

# Research on Jinhua City Sports Facilities Planning and Urban Spatial Structure Optimization

Wei Ningning<sup>1\*</sup>, Hu Lingfeng<sup>1</sup>, Fan Chengxiang<sup>1</sup><sup>1</sup>Zhejiang Normal University, College of Physical Education and Health Sciences, Zhejiang Jinhua, 321000DOI: <https://doi.org/10.36347/sjahss.2024.v12i08.001>

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**\*Corresponding author:** Wei Ningning

Zhejiang Normal University, College of Physical Education and Health Sciences, Zhejiang Jinhua, 321000

**Abstract****Original Research Article**

With the increasing awareness of national fitness, the planning and management of sports venues has become the key to improving the level of urban public services. Taking the POI data of sports venues in Jinhua City as the research object, this paper analyzes the spatial distribution characteristics of sports venues in Jinhua City, traffic accessibility and its relationship with housing prices. The study found that all the sports venues in Jinhua have good traffic accessibility, and there is a positive correlation with housing prices. Among them, the average housing prices in urban public sports venues and commercial fitness and leisure venues are higher. The research results provide a scientific basis for the planning and management of sports venues in Jinhua City, and are of great significance for promoting the balanced development of sports facilities and improving the quality of life of residents.

**Keywords:** Jinhua, Sports Venues, Spatial Distribution, Accessibility, Housing Prices, Urban Planning.

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## PREFACE

With the rapid development of economy and society and the continuous improvement of people's living standards, sports fitness has become an indispensable part of people's daily life. As an important carrier of national fitness, whether the layout of sports venues is reasonable is related to the enthusiasm of residents to participate in sports and thus affect the health status of residents [1]. China is in a new stage of building a socialist modern country in an all-round way. National fitness has risen to a national strategy. The construction and improvement of sports venues has become an important part of improving the level of public services [2]. As an important carrier of sports activities, the planning and layout of sports venues directly affect the quality and efficiency of sports public services, and then affect the physical and mental health and quality of life of residents [3]. As a city that has been listed on the list of 'livable cities in China' for many times, the construction and development level of sports facilities in Jinhua City and its relationship with transportation and housing prices reflect the status of regional sports undertakings and living environment to a certain extent.

Domestic and foreign scholars have made fruitful research results on the spatial layout of sports, leisure and fitness facilities. Many scholars have studied

the relationship between the distance range of citizens' living places and the allocation of sports facilities [4-6], and believe that the accessibility and availability of sports facilities play an important role in promoting residents' participation in physical exercise [7-8]. In addition, the exploratory spatial data analysis method is used to study the spatial pattern and spatial differentiation characteristics and influencing factors of sports venues [9], and the accessibility of venues [10]. It is considered that the spatial distribution of sports venues and facilities is the inevitable result of the coupling of economic, social, cultural and traffic factors at the regional scale, or the coupling of micro-location factors such as business circle distance, housing price level, housing density and traffic stations at the micro-scale of the point [11]. Therefore, the purpose of this study is to systematically analyze the distribution characteristics, accessibility and relationship with housing prices of sports venues in Jinhua City, so as to provide scientific basis for the planning and management of sports venues in Jinhua City and similar areas, promote the balanced development of sports facilities, improve the quality of life of residents, and provide reference for urban and rural planning and sports facilities layout.

## 1 DATA SOURCES AND RESEARCH METHODS

### 1.1 Data Source

Taking Jinhua City as the research area, Jinhua City has 2 districts, 3 counties, and 4 county-level cities, and 2 districts are Jindong District and Wucheng District; the three counties are Wuyi County, Pujiang County and Pan 'an County; the four county-level cities are Lanxi City, Yiwu City, Dongyang City and Yongkang City.

The data mainly come from the national sports venue statistical survey system, and through the acquisition of Baidu map POI interest points (some missing or doubtful data are proofread and supplemented according to GaoDe map). Among them, POI data is the 'point' data of commercial fitness and leisure places (Baidu map as of April 2023), including place name, address, type, latitude and longitude and other information. On the basis of the 'Classification of Sports and Related Industries (Trial)' formulated by the National Bureau of Statistics and the State General Administration of Sports, the collected sports facility information is coded and the address is analyzed. Through the conversion of network map coordinates and geographical coordinates, the geospatial location of sports facility or place information in the central urban area is obtained. By comparing the map of Jinhua City and correcting the wrong address information, the attribute database of sports venues is established. In addition, ArcGIS is used to vectorize the spatial elements such as county (city, district) administrative boundaries and traffic network in Jinhua City. The housing data of Jinhua city and county (city, district) are derived from the real estate home network platform-House guests, room world. Due to the limited data acquisition, the article mainly considers the distribution of sports venues in Jinhua City in April 2023.

### 1.2 Research Methods

#### 1.2.1 Buffer Analysis

Buffer analysis is used to evaluate the impact of a geographical element on the surrounding area. In the study, the buffer analysis method was used to evaluate the traffic accessibility of Jinhua sports venues. Firstly, a buffer zone of 1 km is created around the traffic artery to simulate the walking range of residents. On this basis, the proportion of buffer zones in which various sports venues are located is calculated to evaluate the traffic accessibility of sports venues [12].

#### 1.2.2 Kriging Interpolation Method

Kriging interpolation method is an interpolation method based on geostatistics, which is used to predict the value of spatial data at unknown points [13]. The Kriging interpolation method is used to analyze the spatial correlation between the distribution of sports venues and housing prices in Jinhua [14]. Firstly, the logarithmic transformation of housing price data is carried out, and the semi-variance function is selected to

describe the spatial correlation of housing price data. Then, the Kriging model is constructed to generate the spatial distribution map of housing price. Finally, the spatial correlation between the distribution map of housing price and the distribution map of sports venues is discussed.

## 2 RESULTS AND ANALYSIS

### 2.1 Type Division of Sports Venues

To explore the distribution characteristics of various sports venues, the research basis is to define the attributes of various sports venues. In other words, the classification standard of various sports facilities and venues is a prerequisite for further research. Based on the classification criteria and reference basis of sports venues, this paper focuses on the distribution characteristics of 5 types of sports venues in Jinhua county (city, district) (urban (county, district) public sports venues, street / township / community sports venues, enterprises and institutions sports venues (except schools), school sports venues, commercial fitness and leisure venues, hereinafter referred to as 5 types of sports venues). From the perspective of attributes and characteristics, all kinds of sports venues in Jinhua City are divided into five types of sports venues. By analyzing the spatial distribution of five types of sports venues, the distribution characteristics, shortcomings and deficiencies of various sports venues can be clearly presented, which has a more intuitive feedback for future urban and rural planning and construction.

### 2.2 Spatial Correlation Analysis

Although POI data is point data, behind each POI point is the corresponding geographical thing, which is the inevitable result of the coupling of various factors and elements. According to the distribution of sports venues in Jinhua City, the study mainly presents its relationship with the main highway traffic roads and residential real estate prices.

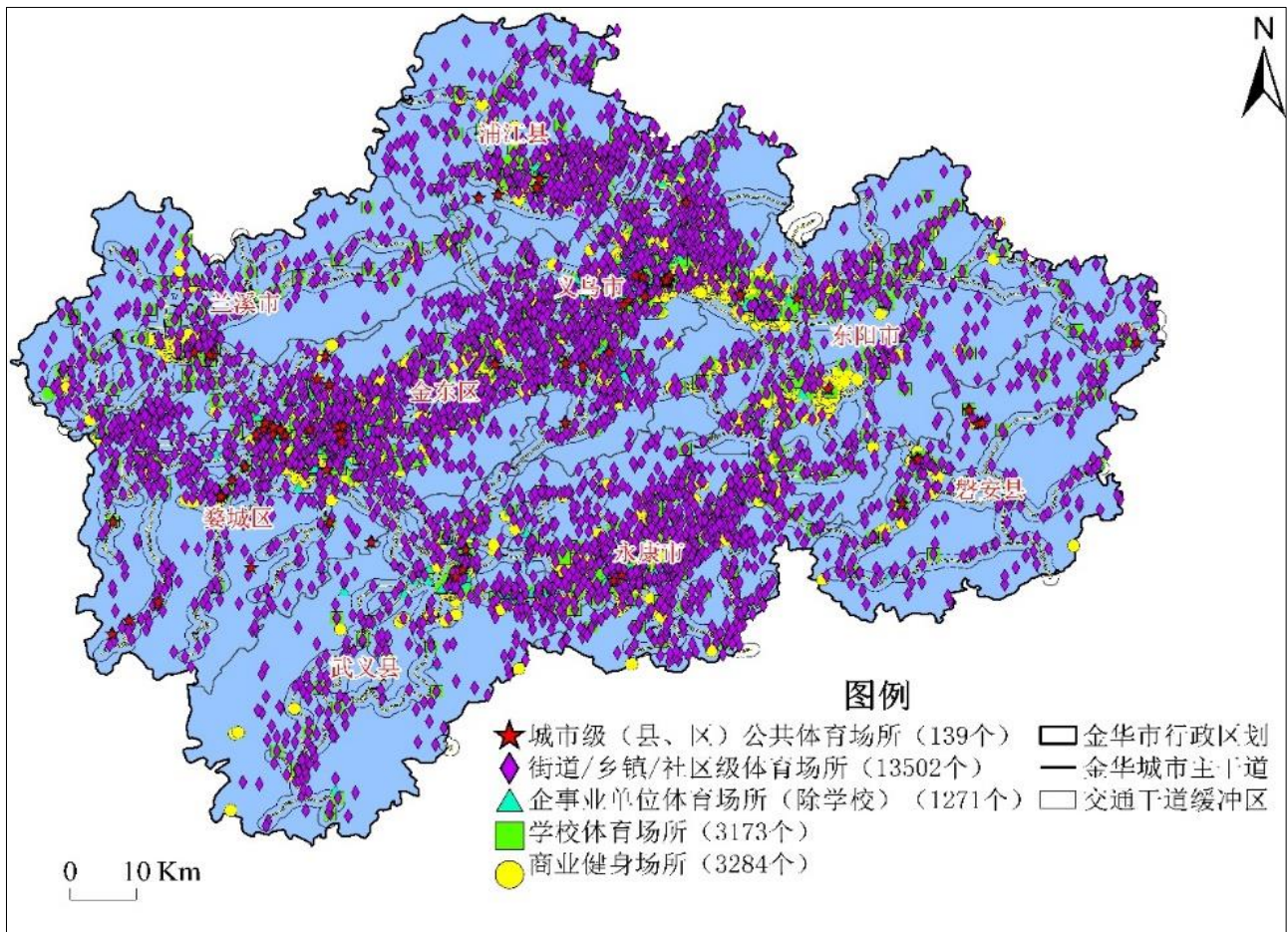
#### 2.2.1 Relationship with Traffic Trunk Lines

The spatial accessibility of public facilities refers to the convenience of people with corresponding needs to reach the target facilities from a certain location through a certain mode of transportation. The level of accessibility is an important reference factor for residents to choose fitness places, which directly affects the motivation of fitness participants. ArcGIS is used to vectorize the spatial elements such as administrative boundaries and traffic network of each county (city, district), and draw a buffer zone of 1km range according to the distribution of the main traffic arteries in the city (Figure 1). From the perspective of the proportion of various sports venues located in the 1km buffer area of the main traffic trunk line, 95.5 % of the public sports venues at the city level (county, district), 95.2 % of the commercial fitness and leisure venues, 91.7 % of the sports venues of enterprises and institutions, 89.4 % of the school sports venues, and 71.3 % of the street /

township / community sports venues. Overall, 79 % of the sports venues are located within the 1km buffer range of the main traffic trunk lines, and generally have good traffic accessibility. There are two reasons for the good traffic accessibility of sports venues and facilities: first, the construction site selection of various sports venues is more favored in areas with convenient transportation; second, the construction of sports venues to promote the further improvement and optimization of public transport system.

The inappropriate site selection of sports facilities will lead to the inability of sports public services to effectively benefit the people, and the dependence of different types of sports facilities on transportation facilities is different. In the layout and location of national fitness sports facilities, it is necessary to consider the setting of public transportation system, especially around bus stations, to build a network of venues and facilities suitable for walking fitness. At

the same time, it is also necessary to fully consider the combination of different travel modes of the masses to meet the diverse needs of fitness travel. The ' 14th Five-Year Plan ' for the development of comprehensive transportation in Jinhua City proposes to strengthen the connection between bus stations and rail transit, and accelerate the construction of infrastructure such as bus transfer hubs, public transport stations, and bus lanes. Comprehensively improve the urban slow traffic system, create high-quality walking and cycling space, and expand service functions such as leisure fitness and ecotourism. By 2025, the total mileage of the greenway will reach 1,000 kilometers, the ratio of 10 minutes to the bus station in the built-up village will be more than 70 %, and the proportion of public transport transformation will reach 95 %. At present, the urban and rural transportation infrastructure in Jinhua is developing rapidly, and the rail transit is basically completed and put into use, which enriches the way of residents ' fitness travel.



**Fig. 1: The relationship between the distribution of sports venues in Jinhua counties (cities, districts) and the main traffic arteries**

**2.2.2 Relationship with Residential Real Estate Prices**

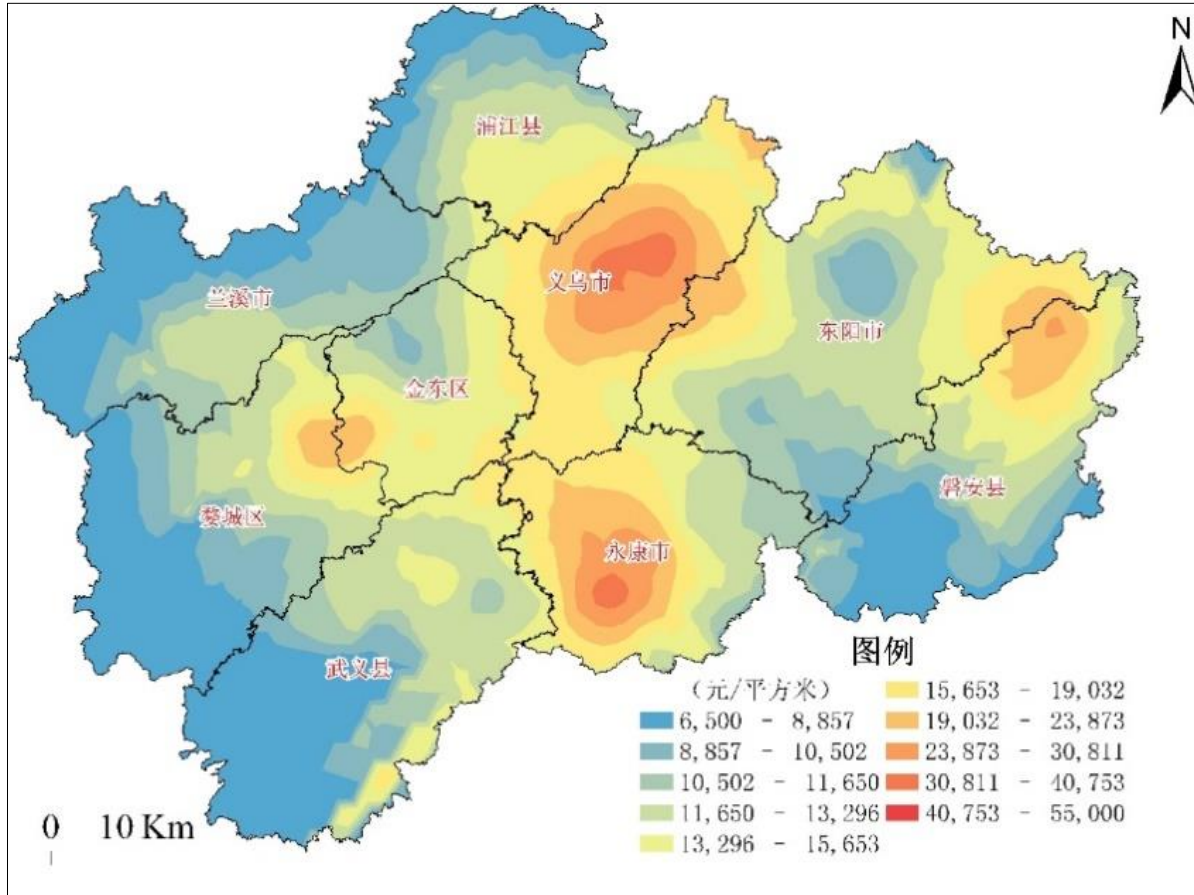
With the continuous improvement of people 's needs for a better life, the sports and fitness environment has gradually become an important factor in choosing the living environment. The price of residential real estate

reflects the recognition of the living environment in some areas. The study transforms the housing price data by log, and uses the quadratic function algorithm to avoid the interference of local variation on the global trend. The sample data shows a normal distribution, and the



variation shows spatial autocorrelation in each region. It can be seen that there is a certain positive correlation between the distribution of Jinhua sports venues and the spatial distribution of housing prices. Using ArcGIS to perform ordinary Kriging interpolation on the sample

data, the spatial distribution pattern of commercial housing prices in Jinhua City from April to May 2023 (Fig.2) and its relationship with the distribution of fitness places (Fig.3) were drawn.



**Fig. 2: The spatial distribution pattern of the price of commercial housing in Jinhua County (city, district)**

Statistics show that the average price of commercial housing in Jinhua counties (cities and districts) from June 2022 to May 2023 is relatively stable (Fig.4), which can eliminate the interference caused by special circumstances. According to recent data, the average house price of 9 counties (cities and districts) in Jinhua from April to May 2023 is 16584 yuan / m<sup>2</sup>. The average house price of each county (city and district) from April to May is from high to low: Yongkang City 26180 yuan / m<sup>2</sup>, Yiwu City 23982 yuan / m<sup>2</sup>, Wucheng District 17543 yuan / m<sup>2</sup>, Jindong District 16697 yuan / m<sup>2</sup>, Pujiang County 14312 yuan / m<sup>2</sup>, Dongyang City 12558 yuan / m<sup>2</sup>, Lanxi City 11963 yuan / m<sup>2</sup>, Wuyi County 11561 yuan / m<sup>2</sup>, Pan'an County 8000 yuan / m<sup>2</sup>. The average house price in the dense distribution area of sports venues within the city is 20517 yuan / m<sup>2</sup>, which is 1.23 times the average house price. Among them, the

average price of public sports venues in urban (county, district) areas is 25479 yuan / m<sup>2</sup>, the average price of commercial fitness and leisure venues is 24262 yuan / m<sup>2</sup>, the average price of street / township / community sports venues is 22693 yuan / m<sup>2</sup>, the average price of school places is 22186 yuan / m<sup>2</sup>, and the average price of enterprises and institutions (except schools) is 20797 yuan / m<sup>2</sup>. The real estate price and the density of sports venues show a synchronous increasing relationship. The average housing prices in urban (county, district) public sports venues and commercial fitness and leisure venues are generally higher than those in other areas. Urban (county, district) public sports venues play a positive role in driving land prices and promoting the development of the real estate industry, while the location of commercial fitness and leisure venues tends to be densely populated areas or high-quality residential areas.

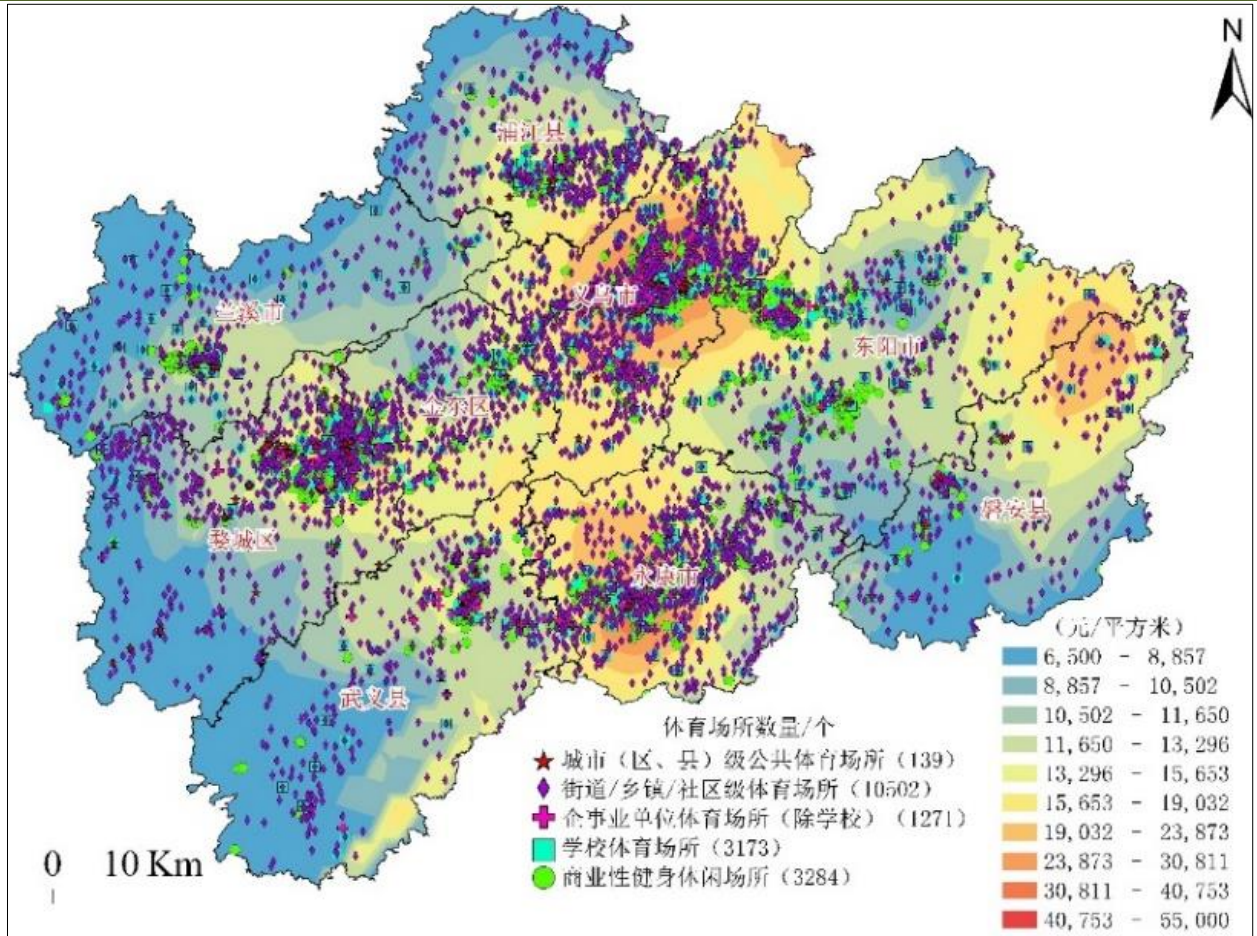


Fig. 3: The relationship between the distribution of fitness places and the price of commercial housing in Jinhua County

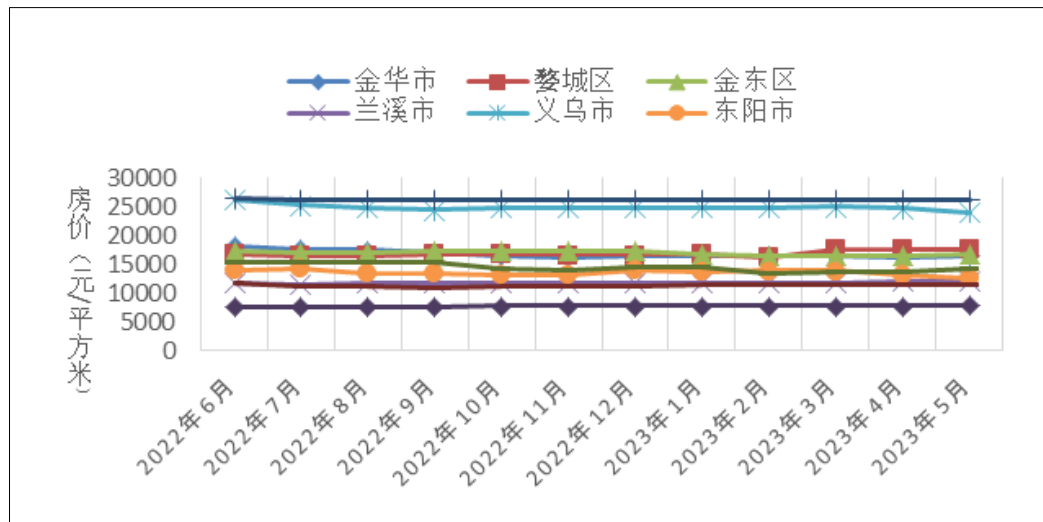


Figure 4: The average price trend of commercial housing in Jinhua city and county (city, district) from June 2022 to May 2023

### 3. CONCLUSION

Through the in-depth analysis of the distribution characteristics, accessibility and relationship with housing prices of sports venues in Jinhua, the following conclusions are drawn:

- 1) Distribution characteristics of sports venues: There are various types of sports venues in Jinhua, including urban public sports venues, street / township / community sports venues, enterprises and institutions sports venues, school sports venues and commercial fitness

and leisure venues. The spatial distribution of these places shows obvious regional differences. Urban public sports venues and commercial fitness and leisure venues are densely distributed in space, while the distribution of street / township / community sports venues is relatively small.

- 2) Traffic accessibility evaluation: Through the GIS buffer analysis method, it is found that 79 % of the sports venues in Jinhua City are located within the 1km buffer range of the main traffic trunk lines, showing good traffic accessibility. This shows that the construction of sports venues tends to be located in areas with convenient transportation. At the same time, the construction of sports venues has also promoted the improvement and optimization of the public transportation system.
- 3) The relationship between sports venues and housing prices: there is a positive correlation between the distribution of sports venues and housing prices in Jinhua. The housing prices in urban public sports venues and commercial fitness and leisure venues are generally higher than those in other areas. This shows that the improvement of sports facilities has a positive impact on improving the recognition of living environment and housing prices.

#### 4. SUGGESTIONS

Based on the research results, it is suggested that Jinhua City should fully consider the layout of sports venues in urban and rural planning and construction, such as the close relationship between housing prices and fitness and leisure venues. In particular, the construction of a network of venues and facilities suitable for walking and fitness around bus stops. At the same time, we should strengthen the construction of public transport system and improve the accessibility of sports venues to meet the diverse fitness needs of the masses.

With the rapid development of urban and rural transportation infrastructure in Jinhua City, the use of rail transit has provided residents with a richer way of fitness travel. It is expected that by 2025, Jinhua will further improve the urban slow traffic system and improve the quality of life and fitness environment of residents. The research provides a scientific basis for the planning and management of sports venues in Jinhua City, and is of great significance for promoting the balanced development of sports facilities and improving the quality of life of residents.

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