

Article

Towards the Healthy Community: Residents' Perceptions of Integrating Urban Agriculture into the Old Community Micro-Transformation in Guangzhou, China

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Abstract: In the renewal of old communities, one of the development directions is to improve health and enhance well-being. A healthy community includes four aspects of health, namely, healthy production, healthy lifestyle, healthy environment and ecosystem, and healthy physical and mental states of residents living in the community. Urban agriculture (UA), as a form of the community garden, is a supplementary form for the lack of production function in the urban community. It also has the potential to contribute to sustainable and resilient urban communities. This study focuses on analysing the health benefits of UA and attempts to identify old community residents' attitudes and perceptions towards UA and understand their confusion and worry. The purpose of this study is to promote the healthy and sustainable development of old communities by integrating UA into the micro-transformation of old communities and provide planning and design strategies and community development ideas for the micro-transformation. Surveys were conducted on 10 old communities in Yuexiu district, located in Guangzhou, China. Statistical analysis was conducted using IBM Statistical SPSS version 26 to obtain information on the factor structure of residents' perceptions towards the health benefits of UA. The analysis results showed significant differences between gender groups and the status of children on old community residents' perceptions towards general UA benefits. The main factors accounting for old community residents' perceptions towards the health benefits of UA were environmental health benefits, physical and psychological health benefits, and community health benefits. When developing UA in old communities, co-construction and co-sharing mode, public participation mode, and promotion mode are three important development strategies. Construction location, design style, and seasonal design are also critical for the construction of UA in old communities.

Keywords: urban renewal; urban agriculture; healthy community

1. Introduction

Rapid urbanization has radically changed the relationship between humans and the settlement environment [1]. Urban renewal originated in the Western countries and had expanded beyond physical changes to include actions aimed at social and economic improvements. It encompasses three generations, which are physical determinism, neighbourhood rehabilitation that emphasizes social problems, and economic revitalization [2,3]. However, with the urban sprawl and change of the settlement environment, urban problems and human diseases [4–7], such as air pollution [8,9], urban heat island [10], obesity [11,12], respiratory diseases [13,14], cardiovascular diseases [15,16],

and mental diseases [17], are increasing. Health problems and diseases are the result of a complex series of interactions between human factors, including genetics and health behaviour, and the ecosystems in which humans live [18,19]. Western countries in recent years have begun to actively explore how to make cities and communities sustainable, healthy, and beneficial to human beings through urban renewal programmes. Governments, scholars, and experts of urban planning and public health have continued to explore the improvements in health through urban renewal interventions [20]. Urban renewal programmes include large-scale clearance, increased green infrastructure, and commercial and residential area redevelopment [21,22].

China boldly embarked on a journey from a planned economy to a market economy in 1978, and the urban land reforms and housing reforms ushered in the emergence of real estate markets in the late 1980s [23,24]. Since then, large-scale urban renewal programmes have prevailed in cities across the country, like the large-scale clearance programmes in the 1950s and 1960s in the United States [25]. Measures, standards, and rules have been issued and instituted. These programmes focus on improving the built environment of residential areas [26,27]. In 2017, the Ministry of Housing and Urban Rural Development of the People's Republic of China (MOHURD) proposed the transformation of old communities to improve the quality of residents' life, not only the built environment, and to create a new governance structure of co-governance, co-construction, and co-sharing. The old community mainly refers to the residential areas located in the scope of the old urban area, built before 2000 and still in use, wherein residential units and their external environment are old. The construction standards are low, the use functions and supporting facilities are incomplete, outdoor activity spaces are insufficient, and potential safety hazards exist in disrepair and lack of property services, which cannot meet people's normal or higher living needs.

In the renewal of old communities, sustainability is one of the most important concepts on community development, and how to use the resources to meet residents' current needs while ensuring that resources are available for future generations is a key issue [28–30]. The goals of sustainable community development are to increase land production by maximizing resource utilization, to promote resource recycling by utilizing waste, to promote a sustainable lifestyle by changing the community environment to relax the residents' spirit and stabilize their emotions, to improve communication by encouraging every member to participate in community building, and to foster community attachment by holding interactive activities. As western experts and scholars have done in recent years, one of the sustainable development paths of old communities is to improve health and enhance well-being [31,32], which is in line with the goals of community sustainable development (Figure 1).



Figure 1. Community sustainable development goals.

The definition of health was set out by WHO (1946) as follows: ‘Health is not merely the absence of disease and infirmity but a state of optimal physical, mental and social well-being’ [33,34]. Three changes are needed to turn an old community into a healthy one. The traditional settlement environment is an integrated environment of production, life, and ecology [35,36]. However, after agricultural activities being excluded from the city, production activity has become non-existent in the settlement environment, and the ecological function has gradually degraded. Therefore, urban agriculture (UA) is a supplementary form for the lack of production function in the urban community. Except for the provisioning function, UA has been paid more attention by scholars and experts worldwide [37]. Some of them research on the food policies related to UA, whereas others focus on the benefits of UA. UA can contribute to household food security in developing countries and developed countries in times of crisis during the 20th century. However, nowadays, UA is practiced more for social, cultural, and environmental reasons than provisioning [38–40]. The forms of UA are community gardens, urban farms, edible school gardens, and roof farms [41–43]. UA provides people with many nature contact opportunities. Exposure to biodiverse environmental microbiomes contributes positively to human health [44]. UA can re-connect urban populations to biodiverse microbial communities [45–48]. Therefore, UA has been viewed as having the potential to contribute to sustainable and resilient urban communities. UA should not be a substitute for urban green lands, but as a complementary form of green space, which can enrich the types of urban green space [49–51]. Restructuring environments provide opportunities for physical activity and can change the communities’ lifestyle [52–54]. Urban planning and design have the potential to impact public health positively or negatively. Changes to the built environment can improve public health through increased opportunities for healthy behaviours [55].

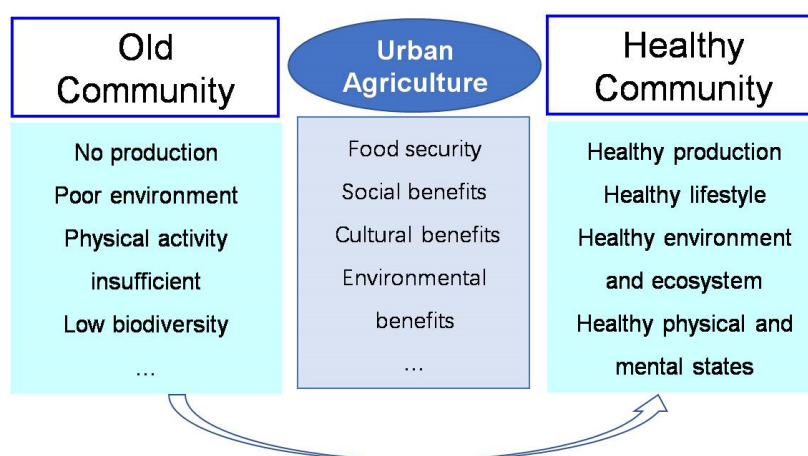
A healthy community includes four aspects of health (Table 1, Figure 2), namely, healthy production, healthy lifestyle, healthy environment and ecosystem, and healthy physical and mental states of residents living in the community. Healthy production refers to a community with healthy built environment and healthy production activities, which can provide healthy food and circulate material resources, such as kitchen waste [38,56]. A healthy lifestyle includes the mental and physical health of people and is related to diverse outdoor activities, all-age participating opportunities, communication promotion, and parent–child relationship establishment. A healthy ecosystem refers to an enjoyable environment, environmental biodiversity, and ecosystem service provision. Old communities usually have no production function, poor environment, lack of outdoor space, lack of available types of activities, and low biodiversity of green space [37,57,58]. UA has three beneficial features of society, culture, and environment, and, as such, it is the best strategy that can supply the choice to maintain the sustainable development of a city [37,59,60]. The intervention of UA in a community can make the community have production function, improve biodiversity, increase the type and time of outdoor activities of residents, and promote the interaction of community residents. Therefore, UA can make an old community healthy and sustainable.

UA is widely used in communities in European and North American countries [43,61–63]. It has been tried in many old communities in China [64,65]. However, Guangzhou, as the only first-tier city among the 15 pilot cities for micro-transformation [66,67], has carried out significant community micro-transformation so far. However, the integration of UA into the community is relatively rare.

This study attempts to explore the feasibility of integrating UA into the old communities in Guangzhou based on analysing the benefits of UA and the transformation process of old communities in Guangzhou, and to identify old community residents’ attitudes and perceptions of UA and understand their confusion and worry. Then, planning and design strategies and community development ideas for the micro-transformation of old communities were provided.

Table 1. Relationship between a healthy community and urban agriculture (UA).

Healthy Communities		UA Activities
Healthy environment and ecosystem	Enjoyable environment	Create a pleasant environment through productive landscape
	Environmental biodiversity and ecosystem service provision	Increase plant species and communities, build animal habitat
	Abundant green space	Enrich green space types by planting productive landscape
Healthy lifestyle	Experience of farming life	Planting, cultivation, maintenance, harvesting, and processing
	Traditional rural emotional sustenance	Agricultural education
	Communication promotion	Co-construction and sharing, Changing social patterns Establish a parent–child relationship
	All-age participating	Almost all activities
Healthy production	Food security	Provide fresh vegetables and fruits
	Waste utilization	Utilization of kitchen waste, Utilization of organic matter such as leaves
Healthy physical and mental states	Invigorate health effectively	Be accessed conveniently
	Increase physical activity	Planting, cultivation, maintenance, harvesting, and processing
	Relieve pressure	Cultivate sentiment and relax

**Figure 2.** Turn old communities into healthy communities through urban agriculture.

2. Research Design

2.1. Study Area

The study was conducted in Guangzhou, Guangdong Province, China. Guangzhou is located in the centre of Guangdong province, which is one of the most important metropolitan areas in the country (Figure 3). Guangzhou belongs to the subtropical monsoon climate, and has been affectionately called the ‘Flower City’ since ancient times. The total area is around 7434.4 km² with a population of approximately 14.04 million people in 2018 (Population, 2018). Guangzhou City governs eleven districts, namely Liwan, Yuexiu, Haizhu, Tianhe, Baiyun, Huangpu, Panyu, Huadu, Nansha, Conghua, and Zengcheng Districts.

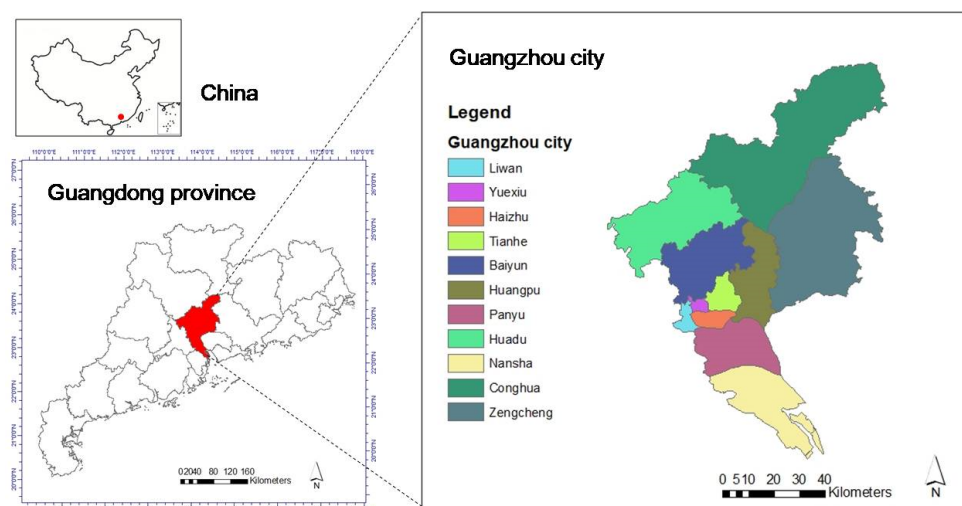


Figure 3. Study area: Guangzhou city.

2.2. Methods

This study was conducted with a mixed method of qualitative analysis and quantitative analysis. Literature review, comparative analysis, and inductive analysis were used in qualitative analysis, which was used to explore the relationship between healthy development of old communities and UA, and to analyse the feasibility of integrating UA into the micro-transformation of old communities. The quantitative analysis of this study was used to study residents' perceptions of UA, including questionnaire design, pilot questionnaire, final questionnaire, and data statistical analysis. On this basis, the qualitative analysis method is also used to summarize the development mode, planning, and design strategy of UA in the micro-transformation of old communities.

2.3. Research Framework

This study was conducted in three steps. Firstly, the relationship between a healthy community and UA activities was explored to find out whether UA can make a community healthy and sustainable and how to make a community healthy and sustainable through UA. This part is also the background and premise of the whole research. Then, the present situation analysis of old communities, renovation of old communities in Guangzhou, and a creative urban renewal mode “micro-transformation” were analysed. In this part, we focused on the feasibility of integrating UA into the micro-transformation of old communities. The third step was to explore residents' perceptions of old communities and proposed development and design strategies of UA.

Figure 4 illustrates the research framework.

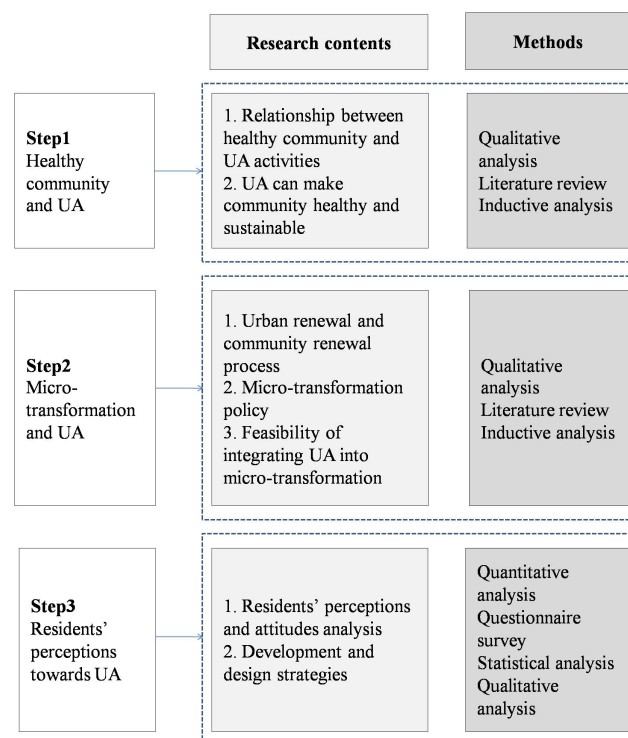


Figure 4. Research framework.

3. Feasibility of Integrating UA into Micro-Transformation of Old Communities in Guangzhou

3.1. Present Situation of Old Communities in China

According to preliminary statistics, China has nearly 160,000 old communities, involving more than 42 million households and a construction area of approximately 4 billion square meters [68]. An old community records the economic and social development of the city for a period, which is the memory of one generation or even several generations. During the rapid development of urbanization, the infrastructure, supporting facilities, and public space of old communities have long been consumed, and thus cannot meet the living needs of residents [24]. For old community reconstruction, the ‘big demolition and big construction’ approach is often adopted. Although the modern high-rise residential area built in this way may meet the needs of life, it lacks the original historical features and human feelings. The purpose of the micro-transformation of the old community is to solve the problem of life of the old city residents from the source, improve the living conditions of the people, and improve the appearance of the city [69,70]. It is an important livelihood project with popular feeling. Attention should be paid to the organic renewal, protection, and inheritance during urban construction while meeting the needs of residents.

On 1 December 2017, the MOHURD held a symposium to promote the pilot work of the transformation of old residential areas in Xiamen. The reconstruction of old residential areas is an important measure to solve the problem of unbalanced and inadequate urban development and realise people’s yearning for a better life. To promote the transformation of old residential areas is conducive to improving the living conditions and quality of life of residents; improving the sense of access, happiness, and security of the masses; improving the environment of residential areas, continuing the historical context, and realizing the sustainable development of cities; strengthening and innovating social governance at the grassroots level; and creating the social governance structure of co-construction, co-governance, and co-sharing. The pilot project was carried out in 15 cities to better promote the transformation of old residential areas. The purpose was to explore the new mode of the transformation of old residential areas in cities and provide replicable and generalizable experiences for

promoting the transformation of old residential areas in China. The meeting stressed three principles in the pilot work. The first was to adhere to the people-centred principle, make full use of the concept of ‘co-creation’, stimulate the enthusiasm of the residents, mobilise the enthusiasm of the relevant units in the community, participate in the transformation of the old community together, and realise decision making, development, co-construction, co-management, effect evaluation, and achievement sharing. The second was to adhere to problem orientation and clarify key contents. The expectations of the masses must be complied, improving the people’s livelihood first and then clarifying the key points and contents of the transformation of old residential areas in the near and long term. The third was to adhere to the principle of adjusting measures to local conditions and implementing precise policies [71–73]. Based on fully considering the actual problems of local and old residential areas, a scientific transformation method and planning framework needs to be studied and applied.


3.2. Renovation of Old Communities in Guangzhou

At the end of 2017, Guangzhou was selected as the pilot city for the renovation of old residential quarters by the MOHURD, and it was the only first-tier city among the 15 selected cities. Guangzhou’s old city renewal work has been deepening and expanding. From the previous simple construction of new buildings to ‘addition’, it is gradually realising the ‘equal emphasis on addition and subtraction’ and no longer unilaterally pursuing high volume and economic balance. Great changes have taken place in the core and spirit of urban old environment transformation. In the past, the changes in buildings and their surrounding environment have been paid attention to. What is promoted now is to create a healthy lifestyle and improve the quality of life through the change of urban old environment [74].

A preliminary exploration revealed that the construction safety problems of the old community are prominent and affect the development of the city in 2009. From 2010 to 2014, the Ministry of Land and Resources carried out the ‘three old’ (old town, old factory building, old village) transformation work. The state-owned land has been promoted effectively, and the stock of land has been activated. From 2015, the Urban Renewal Bureau was established, and the measures of Guangzhou Municipality on urban renewal were implemented. The Urban Renewal Bureau has worked out the implementation plan for the micro-transformation of old residential quarters in Guangzhou in 2017. Guangzhou Urban Renewal Bureau has formulated the three-year (2018–2020) action plan for the micro-transformation of old communities in Guangzhou, and the municipal government has also deliberated and approved the annual plan for urban renewal in 2018 (the second batch). In 2018, Guidelines for the Design of the Micro-transformation of Guangzhou’s Old Communities was officially issued. See Figure 5 for details of Guangzhou’s micro-transformation.

3.3. Micro-Transformation of Old Communities

‘Micro-transformation’ is a creative urban renewal mode put forward in the measures for urban renewal of Guangzhou implemented in 2016. It refers to a strategy to update the appearance and function of buildings through partial demolition, replacement of building functions, maintenance and repair, renovation, protection, activation, improvement of infrastructure, and other methods under the premise of maintaining the current construction pattern and texture [68]. The micro-transformation includes the micro-transformation of old factory buildings [75,76], old towns [76], old villages [77], and old communities. However, a clear definition of the micro-transformation of old communities does not exist. By combing the literature on community transformation and community renewal and combining the studies with the measures of Guangzhou city renewal issued by the city, the micro-transformation of old communities is defined as one that is led by the government and participated by the market and residents to solve the problems of backward functions and facilities of old communities in the city to improve the living environment of the old community and promote the construction of the social capital of the old community. Multiple cooperative ways can meet the different demands of the residents.



Year	Government Measures
● 2009	Preliminary exploration revealed that the construction safety problems of the old community are prominent and affect the development of the city.
● 2010-2014	The Ministry of Land and Resources carried out the ‘three old’ (old town, old factory building, old village) transformation work, and Guangdong Province aims to build an intensive land use demonstration province. The preparation of state-owned land and activation of the stock of land had effectively been promoted.
● 2015-2016	Guangzhou Urban Renewal Bureau was established, and urban renewal measures were implemented. In view of the problems in the ‘three old’ transformation, the urban renewal mode of ‘micro-transformation’ was creatively put forward. First, it changed the method of demolishing and building old communities in the past but let the old communities retained their historical and use values through gradual restoration. It emphasised the participation of multiple subjects, innovation of transformation methods and effective improvement of comprehensive benefits of transformation.
● 2017	Guangzhou Urban Renewal Bureau has worked out the implementation plan for the micro- transformation of old residential quarters in Guangzhou. The implementation plan clearly proposed that by 2020, the city will focus on 702 micro-transformation of old communities with incomplete functional support, low construction standards, outdated facilities, aging infrastructure and poor environment. At the same time, the reconstruction object is the public part of the building body and the public part of the community.
● 2018	Guangzhou Urban Renewal Bureau has formulated the three-year (2018–2020) action plan for micro-transformation of old communities in Guangzhou, and the municipal government has also deliberated and approved the annual plan for urban renewal in 2018 (the second batch). Guidelines for the Design of Micro-transformation of Guangzhou’s Old Communities was officially issued. In the guidelines, three goals are put forward for the old community, including the quality community which is committed to improving the living environment, the cultural community which continues the unique culture of the community and the smart community which is guided to share and open.

Figure 5. Guangzhou micro-transformation process.

3.4. Change of the Concept and Management Mode of Community Transformation

China’s community transformation has experienced a process from large-scale demolition and construction to micro-reconstruction. Community construction and management have gradually changed from a top-down management mode to a sharing and co-governance mode, which is also the trend of community development [78]. China’s urban residential area management system has been a vertical structure from top to bottom. The residential area management system has developed from the ‘unit system’ to ‘block system’ and then to ‘community system’ and has gradually moved to a multi-body governance system. However, the phenomenon where the government plays a dominant role in the management system remains obvious. Community residents develop an excessive dependence on the government. They are accustomed to passively accepting the role, and lack the enthusiasm to participate in joint governance. Community micro-transformation is a community transformation model that focuses on community co-governance, public participation, and community sharing [79–81]. The micro-transformation of the old community is essentially community governance, and the different interests of the community can be reconciled by forming relationships between the old community micro-reform and cooperation governance and generating interactions and taking joint actions to promote community development.

3.5. Feasibility of Integrating UA into Micro-Transformation

During community micro-transformation, many ways can be taken to intervene in micro-transformation, such as art space implantation, industrial upgrading, and other community activation means. Moreover, with the improvement of demand level and the arrival of the experience economy era, people’s feelings of human settlements no longer simply stay at the visual level, but pay more attention to the sense and experience of space. Among the many ways, the introduction of a productive landscape into the community micro-transformation can not only improve the community environment and enhance community vitality, but also foster a sense of participation and experience and promote community co-governance and shared development.

According to the analysis above, old communities usually have no production function, poor environment, lack of outdoor space, lack of available types of activities, and low biodiversity of green space. A healthy community includes four aspects of health, namely, healthy production,

healthy lifestyle, healthy environment and ecosystem, and healthy physical and mental states of residents living in the community. UA has three beneficial features of society, culture, and environment. It is the best strategy that can be possibly supplied the choice to maintain the sustainable development of a city. The intervention of UA in the community can make the community have production function, improve biodiversity, increase the type and time of outdoor activities of residents, and promote the interaction of community residents. Therefore, UA can make an old community healthy and sustainable.

4. Old Community Residents' Perceptions and Preferences towards UA in Guangzhou

4.1. Survey Sites

Surveys were conducted on 10 old communities which are in Yuexiu district, located in Guangzhou, China (Figure 6, the Chinese characters in the Figure 6 are place names). The area of Yuexiu district is 33.8 km², and it has 18 streets under its jurisdiction, with a total registered population of 1,158,400 (Sixth Census). Yuexiu district is the oldest central city with the smallest area and the highest population density in Guangzhou. The district has 148 old communities, accounting for 67% of 222 communities in the district. The plan was to achieve the full coverage of the old residential area transformation through a total of six years, from 2016 to 2021. In 2016 and 2017, 38 community micro-transformation projects were implemented, and they have been completed. There are 70 old communities completed in the city, of which 32 are in Yuexiu district, ranking first. Besides, there are 331 old communities approved in the city, of which 132 are in Yuexiu district, ranking first. However, in the transformed community, the transformation of public space mainly includes the traditional transformation, such as the increase of barrier-free facilities, the renovation of flower beds, the replacement of pavements, and the connection of pedestrian routes, among others. Several communities become involved in art. This study hopes to understand residents' acceptance of UA, and the author hopes to invest in UA in the following micro-transformation projects. As UA has been applied in the community reconstruction of foreign countries and other cities in China, it is well accepted by the residents.

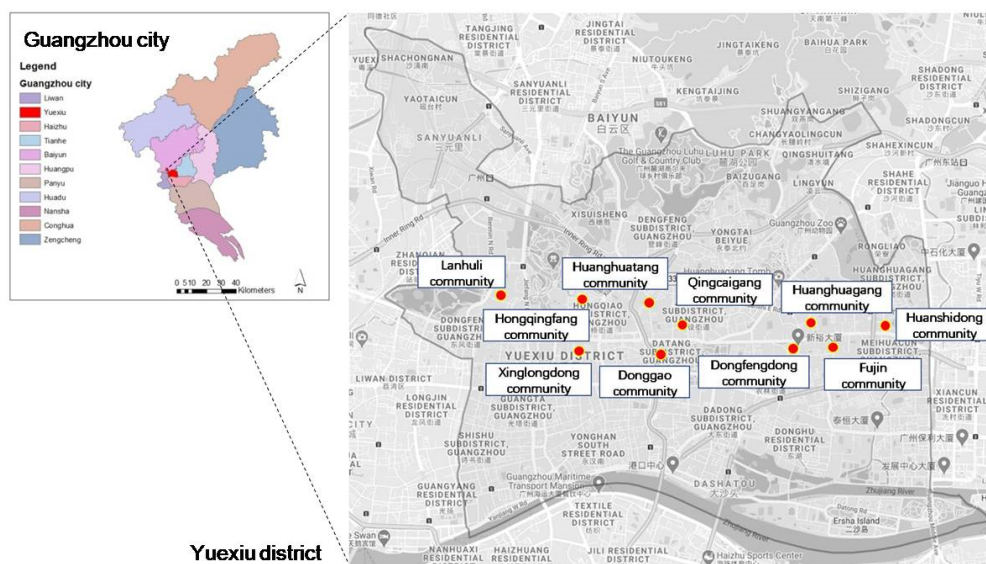


Figure 6. Survey sites.

4.2. Survey Structure

The survey consisted of a combination of open and closed questions designed to gather information on the attitudes towards UA participation and its effects on human health and well-being in terms of physical benefits, psychological benefits, and environmental benefits. The questionnaire contained 17 questions, divided into four groups (Table 2). The first group of questions was related to residents'

demographic information. The second group of questions was related to residents' perceptions of the health benefits of UA. Participants were asked the general health benefit perception of UA in the old community and whether they thought UA provided health and well-being effects based on a five-point Likert scale (where 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree). The third group of questions was related to UA participant intention of residents. The last group consisted of general questions related to what kinds of UA do residents prefer to use in the old community and where. At the end of the survey, respondents had the opportunity to provide personal comments on their thoughts about UA and how it influences their health. Study participants were required greater than or equal to 18 years old and were residents living in old communities of Guangzhou.

Table 2. Survey structure and questionnaire items.

Survey Structure	Questionnaire Items
Group 1 Demographic information	Gender
	1. Male 2. Female
	Age
	1. 18–29 2. 30–49 3. 50–69 4. ≥70
	Residency length
	1. ≤1 year 2. 2–4 years 3. 5–9 years 4. ≥10 years
	Employment
	1. Student 2. Retired 3. Unemployed 4. White-collar workers 5. Blue-collar workers
Group 2 Perceptions of the health benefits of UA	Family Income (per month)
	1. <3000 RMB 2. 3000–4999 RMB 3. 5000–7999 RMB 4. ≥8000 RMB
	Living Status
	1. Single 2. With family
	Children Status
	1. Live without children 2. Live with children
	Rural Living Experience
	1. ≤1 year 2. 2–4 years 3. 5–9 years 4. ≥10 years
Group 3 UA participant intention	General health benefits perception
	General health benefits perception of UA in old community (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree)
	UA human health and well-being effects
	Enrich Green Space Types and Landscape, Provide Experience of Farming Life, Be Close To Nature, Be Accessed Conveniently, Increase Community Biodiversity, Provide Fresh Food, Invigorate Health Effectively, Increase Physical Activity, Relieve Pressure, Promote Neighbourhood Communication, Enrich Community Life, Increase Pleasure (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, 5 = strongly agree)
	Do you support planting vegetables and fruits in the public space of the community?
	1. Yes 2. No
	Would you like to participate in planting, harvesting, and management activities in the community?
	1. Yes 2. No
Group 4 Planning and design preferences towards UA	What is the main reason to not support?
	1. May contaminate the community environment 2. No ornamental plants look good 3. Management is troublesome 4. Feel uninteresting or useless
	What is the main reason to not participate?
	1. Cannot plant 2. Do not have time 3. Do not like to participate in agricultural activities
	How often do you want to participate?
	1. 1–2 times per week 2. 1–2 times per month 3. 3–4 times per year
	How much time do you want to spend on UA every time?
	1. <1 h 2. 1–2 h 3. 2–4 h
Group 4 Planning and design preferences towards UA	Which space in the community do you think is suitable for agricultural activities?
	1. Central green space 2. The green space in front of the building 3. On the top of the roof 4. Balcony and others
	Which planting form do you think is suitable for the community?
	1. Whole community sharing mode (co-plant, co-harvest, co-management) 2. One piece of land or one box for each family
Group 4 Planning and design preferences towards UA	Which planting arrangement form do you think is suitable for the community?
	1. All vegetables and fruits 2. All flowers 3. Most vegetables, a small part of flowers 4. Most flowers, a small part of vegetables

4.3. Sampling Method and Data Collection

A pilot test was conducted on a convenience sample of 50 residents to clarify the wording and amended according to feedback obtained. Finally, 500 printed questionnaires were distributed in 10 old communities from October to November 2019. Fifty questionnaires were distributed to each community, and respondents were approached randomly. The questionnaires were administered using a direct face-to-face survey method because of the relatively high response rate of this method [82]. Finally, a total of 500 questionnaires were collected, for a 100% return rate. Altogether, 434 were deemed valid and 66 were deemed invalid because of incompleteness, so the valid response rate is 86.8%. With a 95% confidence level, the sample size needed to yield results that precisely reflect the target population within $\pm 5\%$ admitted error is 384. Therefore, the sample size in this study was appropriate.

4.4. Data Analysis

Statistical analysis was conducted using IBM Statistical SPSS version 26. To obtain information on the factor structure of residents' perceptions towards the health benefits of UA, factor analysis using a correlation coefficients matrix of 12 perception items was conducted. The principle axis method, based on the criterion of selecting eigenvalues greater than 1 and varimax rotation of the factors, was used. For analysing differences between demographic characteristics in UA use and perceptions towards health and well-being benefits of UA, descriptive statistics, independent sample *t*-test, and one-way ANOVA were applied. The one-way ANOVA is used to test whether or not the means from three or more groups are significantly different from one another. In this study, descriptive statistics were used to indicate demographic characteristics, and independent sample *t*-test and one-way ANOVA were used to test whether or not the averages of general health benefits perceptions towards UA are significantly different from one another based on variances in personal data.

5. Results and Discussion

5.1. Relationship between Demographic Characteristics and Residents' Perceptions towards General UA Health Benefits

In this section, when comparing the mean values of general health benefit perceptions towards UA based on variables of gender, living status, and children status, since each variable is divided into two groups, an independent sample *t*-test was used. When comparing three or more mean differences based on age, occupation, and family income, one-way ANOVA was used.

Test of homogeneity of variances was conducted to test whether or not the variance is homogeneous, and the results of Levene statistics showed that *p* values of the age variable ($p = 0.358$), employment variable ($p = 0.473$), and family income variable ($p = 0.929$) were more than 0.05, which indicates that the variance is homogeneous, and one-way ANOVA can be used.

Table 3 shows the descriptive statistics of the respondents and the results of independent sample *t*-test and one-way ANOVA. In terms of gender, the ratio of surveyed male and female respondents was almost equal. The participants were composed of 50.9% women and 49.1% men (Table 2). The *t*-test for independent samples showed significant differences between gender groups on residents' perceptions towards general UA benefits ($F = 22.750$, $p = 0.000$). The mean perception of women (mean = 4.34) was higher than that of men (mean = 3.93).

Most of our respondents belonged to the age category of 50–69 years (39.6%), followed by that of 30–49 years (37.8%). The age group of 18–29 was represented by 15.2% of the sample and that of over 70 by 7.4%. One-way ANOVA showed significant differences between age groups on residents' perceptions towards general UA benefits ($F = 3.232$, $p = 0.022 < 0.05$). The age category of 50–69 years appeared to have the highest perception (mean = 4.23) towards UA benefits, followed by that of 30–49 years (mean = 4.15) and the oldest (over 70 years, mean = 4.03). The age group of 18–29 years showed the lowest perception (mean = 3.92).

Table 3. Demographic characteristics and residents' perceptions of the general health benefits of UA.

		N	%	Perceptions on the General Health Benefits		
	Total	434	100	Mean	SD	t-Test ANOVA Test
Gender	Male	213	49.1	3.93	0.66	F = 22.750, $p = 0.000 < 0.05$
	Female	221	50.9	4.34	0.71	
Age	18–29	66	15.2	3.92	0.71	F = 3.232, $p = 0.022 < 0.05$
	30–49	164	37.8	4.15	0.70	
	50–69	172	39.6	4.23	0.73	
	≥70	32	7.4	4.03	0.69	
Residency length	≤1 year	42	9.7	4.07	0.64	F = 1.139, $p = 0.333 > 0.05$
	2–4 years	59	13.6	4.00	0.69	
	5–9 years	123	28.3	4.16	0.68	
	≥10 years	210	48.4	4.18	0.76	
Employment	Student	23	5.3	3.73	0.69	F = 2.439, $p = 0.046 < 0.05$
	Retired	180	41.5	4.19	0.72	
	Unemployed	14	3.2	3.92	0.61	
	White-collar workers	157	36.2	4.16	0.68	
	Blue-collar workers	60	13.8	4.11	0.78	
Family Income (per month)	<3000 RMB	41	9.4	3.73	0.63	F = 21.496, $p = 0.000 < 0.05$
	3000–4999 RMB	99	22.8	3.89	0.72	
	5000–7999 RMB	214	49.3	4.17	0.69	
	≥8000 RMB	80	18.4	4.59	0.56	
Living Status	Single	27	6.2	3.92	0.73	F = 0.034, $p = 0.125 > 0.05$
	With family	407	93.8	4.15	0.72	
Children Status	Live without children	233	53.7	4.12	0.67	F = 8.317, $p = 0.004 < 0.05$
	Live with children	201	46.3	4.16	0.77	
Rural Living Experience	≤1 year	291	67.1	4.09	0.74	F = 1.747, $p = 0.157 > 0.05$
	2–4 years	16	3.7	4.12	0.80	
	5–9 years	24	5.5	4.08	0.50	
	≥10 years	103	23.7	4.28	0.66	

In terms of work status, almost half of the respondents were retired (41.5%), whereas 36.2% of the respondents were white-collar workers, followed by 13.8% blue-collar workers, 5.3% of students, and 3.2% unemployed. The ANOVA test showed significant differences among employments on residents' perceptions towards general UA benefits ($F = 2.439$, $p = 0.046 < 0.05$). The mean perceptions of retired (mean = 4.19, $p = 0.004$), white-collar workers (mean = 4.16, $p = 0.008$), and blue-collar workers (mean = 4.11, $p = 0.032$) are higher than those of students (mean = 3.7391).

Almost half of the respondents lived in the communities for over 10 years, 28.3% lived 5–9 years, 13.6% lived 2–4 years, and 9.7% lived less than 1 year. The ANOVA test showed no significant differences among residency length on residents' perceptions towards general UA benefits ($F = 1.139$, $p = 0.333 > 0.05$).

In terms of family income level, 49.3% of the interviewed people's family income was 5000–7999 RMB per month, 22.8% was 3000–4999 RMB per month, 9.4% was less than 3000 RMB per month, and 18.4% was over 8000 RMB per month. One-way ANOVA showed significant differences among family income levels on residents' perceptions towards general UA benefits ($F = 21.496$, $p = 0.000$). The mean perceptions of those earning over 8000 RMB per month (mean = 4.59, $p = 0.000$) were higher than those earning 5000–7999 RMB per month (mean = 4.17, $p = 0.000$), 3000–4999 RMB per month (mean = 3.89, $p = 0.000$), and less than 3000 RMB per month (mean = 3.73, $p = 0.000$).

In terms of income resident status, 93.8% of the participants lived with family, and 6.2% lived without family. The *t*-test for independent samples showed that no significant differences between resident status on residents' perceptions towards general UA benefits ($F = 0.034$, $p = 0.125$).

More than half of the participants lived in rural areas for less than one year, with a ratio of 67.1%, and 23.7% lived more than 10 years. One-way ANOVA showed no significant differences among rural living experience on residents' perceptions towards general UA benefits ($F = 1.747$, $p = 0.157$).

Of the participants, 53.7% lived without children, and 46.3% lived with children. The *t*-test for independent samples showed significant differences between the status of children on residents' perceptions towards general UA benefits ($F = 8.317, p = 0.004$). The mean perceptions of the respondents with children (mean = 4.16) were higher than those without children (mean = 4.12).

The analysis results showed significant differences between gender groups and the status of children on old community residents' perceptions towards general UA benefits. Women's perceptions were higher than men's. The residents of old communities held a supportive attitude towards the whole UA with high scores. Compared with men, women had a higher evaluation of the health benefits of integrating UA into old communities. The mean perceptions of the respondents with children were higher than those without. Residents with children expressed that UA can enrich their children's extra-curricular life, educate their children in agriculture through urban agricultural activities, and promote parent-child relationship. There were also significant differences among age groups, employment, and family income levels. The age group of 50–69 years appeared to have the highest perceptions towards UA benefits, followed by that of 30–49 years, oldest (over 70 years), and 18–29 years. Retired residents appeared to have the highest perceptions, followed by white-collar workers, blue-collar workers, and students. Most of the residents aged 50–69 were retired. In the interview, most of them expressed their approval for the development of UA in the old communities. Some people thought that the development of cities can make their families eat their own vegetables and feel safe and assured. Some people mentioned that it can save physical strength and time without going to the market every day. Some people thought that the UA can provide for them, enable family outdoor activities, feel very fun, and allow them to know other people in the community. The mean perceptions of those earning over 8000 RMB per month were higher than those earning 5000–7999 RMB, 3000–4999 RMB, and less than 3000 RMB. High-income groups paid more attention to food safety, physical and mental health, and other issues.

5.2. Factors of the Perceptions towards UA Benefits

The reliability of residents' perception items of the health benefits of UA was 0.911 using Cronbach's alpha measure, which showed the good reliability of the whole data.

The mean ratings of the 12 items indicated that many residents felt that UA in old communities can increase physical activity (4.09), provide fresh food (4.08), be close to nature (4.06), invigorate health effectively (4.05), relieve pressure (4.04), be accessed conveniently (4.02), increase community biodiversity (4.00), enrich green space types and landscape (3.98), provide the experience of farming life (3.95), promote neighbourhood communication (3.75), enrich community life (3.65), and increase pleasure (3.46).

To extract the factors of residents' perceptions towards the UA benefits among 12 variables, factor analysis was conducted. Based on the factor analysis of a matrix of the 12 perception items, three factors were found that accounted for 81.854% of the total variance among all judgments. Factor loadings and communalities for the items are shown in Table 4. Based on an inspection of the factor loadings, the factors were labelled as follows: Factor 1, accounting for 34.018% of the total variance, was called 'environmental health benefits'; factor 2, accounting for 28.598%, was called 'physical and psychological health benefits'; factor 3, accounting for 19.238%, was called 'community health benefits'. Physical and mental health factors could explain the most results, which showed that residents paid more attention to the health benefits of UA. The health benefits of UA are mainly reflected in three aspects: Environment and ecosystem, physical and mental development of residents, and community development. According to the perceptions of UA health benefits by residents, it can be seen that the health benefits of UA were highly evaluated by residents, and residents do hold a positive attitude towards UA. Therefore, the UA development in the micro-transformation of old communities can improve the health of communities, such as enhancing the biodiversity of the community, improving the ecosystem service function, providing physical exercise opportunities for

residents, promoting the mental health of residents, promoting the sense of community, and promoting the sustainable development of the community.

Table 4. Factor analysis of the perception of UA benefits.

	Component			Mean	SD
	1	2	3		
Enrich Green Space Types and Landscape	0.941	0.113	0.110	3.98	0.74
Provide the Experience of Farming Life	0.903	0.131	0.068	3.95	0.74
Be Close to Nature	0.880	0.254	0.170	4.06	0.81
Be Accessed Conveniently	0.860	0.107	0.124	4.02	0.77
Increase Community Biodiversity	0.856	0.090	0.021	4.00	0.77
Provide Fresh Food	0.120	0.908	0.217	4.08	0.71
Invigorate Health Effectively	0.144	0.859	0.185	4.05	0.71
Increase Physical Activity	0.169	0.856	0.298	4.09	0.72
Relieve Pressure	0.160	0.833	0.215	4.04	0.76
Promote Neighbourhood Communication	0.101	0.316	0.892	3.75	0.95
Enrich Community Life	0.105	0.171	0.886	3.65	0.81
Increase Pleasure	0.155	0.446	0.672	3.46	1.09

Linear regression was conducted to look into the relationship between the general health benefit and extracted factors (Table 5). The results were as follows: General health benefit = $0.107 \times \text{factor 1}$ (environmental health benefits) + $0.626 \times \text{factor 2}$ (physical and psychological health benefits) + $0.207 \times \text{factor 3}$ (community health benefits). Physical and mental health factors could explain the most results, which showed that residents paid more attention to the health benefits of UA.

Table 5. Linear regression of the general health benefit and factors.

Model	Unstandardized Coefficients		Standardized Coefficients	<i>t</i>	Sig.
	B	Std. Error	Beta		
(Constant)	4.141	0.013		320.808	0.000
Environmental Health Benefits	0.107	0.013	0.149	8.286	0.000
Physical and Psychological Health Benefits	0.626	0.013	0.870	48.458	0.000
Community Health Benefits	0.207	0.013	0.288	16.044	0.000

5.3. Support and Participant Intention of UA in Old Communities

Of the respondents, 91.5% expressed support intention of UA in their communities, and 89.2% expressed the desire to participate in UA activities in their communities. The reason for not supporting the development of UA in the old community was that the later maintenance is troublesome. The next reason was that UA is not as beautiful as ornamental plants. Some people thought that UA may contaminate the community environment and feel uninteresting or useless. The main reason they do not want to participate in UA was that they do not have time to do that. Some residents thought they cannot, so they do not want to participate. Some people did not like to participate in agricultural activities.

As shown in Table 6, the majority of respondents stated that they were willing to spend 1–2 times per week (41.9%) and 1–2 h (45.6%) per time on UA activities, followed by those who intended to spend 1–2 times per month (29.0%) and 3–4 times per year (18.4%), less than 1 hour per time (24.7%)

and 2–4 h (19.1%). The ANOVA showed that the participation frequency and the time spent using UA did not differ significantly between demographic characteristics.

Table 6. Support and participant intention of UA in old communities.

	Items	N	%
Main Reason to not Support	Total	37	8.5
	May contaminate the community environment	8	1.8
	No ornamental plants look good	9	2.1
	Management is troublesome	17	3.9
	Feel uninteresting or useless	3	0.7
Main Reason to not Participate	Total	47	10.8
	Cannot plant	16	3.7
	Do not have time	27	6.2
	Do not like to participate in agricultural activities	4	0.9
Participate Frequency	Total	388	89.3
	1–2 times per week	182	41.9
	1–2 times per month	126	29.0
	3–4 times per year	80	18.4
Time Spent	<1 h	107	24.7
	1–2 h	198	45.6
	2–4 h	83	19.1

The results showed that almost all residents supported the development of UA in the old communities and expressed their willingness to participate in various activities of UA. Residents who did not support the development of UA were mainly worried about maintenance, planting effect, environmental pollution, and so on, and residents who did not want to participate expressed the idea of no time and no planting experience, among others. Therefore, in the actual development process, the first thing to solve is the maintenance problem. The two ways to address this are community-centralised management and residents' own management. Besides, lectures on UA knowledge can be held regularly, and experts can be hired to train residents in the cultivation and maintenance of vegetables and fruits. The mode of mutual help and mutual assistance with the village can be formed, and the old community residents can be trained by the farmers in the village, which not only solves the residents' concerns, but also promotes the employment of the rural population.

5.4. UA Forms and Types in Old Communities

Table 7 displays UA forms and types preferred by residents of old communities. In terms of UA location and forms, 56.9% of the respondents supported participation in planting, harvesting, and management activities in the community in the green space in front of the buildings (56.9%), followed by on the top of the roof (14.5%), central green space (11.8%), and balcony (6.2%).

More than half of the respondents (58.1%) were inclined towards the whole community sharing mode (co-plant, co-harvest, co-management) to develop UA activities in old communities. Of the respondents, 31.3% tended one piece of land or one box for each family to develop UA activities. In terms of planting arrangement, 39.2% of respondents chose all vegetables and fruits, 31.1% chose most vegetables and a small part of flowers, and 14.3% chose most flowers and a small part of vegetables.

Since the implementation of micro-transformation of old communities, governments at all levels have actively promoted community co-construction through various ways and channels to stimulate the enthusiasm of community residents to participate in community transformation and development [78]. The survey results showed that the community governance mode of co-construction and sharing has been accepted by community residents. UA involved in the micro-transformation of old communities is a good way to develop community co-construction and sharing.

Table 7. UA forms and types in old communities.

Items		N	%
Total		388	89.3
UA Location	Central green space	51	11.8
	The green space in front of the buildings	247	56.9
	On the top of the roof	63	14.5
	Balcony and others	27	6.2
Land Use Form	Whole community sharing mode (co-plant, co-harvest, co-management)	252	58.1
	One piece of land or one box for each family	136	31.3
Planting Form	All vegetables and fruits	170	39.2
	All flowers	21	4.8
	Most vegetables, a small part of flowers	135	31.1
	Most flowers, a small part of vegetables	62	14.3

5.5. Implications for UA Development in the Micro-Transformation of Old Communities

China's urban planning has changed from top-down to bottom-up in recent years and public participation has been emphasized. Community planning and building are also experiencing such changes, and co-construction and co-sharing have become the focus of community development. Through the analysis of the present situation of old communities in China, the renewal process of old communities in Guangzhou, the concept of micro-transformation of old communities, and the analysis of policies and models of micro-transformation of old communities in Guangzhou, as well as the analysis of UA features, we have proposed that it is feasible to integrate UA into the planning and design stage of community micro-transformation. Moreover, according to the previous analysis, UA, as a form of the community garden, has social, environmental, economic, and other functions, and has been accepted by residents in Western countries, Japan, and South Korea with good development experiences, which can make the community healthy and lead to sustainable development. However, it is only in its infancy in China. At present, there are several good cases [83] in a few cities such as Beijing Little Donkey Farm, Shanghai Initiative Garden [64], Baicao Garden, and the Children's Garden in Hunan Agricultural University [84]. Guangzhou is one of the pilot cities in China to carry out community micro-transformation. The transformation of community public open space is one of the key contents of micro-transformation. Many communities in Guangzhou have adopted the form of integrating art into public open space, and UA will also be a very good form of intervention.

Through the statistical analysis of UA support attitude, participation frequency, time spent, construction location, development style and form, and through interviews, when developing UA in old communities, the three development strategies are as follows: (1) Construction and management mode, (2) planning mode, and (3) promotion mode. The first mode entails promoting and forming the community construction and governance mode of co-construction and co-sharing. The integration of UA in the micro-transformation of old communities is conducive to co-construction and co-sharing mode. Therefore, the use of UA planning strategies in the renewal and micro-transformation of old communities is conducive to the implementation of the concept of 'co-creation'. 'Co-creation' means co-planning, co-construction, and co-sharing. The maintenance of old communities' UA in the later stage can adopt the combination of community-centralized maintenance and personal maintenance. The maintenance cost is not involved in this study. However, through interviews, most residents said that the maintenance cost should be borne by the government or the community. If the community adopts the centralized maintenance mode and the participating residents have to pay, then they are willing to bear less maintenance costs. Therefore, the amount of maintenance costs and payment methods should be further analysed and studied in combination with residents' income. The planning mode has changed from the top-down government-led mode to the bottom-up public participation mode. During the development of UA in old communities, public participation mode should be encouraged; community planners and designers should actively listen to the opinions of the residents

on UA and try to meet the needs of community residents so that they can act as planners and designers. Some communities, although not the communities mainly developing UA, have begun to explore this aspect, looking for capable people in the community and allowing them to participate in community planning. It can also enrich the spare time life of community residents, make the residents communicate with one another, and realize the concept of community 'co-creation'. Public participation in UA planning is essential. In the promotion mode, according to China's current situations, the community garden development foundation is relatively insufficient. The development of UA will also encounter many difficulties and problems, through the above analysis, we can see that residents who did not support the development of UA were mainly worried about plant selection, planting technology, and maintenance, and residents who did not want to participate expressed the idea of no planting experience. To better promote and develop UA in old communities, increase residents' interest, and enable them to gain something from their work, UA lectures on the introduction of excellent cases at home and abroad, and the functions of UA can be carried out regularly. The residents can then understand UA in the community and be introduced to the agricultural technologies related to UA from the aspects of seed selection, cultivation, maintenance, and harvest. Residents can get training and practice. Parent-child gardening, holiday farm, weekend picking, and other activities can be held on holidays and weekends.

In turn, the following three planning and design strategies are important: (1) Construction location, (2) design style, and (3) seasonal design. The spatial carrier of community UA is mainly the public green space in the community. According to the survey, most of the old community residents prefer to build UA on the public green space in front of the community residential buildings. A small number of residents tend to use the roof space and the central green space to develop community UA, and fewer residents think that they can use balcony space for development. Therefore, priority can be given to the construction of UA in front of residential buildings, which is more convenient for residents, especially for the elderly. In terms of design style, most of the residents support the planting of all vegetables and fruits in the UA of the community, whereas some support the planting of most vegetables and a small number of flowers. Other residents are worried about the ornamental effect of the community garden and think that the form of planting flowers and vegetables as a supplement is better. Therefore, the community UA should develop an edible and productive landscape mainly composed of vegetables and fruits, supplemented by ornamental flower planting at the entrance, central garden, and focal position to achieve the effect of combining production and ornaments. Most of the residents support the cultivation of all vegetables and fruits, or most of them, and a small number of ornamental plants. Concerning seasonal design, the main problem faced by the landscape type of production materials is the seasonal problem. To make full use of space and time, seasonal edible plants are designed in the green space of old communities.

6. Conclusions and Limitations

Nowadays, the place of community UA is no longer a simple food production land, but also a community exchange and interaction centre. It has a catalytic effect on community construction, and one of the advantages is that it directly contributes to the promotion of a healthy community.

This study explored the elements that healthy communities need to have and the feasibility of using UA as a community garden form in a large number of old community micro-transformation projects in China. We also focused on old community residents' perceptions of the health benefits of UA. A survey questionnaire was used to grasp residents' acceptance of UA and their preferences for planning and design forms of UA. A large number of micro-transformation projects are being carried out and will be carried out in Guangzhou and other cities in China. We proposed that more agricultural activities could be integrated into community open spaces, enrich the outdoor activities, and improve the physical and mental health of the residents. Through the intervention of UA, the community can form the co-construction and co-sharing mode, form the community cohesion, and make the community healthy and lead to sustainable development. This study did not quantitatively examine the

health benefits of UA. Future studies should employ a mix of medical experiments and questionnaires into the research.

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