to next question. Take the first questions for example, if the respondents indicated no difficulty with running or jogging about 1 Km, they would not be asked about DB002 and DB003. So I recode system missing as 0 in DB002 and DB003. After conducting univariate analyses for *Functional Limitation*, I find out most of the respondents' answers concentrated on the first two choices. Due to its left skew-ness, I dummy code 4-level-answer as "0= No difficulty" and "1=Difficult". In order to calculate the level of functional limitation, I create an index adding up all the limitations listed.

Independent Variable

My independent variable is from a Community Questionnaire answered by the office staff from each primary sample unit. This questionnaire is meant to collect general information about each primary sample unit. My independent variable is the variety of community facilities, which indicated differences in availability of different facilities. It is measured by this set of questions (JB029_1[1]-JB029_1[14]): "Does your village/community have the following type of facilities –(1) Basketball; (2) Swimming Pool; (3) Outside exercising facilities; (4) Table tennis; (5) Room for card games and chess games; (6) Room for ping-pong; (7) Association for calligraphy and painting; (8)

Dancing team or other exercise organization; (9) Organizations for helping the elderly and the handicapped; (10) Employment service; (11) Activity center for the elderly; (12) Nursing home; (13) Elderly association; (14) Other entertainment facilities?" Two choices are given: Yes and No. As we can see, there are three types of facilities- physical facilities, social facilities, and functional facilities. In order to explore those potential different impacts from various facilities, I group them into three types of facilities. And then, I conduct correlation among those but found out those are highly correlated (.5 +) with each other. And then I run correlations between each type of facility, activity, and health measures. I found out physical activity and functional limitation were negatively associated with each type of facility, whereas social activity and self-rated health were positively associated with each type of facility. Basically, it means those three types of facility are related to activity and health measures in the same way. Besides that, there is no way to figure out the nature of other entertainment facilities. So I exclude (14). Finally, I create an index just adding up the number of community facilities from (1) to (13) as *the Variety of Community Facilities.* Basically, this means greater values stand for higher levels of variety.

Intervening Variables

Physical Activity is measured by asking (DA051_1-DA051_3): "During a usual week, did you do any (1) vigorous activities; (2) moderate activities; (3) walking for at least 10 minutes continuously?" I firstly compute four levels of physical activity separately as following: no physical activity, walking only, moderate but not vigorous, and vigorous no matter other activities. Then, I select all of them and combine those four

into one variable-*Physical Activity*. I code these physical activity as following, "0=no physical activity", "1=walking only", "2=moderate but not vigorous", and "3=vigorous no matter other activities". Then I can distinguish four types of activity by the different level of coding. Please noted, there were just half of the respondents (N=6,910) who were asked about physical activities. Among the respondents who were selected for physical activity questions, there are 2 missing on self-rated health. There is 1 missing on functional limitation. There are 26 missing on variety, 37 missing on social activity, 3 missing on age, 2 missing on male, 3 missing on each education level, 1 missing on current drink, as well as 37 missing on community SES. Then, I select all respondents who are older than 45 years old, and include all of them in this measure.

In terms of *Social Activity*, respondents are asked of activities (DA056s1-DA056s12) they have participated in during last month. Those activities includes: "(1) interacted with friends; (2) played Ma-jong, played chess, played cards, or went to community club; (3) provided help to family, friends, or neighbors who do not live with you and who did not pay you for help; (4) went to a sport, social, or other kind of club; (5) took part in a community-related organization; (6) done voluntary or charity work; (7) cared for a sick or disabled adult who does not live with you and who did not pay you for the help; (8) attended an educational or training course; (9) stock investment; (10) used the Internet; (11) other; (12) none of these". Regarding the nature of social activity, I excluded (7), (9), (10), and (11). And for the last one (none of these), I treated it as 0, meaning no social activity. The index I created counts the number of activities from (1) to (6) as well as (8) that one participated in during last month.

Control Variables

Scholars have confirmed the significant impacts of demographics as well as the impacts that lifestyles have on health (Lubin, Zuckerman, Breytspraak, Bull, Gumbhir, and Rinck, 1988; US Department of Health and Human Services, 2006; Vartanian, Schwartz, and Brownell, 2007). There is a need to control for age, education, expenditure, marital status, smoking, as well as drinking. For community characteristics, I control *Community SES* (JK002), which is from community questionnaire. Interviewers were asked to rate the social economic status based on observation with a 7-point scale from very poor to very rich. Because there are part of respondents are surveyed in 2012, which is not during the start year of the baseline- 2011. So *Age* is measured by iyear (the year of survey) minus birth year (BA002_1). For those who just answered age in BA004 whereas skip BA002_1, I substituted BA004 into where they originally from. *Gender* is dummy coded (1= "male"), which is from interviewers' observation. Education is measured in levels by answers to the question "what is the highest level of education you have attained". There are 11 choices, including 1)No formal education (illiterate), 2)Did not finish primary school but capable of reading and/or writing, 3)Sishu/home school, 4)Elementary school, 5)Middle school, 6)High school, 7)Vocational school, 8)Two-/Three-Year College/Associate degree, 9)Four-Year College/Bachelor's degree, 10)Master's degree, 11)Doctoral degree/Ph.d. I divided education (BD001) into four categories and dummy coded them as following: *No education* (1= "No education"), *Elementary* (1= "Elementary"), *Middle* (1= "Middle"), *College* (1= "College") (Luo, Zhang, & Gu, 2015). The location (Urban-nbs) is measured by Urban and Rural (1=

"Urban"). As for *Expenditure on Household Living* (GE006-GE010), I add up food, necessity and entertainment costs during last year. I top-coded each expenditure item to handle those extremely large values. Take GE006 for example, respondent are asked, "In the past week, what was the value of household consumption of food, including both food purchased and food eaten from your own production (excluding eating out expenditures, alcohol, cigarettes, cigars and tobacco expenditure) ". I top-coded those more than 1,000 yuan into the 1,000 yuan group. Then I multiply by 52 weeks and get household food consumption from the last year. I used the same method to get necessity and entertain expenditure, but with different level of soft check. Then, I added up food, necessity, and entertain expenditure as *Expenditure.* Because there are still a lot extreme values and a large number of respondents missing on expenditure items, I grouped them into expenditure below 33%, expenditure between 33% and 66%, expenditure above 66%, and missing expenditure. According to Goldman, Korenman, and Weinstein (1995), marital status is associated with health among older adults. So I also recode marital status (BE001) as *Married* and *Unmarried* (1= "Married"). *Smoke* (DA059) is measured by asking, " have you ever chewed tobacco, smoked a pipe, smoked self-rolled cigarettes, or smoked cigarettes/cigars". I code those who ever smoked as 1 and who never smoke as 0. *Current Drinking* (DA067) is collected from the health functioning section by asking, "did you drink any alcoholic beverages, such as beer, wine, or liquor in the past year" I code respondents with no alcoholic consumption during the last year as 0 and code those with alcoholic consumption as 1.

Statistical Procedures

To test the hypotheses in this study, I propose the following analyses:

First, I will run univariate analyses for demographic characteristics, the variety of community facilities, physical activity, social activity, as well as health measures for the whole sample and separately for men and women. This way, I can get a basic idea about all dependent, independent, and control variables and whether there are gender differences among these variables.

Second, I will run the bivariate analysis between the variety of community facilities and self-rated health/functional limitation, physical activity and self-rated health/functional limitation, social activity and self-rated health/functional limitation separately for men and women.

Third, I will run four Ordinal Logistic Regression models and adjust for clusters to examine the association between the variety of community facilities, physical activity, social activity and self-rated health to see whether there is an association between community facility and health and the mediating roles of physical activity and social activity in this relationship, controlling for other control variables. The reason for adjusting clustering is because the respondents are from different communities, and we cannot assume those who come from the same village to be independent of one another. Adjusting clustering could help to adjust the standard errors of regression coefficient within a cluster (Yeatts, Pei, Cready, Shen, Luo, and Tan, 2013). For current study, the respondents are stratified by different communities. So I use community ID as clusters.

Fourth, I will run four Ordinal Logistic Regression models and adjust for clusters for gender interactions to test the moderating hypothesis of gender in the relationship between variety of community facilities, activity participation and self-rated health.

Fifth, I will run four Ordinal Regression models adjusting for clusters for men and women separately to further examine how men and women differ in the relationship between the variety of community facilities and activities and self-rated health/functional limitation.

Sixth, I will rerun Ordinary Least Squares (OLS) regressions adjusting for clusters on functional limitation in steps 3, 4, and 5.

The regression models in step 3 and 4 for each health outcome can be displayed as the following:

Model 1: Health= Variety + Controls

Model 2: Health=Variety + Physical activity + Controls

Model 3: Health=Variety + Social activity + Controls

Model 4: Health= Variety+ Physical activity+ Social activity + Controls

Model 5: Health=Variety + Varity*Male + Controls

Model 6: Health=Variety + Physical activity + Variety*Male + Physical activity*Male + Controls

Model 7: Health=Variety + Social activity + Variety*Male + Social activity*Male + Controls

Model 8: Health= Variety+ Variety* Male+ Physical activity + Physical activity * Male + Social activity + Social activity * Male + Controls

RESULTS

Descriptive Statistics

Table I reports all the descriptive statistics of each variable included in this study. For the 6,651 valid respondents, on a scale of 1 to 4, the mean of self-rated health is 2.009, which corresponds to "fair" health. There are four categories: very poor/poor (29.9%), fair (46.8%), good (16.2%), excellent/very good (7.2%). On a scale of 0 to 9, the mean of functional limitation is 1.936, which indicates low functional lmitations. On a scale of 0 to 13, the mean for the variety of community facilities is 3.458. For physical activity, on a scale of 0 to 3, the mean is 1.868. And for social activity, on a scale of 0 to 6, the mean is 0.704. The mean age is 59.334. There are 46.1% respondents are male and 40.2% of them live in urban areas. A substantial majority of the respondents are married. For different education levels, there are 27.6% respondents with no education, 39.6% with elementary level of education, 30.4% with middle level of education, and 2.4% of with college level of education. There are 28.2% of households with expenditure below 33%, 28.1% with expenditure between 33% and 66%, 29% with expenditure above 66%, and 14.8% with missing on expenditure. There are 37.4% respondents who have ever smoked in their lifetime and 24.9% of them drinking currently. The mean of community SES is 3.771, which is above medium level of social economic status.

In order to see the moderate impacts of gender, I separate those variables under men and women in purpose. As we can see, from Table 1, there are 5.7% more of men report good or excellent/very good health than women. Women reported more functional limitations than men. There is no significant difference on the variety of facilities for both

genders. Men reported more physical activity and social activity than women. Men are slightly older than women in this sample. For women, there are slightly more from urban arrears than men, whereas there are more men reported as married. In terms of education level, there are 40.1% of women are with no education, whereas 27.6% of men are illiterate. More of women are categorized being in lower levels of education. However, there is no significant difference on expenditure. Not surprisingly, we can see big differences in terms of smoking and drinking. There are over 70% of men ever smoking, and 45% of them current drinking. There are just 7.7% of women ever smoking, and 7% of them current drinking. As predicted, gender difference is significant on self-rated health, functional limitation, physical activity, social activity, age, married, education, smoke, and current drinking.

Bivariate Correlations among All Variables

Table 2 below presents bivariate correlations for men and women separately in this study. One of the most important purposes of correlation matrix is to check multicollinearity problem among variables. Multicollinearity problem arises when the various predictors are highly related among themselves. It will influence estimate coefficients dramatically and make the results unreliable. After conducting collinearity analysis, I found out that all of the tolerance were greater than 0.40, which indicated no collinearity problems existing. As we can see from Table 2, there are 8 pairs of the Pearson Coefficients are above 0.4. There are Self-rated health and Functional Limitation (-.418 for men and -.425 for women), Variety and Urban (.541 for men and .543), Age and Married (-.417 for men), Elementary and Middle (-.717 for men and -.405 for

women), Variety and Community SES (.406 for women). This study intended to use different strategy for two dependent variables. Thus, the high correlation between self-rated health and functional limitation will not be a problem. The high correlations among education levels in this study are not an issue. Same as Urban, they are all control variables and their unique contributions are less of a concern. A high correlation between variety and urban could results in underestimated the effects of variety, but after controlling urban and community SES, this will not an issue.

From Table 2, we can see: (1) Self-rated Health. Self-rated health is positively correlated with the variety of community facilities, indicating older adults who live in the community with more of a variety of community facilities are healthier. Self-rated health is positively related to physical activity and social activity, indicating older adults who participate higher level of physical activity/more types of social activity are more likely to be healthier. Not surprisingly, self-rated health is negatively correlated with age and lower level (elementary) of education. And it is positively correlated with higher level of expenditure (expenditure above 66%), higher level of education, urban, community SES. Surprisingly, drink is positively related to self-rated health. (2) Functional Limitation. Functional limitation is negatively correlated with the variety of community facilities, physical activity and social activity. Not surprisingly, functional limitation is positively correlated with age and middle level of expenditure (expenditure between 33% and 66%), but negatively related to higher level of expenditure (above 66%), higher level of education, urban, and community SES. Compared to those who are not married, those who are married are less likely to be in higher levels of functional limitation. (3) Variety.

Social activity is positively correlated with variety, indicating older adults who live in the community with more of a variety of community facilities are more likely to participate more kinds of social activity. Surprisingly, physical activity is negatively related with variety. (4) Physical activity is positively related to social activity.

Variety, Physical Activity, Social Activity, and Self-rated Health/Functional Limitation

Results from ordinal regression models adjusting for clusters on self-rated health, variety, physical activity, social activity, and control variables are presented in Table 3. In Model 1, the variety of community facilities is tested. As predicted in hypothesis one, the effect from variety is significant at $p<.01$ level, and it is positively associated with self-rated health. This model is reasonable for predicting self-rated health (Chi-square=348.96, df=14, P-value= .000). There is approximately 2.8% variance in self-rated health can be explained by variety and control variable. After controlling for age, expenditure, education, gender, marital status, urban, smoke, drink, community SES, variety still has a significant impact on self-rated health. The odds ratio of the variety is 1.059, which shows the positive association between variety and self-rated health. With every additional facility presented, the odds for older adults of being in higher level of self-rated health will increase by 5.9%, when controlling other variables. Besides that, in Model 1, control variables are significant too. For instance, with every one-year increase in age, the odds of being in higher level of self-rated health will decrease by 2.2% (OR=.978), controlling for other variables. And two education levels are both positively associated with self-rated health, but elementary level is not significant at <0.1 level.

Take college for example, the odds for those respondents with college level of education of being in higher level of self-rated health will increase by 146.1% (OR=2.461) than those with no education, controlling for other variables. Men are 27% (OR=1.270) more likely to report better health than women, controlling for other variables. Surprisingly, the odds for married respondents of being higher level of self-rated health are 14.6% (OR=.856) less likely than unmarried respondents, after controlling for other variables. Urban, expenditure, and community SES are not significantly associated with self-rated health in this model.

In Table 3, variety and physical activity are tested in Model 2. As predicted, the impact of variety and physical activity are both significant at $p<.01$ level, and it is positively associated with self-rated health. After controlling for age, expenditure, education, gender, marital status, urban, smoke, drink, and community SES, variety (OR=1.060) and physical activity (OR=1.174) still have significant and positive impacts on self-rated health. As we can see from Model 2, urban is marginally associated with self-rated health and all other control variables remain similar effect on self-rated health as Model 1. However, there is no evidence for supporting the mediating hypothesis (hypothesis two) as the odds ratio for variety does not decrease once physical activity is added. Variety and social activity are tested in Model 3. Also as predicted, the impact of variety and social activity are both significant at $p<.01$ level, and it is positively associated with self-rated health. As in Model 1 and Model 2, variety (OR=1.055) and social activity 15.1% (OR=1.151) are both positively associated with self-rated health. To be noted, all control variables remain similar effect on self-rated health as Model 1.

However, there is no evidence for supporting the mediating hypothesis (hypothesis two) as the odds ratio for variety only slightly decreases once social activity is added. In Model 4, variety, physical activity, and social activity are tested together. By looking at the results, it is clearly to find out all three variables are significant at $p<.01$ level, which indicating all three variables have significant influence on self-rated health. The Chi-square statistics (374.10), degree of freedom (16), and Pseudo R-square (.032) can prove the significant improvement compared with previous models. Controlling for other variables, the odds for older adults of being in higher level of self-rated health will increase by 5.7% (OR=1.057) with every additional facility presented. Controlling for other variables, the odds for older adults of being in higher level of self-rated health will increase by 16.5% (OR=1.165) with every additional level of physical activity one participated in. Controlling for other variables, the odds for older adults of being in higher level of self-rated health will increase by 13.8% (OR=1.138) with every additional types of social activity one participated in. And all control variables remain similar effect on self-rated health as Model 1.

Results from the OLS regression (adjusted for clusters) of measures of variety, physical activity, and social activity on functional limitation are presented in Table 4. In Model 1, the variety of community facilities is tested. As predicted in hypothesis one, the effect from variety is significant at $p<.01$ level, and it is negatively associated with functional limitation. There are 17.2% variance in functional limitation can be explained by variety and control variable. With every additional facility presented, there will be .072 decrease in functional limitations, after controlling for other variables. Besides

that, in Model 1, several control variables are significant too. For instance, with every one-year increase in age, the respondents will have .062 more functional limitations, controlling for other variables. And education levels are all positively associated with self-rated health, but elementary level is only significant at <0.05 level. Take college for example, respondents with college level of education will have .741 fewer functional limitations than those with no education. Men are .585 lower on functional limitations than women. Married respondents are .215 lower on functional limitations than unmarried respondents. Alcohol drinking is negatively associated with functional limitations. Urban, expenditure, smoke, and community SES are not significantly associated with functional limitation in this model.

Variety and physical activity are tested in Model 2 in Table 4. As predicted, the impact of variety and physical activity are significant at $p<.01$ level, and they are negatively associated with functional limitation. And all control variables have similar effects on functional limitation as Model 1. However, there is no evidence for supporting the mediating hypothesis (hypothesis two) as the coefficient of variety does not decrease when physical activity is added. Variety and social activity are tested in Model 3 (Table 4). Also as predicted, the impact of variety and social activity are significant at $p<.01$ level, and they are negatively associated with functional limitation. To be noted, all control variables have similar effects on functional limitation as Model 1. However, there is no evidence for supporting the mediating hypothesis (hypothesis two) as the coefficient of variety only slightly declined. In Model 4 (Table 4), variety, physical activity, and social activity are tested together. By looking at the results, it is clearly to find out all

three variables are significant at p<.01 level, which indicating all three variables have significant influence on functional limitation. There is 20.1% variance in functional limitation can be explained by this model. Controlling for other variables, older adults will have .071 fewer functional limitations with every additional facility presented. Controlling for other variables, older adults will be .338 lower on functional limitations with every additional level of physical activity one participated in. Controlling for other variables, older adults will have .15 fewer functional limitations with every additional types of social activity one participated in. Still, all control variables remain similar effect on functional limitation as Model 1. However, there is no evidence for supporting the mediating hypothesis.

Gender Differences in the Relationships among Variety, Physical Activity, Social Activity, and Self-rated Health/Functional Limitation

Table 5 tests the interaction effects among variety, physical activity, social activity and gender (hypothesis three). By adding interaction terms between gender and these variables in these models, we can test whether there are significant moderate effects of gender in the relationships between variety and health, physical activity and health, social activity and health. As we can see from Model 5 (Table 5), model with variety, control variables, and interaction term of variety and gender significantly improved the model fit (Chi-square=351.26, df=15, P-value= .000), compared with the one with intercept only. By examining Pseudo R-Squares, we find out that approximately 2.8% variance in self-rated health can be explained by those predictors. With every additional facility presented, older women will be 7% (OR=1.070) more likely to report

better health, when controlling other variables. The interaction term is significantly associated with self-rated health. Thus, there is a significant evidence to show the association between variety and self-rated health vary by gender. The odds ratio of interaction term for variety and gender is .977, which indicates the effect of variety on self-rated health is weaker for men, when controlling for other variables.

From Model 6 (Table 5), model 6 was tested with variety, physical activity, control variables, interaction term of variety and male, and interaction term of physical activity and male. There is a marginally significant evidence to show that the effects of variety on self-rated health is weaker for men. However, the interaction term between physical activity and male is not significant in this model. Besides that, variety (OR=1.071) and physical activity (OR=1.202) are positively associated with self-rated health for women. From Model 7 (Table 5), model was tested with variety, social activity, control variables, interaction term of variety and male, and interaction term of social activity and male. Variety (OR=1.068) and social activity (1.118) both have positive impacts on self-rated health for women. There is a significant evidence to show that the effects of variety (OR=.974) on self-rated health is weaker for men. However, the interaction term between social activity and male is not significant in this model. In Model 8 (Table 5), variety, physical activity, social activity, interaction terms of variety and gender, interaction terms of physical activity and gender, as well as interaction terms social activity and gender are tested together. By looking at the results, it is clearly to find out the main effects of the variety, physical activity and social activity and one interaction term is significant at $p<.01$ level, which indicating those variables have

significant influence on self-rated health. As previous, there is a significant evidence to show that the effects of variety activity (OR=.974) on self-rated health is weaker for men.

Table 6 tests the interaction effects of gender with variety, physical activity, and social activity on functional limitation (hypothesis three). As we can see from Model 5 (Table 6), variety (b=-.075) is still negatively associated with functional limitation after adding interaction between variety and male. The interaction term is not significantly associated with self-rated health. Thus, there is no significant evidence to show there is any interaction effect between variety and gender on functional limitation. From Model 6 (Table 6), model with variety, physical activity, control variables, and interaction term of variety and male, as well as interaction term of physical activity and male can explain 18.7% variable in functional limitation. From Model 7 (Table 6), model with variety, social activity, control variables, and interaction term of variety and male, as well as interaction term of social activity and gender can explain 17.7% variance in functional limitation, compared with the one with intercept only. None of the interaction terms are significant meaning the effects of variety and social activity do not vary by gender. In Model 8 (Table 6), variety, physical activity, social activity, interaction terms between variety and male, interaction terms physical activity and male, as well as interaction terms social activity and male, as well as functional limitation are tested together. There is 20.1% variance can be explained by this model. By looking at the results, it is clearly to find out three separate variables are significant at $p<.01$ level, which indicating those variables have significant influence on functional limitation. Controlling for other variables, older women will be .072 lower on functional limitation with every additional

facility presented. Controlling for other variables, older women will be .332 lower on functional limitation with every additional level of physical activity one participated in. Controlling for other variables, older women will be .177 lower on functional limitation with every additional types of social activity one participated in. None of the interaction terms are significant in this model meaning the effects of variety, physical activity and social activity do not vary by gender.

In order to further examine the gender differences in the effects of variety, physical activity, and social activity on self-rated health, I also run ordinal regression of self-rated health separately for men and women (hypothesis three). Results are shown in Table 7. In Model 1 (Table 7 from Men) and Model 1 (Table 7 from Women), variety is positively related to self-rated health for both genders. Moreover, variety has stronger impact on women (OR=1.069) than men (OR=1.049). From Model 2, we can see, the odds ratios for both variety and physical activity are larger for women than for men, but as we see in Table 5, only gender difference in the effect of variety is statistically significant. Both Model 3 indicates that variety has stronger impact on women (OR=1.067 vs. 1.044). The odds ratio for social activity is larger for men (OR=1.190 vs. 1.115), but as we see in Table 5, this gender difference is not significant. In the full models (Model 12 and 16), the odds ratios for variety and physical activity are larger for women than for men whereas the odds ratios for social activity is larger for men than women, though only the difference in the effect of variety is significant (see Table 5).

In order to further examine the gender differences in the effects of variety, physical activity, and social activity on functional limitation (hypothesis three). I also run

OLS regression of functional limitation separately for men and women. Results are shown in Table 8. In Model 1 (Table 8 from Men) and Model 1 (Table 8 from Women), variety is negatively related to functional limitation for both genders. Moreover, the size of coefficient for variety is greater for women than for men (b =-.074 vs. -.071). From Model 2 from both sides, we can see, the size of coefficients for variety and physical activity are larger for men than for women. Both Model 3 show that the coefficients for variety and social activity are larger for women than men. In the full models (Model 4 from Men and Women), the coefficients for variety and physical activity are larger for men than for women, whereas the coefficient for social activity is larger for women than men. It should be noted that as we see in Table 6, none of these gender differences are statistically significant.

DISCUSSION AND CONCLUSION

Previous research has indicated that there is an association between community characteristics and health status among older adults, but the mechanisms underlying this relationship, and what factors may moderate this relationship are unclear. This study attempts to fill this gap by assessing whether physical/social activities mediate the relationship between community facilities and the health of older adults using a national survey of older adults in China. As one of several studies of public health, the current study aims to determine the impacts of the variety of community facilities on health, the mediating effects of physical activity/social activity, and the gender differences in the relationship between variety, physical activity, social activity, and self-rated health. By

using a cross-sectional survey, which has a large and representative sample including rich information on different types of built/social environments, important contributions in this area.

Consistent with discussion from previous studies, this study confirms that variety of community facilities has a strong impact on health. As Oldenberg (1997) argued, the provision of community facilities with an implication provides the opportunity for forming and maintaining social relationships. As predicted, this study discovered that strong impact from the variety of community facilities on health. This finding is consistent with my first hypothesis- older adults who live in a community with more of a variety of community facilities are healthier. Consistent with activity theory perspective, the current study shows that physical activity and social activity are positively associated with self-rated health and negatively associated with functional limitation. However, after adding activity measures in the model, there is no significant change on the variety coefficient, which indicated there was no mediation effect from physical/social activity. My second hypothesis, which is that activity (physical and social activity) participation mediates the relationship between community facilities and health, is not supported by this data. This can be explained by a lot of activities that can be done without specific facilities. As we all know, physical activity is measured by walking, jogging, and running in this study. The same relationship is seen with social activity. A community center is a good place for the social life of older adults, although most of the dancing team would like to go outside to practice. Thus, there will be no mediation effects from physical/social activity.

According to the results, the variety effect is stronger on women than men- the positive effect of community facilities on health is stronger for women than men. This conclusion helps support my third hypothesis. The current study found positive effects of variety, and physical activity on self-rated health are more evident for women than men, whereas the positive effect of social activity on self-rated health is more evident for men than women. However, both of the interaction terms with activity measures are not significant. This is not consistent with what this study presented in the literature review section. For example, Kennedy (2010) clearly posited that women were more embedded than men in local networks because of their domestic roles. Scholars have found that women's networks were more multifaceted in that they served more functions than men's networks (Antonucci & Akiyama, 1987). Previous research indicates that there is more potential for women to participate in all kinds of network-related activities.

However, this study only supports the moderate effects of gender on self-rated health through variety. This partially supported finding may be explained by the different roles and expectations accords to men and women. Men are more likely to be associated with friends with the same interests and women are more likely to be at home and embedded in community for support work. Contrary to some existing literature (Lubin, Zuckerman, Breytspraak, Bull, Gumbhir, and Rinck, 1988), married respondents in this study are less likely to report better self-rated health. This might be because the majority (>80%) of the respondents are married. On the other hand, married respondents are less likely to report more functional limitations. This is one of the more interesting findings that are worth further discussion. Another interesting finding was the impact from current

drinking, which is positively associated with self-rated health and negatively related to functional limitation among all of the tables. This may be explained by the potential positive relationship between income and drinking. Another explanation might be that those who can drink, because they are in good shape at the first place.

In terms of the Chinese context, we can see there is a big difference between other surveys, over 70% of the respondents reported their health as poor/fair. For centuries, men are expected to be successful in their careers, whereas women are expected to stay at home in families for daily support. This phenomenon is extremely evident in China. Tang & Tang (2001) argued that an internalized gender role had a significant impact on wellbeing of Chinese women. They further explained that in a child-centered world, women were more likely to be dedicated to a family. As Yu and Sarri (1997) argued that there is a great improvement in terms of overall wellbeing for both genders, but far less of them contributed in terms of gender inequality among Chinese.

The current study has several limitations. First of all, the measures I used in this data have limitations. The only measure I can use from this data as an independent variable is the variety of community facilities that cannot provide a full picture of community facilities, such as quality of those facilities. Social activity, as measured in this study, only represents a part of the actual social activity of daily life. Self-rated health and functional limitation, which are used in this study, do not necessarily represent all dimensions of health. There are many other measures that need to be taken into consideration, such as depressive symptoms, and chronic conditions. It might be because the measurement problem, so expenditure variables are not significant across all of the

models. Second, it is still unclear that the mechanisms through community facilities on health vary by gender. In this study, the gender interaction is only significant on the relationship between the variety of the community facilities and self-rated health, but it is not significant on activity measures. Most importantly, causal relationship cannot be determined by this study. Health status cannot be the final point of this relationship, which means health is always correlated with other measures, but we cannot determine which is the start point. For instance, older adults who are healthy which have more potential to walk outside and do exercise than those who are already bounded inside of the house. Thus, we cannot say that the cause of being healthier is because of variety of community facilities presented. The questions remain on why the impacts from same activities on health vary by gender.

In summation, the current study provides some evidence that older adults who live in the community with more of a variety of community facilities are healthier, and it also supports previous literature in that physical activity and social activity are positively associated with self-rated health. This study also adds to the literature documenting the positive effects of a variety of the community facilities on self-rated health being more evident for women than men. This finding suggests that improving the variety of community facilities could be one of the approaches for improving health status of older adults. This finding also suggests that women are more likely to benefit from various types of facilities. At the same time, we also need to pay more attention to the usage of facilities among men, and further examine the impacts from community-related characteristics on health for men. Future research should consider additional aspects of

community facilities, such as quality of facilities, further explore mechanisms underlying the relationship between the variety of community facilities and health. Furthermore, more research to refine measures of different types of facilities as well as the presence and nature of the relationship (impact from social activity is stronger on men than women) is needed.

Table 1 Descriptive Statistics for All Variables

Variables	All	Men	Women	P of Gender Difference
	Mean/Percent (Std)	Mean/Percent (Std)	Mean/Percent (Std)	t/chi-square
Self-rated Health(1-4)	2.009	2.094	1.936	7.470**
	(.866)	(.875)	(.851)	
- Very poor/Poor	29.8%	25.5%	33.4%	
- Fair	46.7%	47.9%	45.7%	
- Good	16.3%	18.1%	14.7%	
- Excellent/Very good	7.2%	8.5%	6.2%	
Functional Limitation (0-9)	1.9361 (2.068)	1.555 (1.904)	2.262 (2.145)	-14.104**
Variety (0-13)	3.458 (3.409)	3.464 (3.410)	3.453 (3.408)	.129
Physical Activity (0-3)	1.868	1.976	1.775	8.095**
	(1.011)	(1.018)	(.995)	
Social Activity (0-6)	.704	.726	.685	1.938+
	(.843)	(.882)	(.807)	
Age (45-101)	59.334	60.021	58.748	5.352**
	(9.688)	(9.573)	(9.748)	
Male (=1)	46.1%			
Urban (=1)	40.2%	39.6%	40.7%	.711
Married (=1)	87.4%	90.4%	84.7%	47.955**
Education				24.925**
-No Education	27.6%	12.9%	40.1%	
-Elementary	39.6%	44.2%	35.6%	
-Middle	30.4%	39.3%	22.8%	
-College	2.4%	3.6%	1.4%	
Expenditure				-.661
-Below 33%	28.2%	28.4%	28%	
-Between 33% and 66%	28.1%	27.9%	28.2%	
-Above66%	29%	29.6%	28.4%	
-Missing Expenditure	14.8%	14.2%	15.4%	
Smoke (=1)	37.4%	72.2%	7.7%	72.563**
Current_Drinking (=1)	24.9%	45.9%	7%	40.908**
Community SES (1-7)	3.771	3.792	3.753	1.184
	(1.348)	(1.343)	(1.352)	
N	6,651	3,065	3,586	

+P<0.1, *P<0.0, **P<0.01.

Table 2 Correlations Matrix for All Variables

Women / Men	1	2	3	4	5	6	7
1. Self-rated Health	1.00	-.425**	.162**	.074**	.082**	-.110**	.127**
2. Functional Limitation	-.418**	1.00	-.149**	-.204**	-.129**	.352**	-.087**
3. Variety	.122**	-.134**	1.00	-.097**	.123**	-.024	.543**
4. Physical Activity	.055**	-.228**	-.157**	1.00	.052**	-.253**	-.164**
5. Social Activity	.127**	-.142**	.131**	.078**	1.00	-.094**	.100**
6. Age	-.153**	.327**	.018	-.217**	-.116**	1.00	-.013
7.Urban	.101**	-.077**	.541**	-.207**	.071	.018	1.00
8.Married	.029	-.126**	.027	.090**	.028	-.199**	.067**
9. Elementary	-.109**	.118*	-.075**	.070**	-.082**	.152**	-.128**
10. Middle	.124**	-.204**	.076**	.002	.103**	-.338**	.144**
11. College	.092**	-.078**	.196**	-.075**	.112**	-.017	.187**
12. Between 33% and 66%	-.013	.027**	-.051	.033	.005	-.062**	-.052**
13. Above 66%	.078**	-.116**	.173**	-.022	.114**	-.154**	.180**
14. Missing Expenditure	-.024	.024	.078**	-.045**	-.023	.058**	.071**
15. Smoke	-.022	-.018	-.063**	.070**	.053**	-.038*	-.067**
16.Current Drinking	.105**	-.121**	-.054**	.099**	.050**	-.136**	-.010
17. Community SES	.078**	-.091**	.396**	-.051**	.063**	-.014	-315**

**.Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 2 Correlations Matrix for All Variables (cont.)

Women / Men	8	9	10	11	12	13	14	15	16	17
1. Self-rated Health	.019	-.010	.095**	.098**	-.013	.065**	-.011	-.012	.057**	.093**
2.Functional Limitation	-.161**	-.022	-.168**	-.059**	-.014	-.089**	-.002	.065**	-.007	-.094**
3. Variety	.003	-.016	.228**	.132**	-.064**	.170**	.092**	-.028	-.036*	.406**
4 . Physical Activity	.112**	.041*	-.061**	-.030	.034*	.001	-.049**	-.044**	.040*	-.037*
5. Social Activity	.011	.009	.123**	.079**	-.014	.085**	-.020	.021	.036*	.086**
6. Age	-.417**	-.065**	-.291**	-.027	-.058**	-.158**	.035*	.120**	.020	-.039*
7.Urban	.004	-.009	.256**	.140**	-.035*	.153**	.077**	.026	-.013	.328**
8.Married	1.00	.055**	.096**	.031	.057**	.094**	-.058**	-.050**	-.003	.053**
9. Elementary	-.027	1.00	-.405**	-.089**	.016	-.034*	-.001	.017	.002	.028
10. Middle	.115**	-.717**	1.00	-.065**	-.016	.151**	.008	-.062**	-.016	.137**
11. College	.045*	-.171**	-.155**	1.00	-.033*	.112**	-.005	-.035*	.023	.079**
12. Between 33% and 66%	.052**	.008	.037*	.053**	1.00	-.395**	-.267**	.006	-.011	-.038*
13. Above 66%	.124**	-.098**	.126**	.146**	-.403	1.00	-.269**	-.021	-.008	.112**
14. Missing Expenditure	-.042*	0	-.030	.003	-.253	-.263**	1.00	-.001	-.007	.046**
15. Smoke	-.007	.037*	-.013	-.054**	.035	-.016	-.011	1.00	.073**	-.016
16. Current Drinking	.049**	-.004	.051**	-.021	-.016	.034	-.004	.184**	1.00	.010
17. Community SES	.038*	-.052**	.041*	.137**	-.014	.114**	.002	-.024	-.010	1.00

**.Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 3 Ordinal Logistic Regression Models of Self-rated Health on Variety of Community Facilities, Physical Activity, Social Activity, and Control Variables

	Model 1	Model 2	Model 3	Model 4
Variety (0-13)	1.059**	1.060**	1.055**	1.057**
Physical Activity (0-3)		1.174**		1.165**
Social Activity (0-6)			1.151**	1.138**
Age (45-101)	.978**	.982**	.977**	.982**
Male (=1)	1.270**	1.231**	1.289**	1.25**
Urban (=1)	1.134	1.196+	1.135	1.194+
Married (=1)	.854*	.840**	.862+	.848*
Education				
-Elementary	1.043	1.043	1.030	1.032
-Middle	1.323**	1.365**	1.286**	1.328**
-College	2.461**	2.584**	2.286**	2.410**
Expenditure				
-Between 33% and 66%	.958	.959	.953	.954
-Above 66%	1.008	1.015	.993	1.001
-Missing Expenditure	.886	.894	.885	.892
Smoke (=1)	.891+	.888+	.878+	.877+
Current_Drinking (=1)	1.528**	1.498**	1.515**	1.487**
Community SES (1-7)	1.032	1.029	1.031	1.028
X 2	348.96**	361.38**	366.20**	374.10**
(df)	(14)	(15)	(15)	(16)
Pseudo R-Square	.028	.031	.030	.032
N	6,651	6,651	6,651	6,651

Note: Numbers are odds ratios. (Std. Err. Adjusted for 443 community clusters)

+P<0.1, *P<0.0, **P<0.01.

Table 4 Regression of Models of Functional Limitation on Variety of Community Facilities, Physical Activity, Social Activity, and Control Variables

	Model 1	Model 2	Model 3	Model 4
Variety (0-13)	-.072**	-.075**	-.068**	-.071**
Physical Activity (0-3)		-.347**		-.338**
Social Activity (0-6)			-.178**	-.150**
Age (45-101)	.620**	.053**	.061**	.052**
Male (=1)	-.059**	-.521**	-.604**	-.538**
Urban (=1)	.100	-.009	.096	-.009
Married (=1)	-.215*	-.180*	-.228**	-.192*
Education				
-Elementary	-.156*	-.158*	-.141+	-.145+
-Middle	-.436**	-.501**	-.399**	-.467**
-College	-.741**	-.835**	-.646**	-.752**
Expenditure				
-Between 33% and 66%	.059	.053	.066	.060
-Above 66%	-.026	-.042	-.006	-.024
-Missing Expenditure	.021	-.007	.020	-.008
Smoke (=1)	.035	.047	.055	.063
Current_Drinking (=1)	-.271**	-.224**	-.258**	-.215**
Community SES (1-7)	-.041	-.035	-.039	-.033
Constant	-.665	.510	-.518	.604
R^2	.172	.198	.177	.201
N	6,651	6,651	6,651	6,651

Note: Numbers are unstandardized coefficients (Std. Err. Adjusted for 443 community clusters)

+P<0.1, *P<0.0, **P<0.01.

Table 5 Ordinal Logistic Regression Models of Self-rated Health on Variety of Community Facility, Physical Activity, Social Activity, and Control Variables with Interaction

	Model 5	Model 6	Model 7	Model 8
Variety (0-13)	1.070**	1.071**	1.068**	1.069**
Physical Activity (0-3)		1.202**		1.197**
Social Activity (0-6)			1.118**	1.105*
Age (45-101)	.978**	.982**	.979**	.982**
Male (=1)	1.386**	1.473**	1.364**	1.473**
Urban (=1)	1.134	1.196+	1.137	1.195+
Married (=1)	.857*	.841*	.864+	.849*
Education				
-Elementary	1.034	1.037	1.023	1.028
-Middle	1.308**	1.356**	1.273**	1.321**
-College	2.481**	2.603**	2.301**	2.422**
Expenditure				
-Between 33% and 66%	.959	.960	.953	.954
-Above 66%	1.009	1.016	.993	1.000
-Missing Expenditure	.885	.893	.883	.891
Smoke (=1)	.888+	.888+	.874*	.876+
Current_Drinking (=1)	1.526**	1.500**	1.511**	1.488**
Community SES (1-7)	1.031	1.029	1.031	1.028
Male X Vairety	.977*	.978+	.974*	.974*
Male X Physical Activity		.949		.941
Male X Social Activity			1.062	1.064
X^2	351.26**	361.88**	372.32**	377.81**
(df)	(15)	(17)	(17)	(19)
Pseudo R-Square	.028	.031	.030	.032
N	6,651	6,651	6,651	6,651

Note: Numbers are odds ratios. (Std. Err. Adjusted for 443 community clusters)

+P<0.1, *P<0.0, **P<0.01.

Table 6 Regression Models of Functional Limitation on Variety of Community Facilities, Physical Activity, Social Activity, and Control Variables with Interaction

	Model 5	Model 6	Model 7	Model 8
Variety (0-13)	-.075**	-.075**	-.071**	-.072**
Physical Activity (0-3)		-.340**		-.332**
Social Activity (0-6)			-.199**	-.177**
Age (45-101)	.062**	.053**	.061**	.052**
Male (=1)	-.609**	-.497**	-.657**	-.551**
Urban (=1)	.099	-.010	.097	-.008
Married (=1)	-.216*	-.180*	-.229**	-.193*
Education				
-Elementary	-.154*	-.157*	-.137+	-.141+
-Middle	-.433**	-.499**	-.394**	-.464**
-College	-.744**	-.835**	-.651**	-.755**
Expenditure				
-Between 33% and 66%	.058	.053	.065	.058
-Above 66%	-.026	-.042	-.007	-.026
-Missing Expenditure	.021	-.007	.019	-.009
Smoke (=1)	.036	.048	.054	.063
Current_Drinking (=1)	-.271**	-.223**	-.259**	-.215**
Community SES (1-7)	-.041	-.035	-.039	-.033
Male				
X Variety	.006	.0001	.006	-.0002
Male				
X Physical Activity		-.014		-.013
Male				
X Social Activity			.043	.053
Constant	-.656	.496	-.496	.607
R^2	.172	.198	.177	.201
N	6,651	6,651	6,651	6,651

Note: Numbers are unstandardized coefficients (Std. Err. Adjusted for 443 community clusters)

+P<0.1, *P<0.0, **P<0.01.

Table 7 Gender Differences on Self-rated Health

	Men				Women			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Variety	1.049**	1.051**	1.044**	1.046**	1.069**	1.069**	1.067**	1.067**
Physical Activity		1.136**		1.122**		1.205**		1.210**
Social Activity			1.190**	1.177**			1.115**	1.102*
Age	.978**	.981**	.979**	.981**	.977**	.983**	.978**	.983**
Urban	1.089	1.140	1.096	1.143	1.168	1.235*	1.166	1.230*
Married	.948	.921	.955	.930	.809*	.806*	.816*	.812*
Education								
Elementary	.980	.965	.968	.955	1.077	1.091	1.066	1.081
Middle	1.364*	1.370*	1.317*	1.325*	1.207+	1.279*	1.182	1.254*
College	2.210**	2.260**	2.025**	2.078**	3.094**	3.288**	2.921**	3.120**
Expenditure								
Between33%and66%	.939	.941	.926	.929	.971	.971	.971	.971
Above66%	1.018	1.026	.994	1.002	.997	1.004	.989	.996
MissingExpenditure	.886	.893	.881	.888	.882	.891	.884	.892
Smoke	.864+	.857*	.849*	.844*	.944	.959	.934	.949
Current Drinking	1.532**	1.511**	1.520**	1.502**	1.516**	1.470**	1.499**	1.456**
Community SES	1.034	1.032	1.035	1.033	1.031	1.027	2.039	1.026
Chi-square	228.84**(	228.37**	233.58**	232.16*	139.57**	155.70**	146.46**	160.73**
(df)	(13)	(14)	(14)	(15)	(13)	(14)	(14)	(15)
Pseudo R-square	.027	.029	.030	.031	.024	.027	.024	.028
N	3,065	3,065	3,065	3,065	3,586	3,586	3,586	3,586

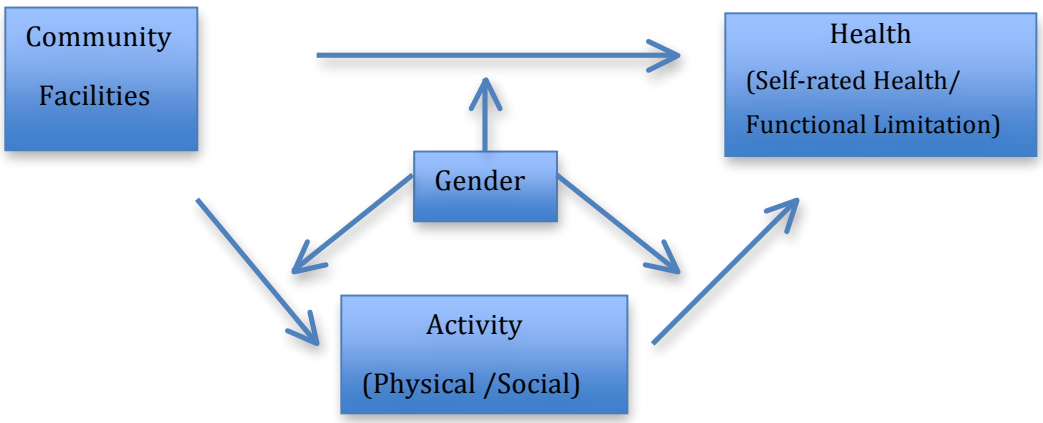
+P<0.1, *P<0.05, **P<0.01.

Table 8 Gender Differences on Functional Limitation

	Men				Women			
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Variety	-.071**	-.076**	-.066**	-.072**	-.074**	-.074**	-.071**	-.071**
Physical Activity		-.364**		-.355**		-.325**		-.317**
Social Activity			-.157**	-.125**			-.201**	-.179**
Age	.053**	.045**	.052**	.044**	.070**	.060**	.069**	.059**
Urban	.154	.023	.145	.019	.042	-.044	.045	-.039
Married	-.316*	-.236+	-.324**	-.244*	-.102	-.099	-.119	-.115
Education								
Elementary	-.202	-.150	-.193	-.144	-.132	-.157+	-.113	-.138
Middle	-.587**	-.588**	-.557**	-.565**	-.302**	-.402**	-.259*	-.361**
College	-.840**	-.890**	-.757**	-.823**	-.694**	-.782**	-.591*	-.689**
Expenditure								
Between33%and66%	.205*	.192*	.219*	.203*	-.057	-.060	-.055	-.059
Above66%	.014	-.015	.040	.011	-.051	-.062	-.038	-.051
MissingExpenditure	.122	.095	.126	.099	-.054	-.084	-.062	-.091
Smoke	-.022	.005	-.005	.0180	.153	.132	.175	.152
Current Drinking	-.312**	-.269**	-.303**	-.263**	-.163	-.108	-.140	-.089
Community SES	-.547	-.040	-.048	-.040	-.036	-.032	-.033	-.029
Constant	-.547	.589	-.428	.655	-1.209	-.003	-1.041	.114
R-square	.153	.187	.157	.190	.148	.169	.154	.173
N	3,065	3,065	3,065	3,065	3,586	3,586	3,586	3,586

+P<0.1, *P<0.05, **P<0.01

Figure I. Conceptual Model of the Relationship among Community Facilities, Activity, Gender, and Health.



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