Middle and Primary Public School Districts Dataset in Nanjing Urban Area (2008, 2018)

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Abstract: Nanjing's main urban area consists of an inner urban area enclosed by the Ming Dynasty city wall and the surrounding areas, namely Xuanwu district, Gulou district, Qinhuai district, Jianye district, Yuhuatai district (northeast part), Jiangning district (northern part), and Qixia district (west side). Relying primarily on text-based data, specific descriptions from education resources of the compulsory public school district in Nanjing's main urban area, for 2008 and 2018, the author first confirmed the location of each school and the scope of its school district, and then sorted and compiled the dataset according to year (2008, 2018), by referring to the Open Street Map and Baidu Map with the support of ArcGIS software. The final dataset includes the following: (1) Raster data of public primary school locations (.tif); (2) School district distribution data of public primary schools, comprising their school district scope, school name, presence or absence of branch schools, the school area, and an admission rate of Nanjing Foreign Language School (.shp); (3) Raster data of public middle school locations (.tif); (4) School district distribution data of public middle schools, comprising their school district scope, school name, school area, and average score data for the senior high school entrance examination (.shp). The full dataset is archived in .tif, .shp formats and consists of 56 data files. The data size is 8.08 MB (compressed to 245 KB). The analysis and research results based on this dataset appeared in a *Geography Research* (Volume 38, issue 8) published in 2019.

Keywords: compulsory education resources; middle school and primary school; school district; spatial differences; Nanjing urban; Geography Research

1 Introduction

The development of education is related to the comprehensive national strength and international competitiveness of the country. Compulsory education, which is universal, obligatory, and cost-free, forms the basis for improving national quality and achieving social equity[1]. The Chinese government has committed to giving priority to a balanced system of education, as fairness in education has become an important issue in modern society[2]. However, under

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the constraints of the school district system policy, the unreasonable, unbalanced and unfair allocation of compulsory education resources has gradually become apparent, which presents a serious problem[3–4].

The spatial pattern of educational facilities and the fair allocation of educational resources have become significant issues for social geographers, both at home and abroad[5–7]. Currently, urban geographers mainly evaluate the balance and distribution of urban educational resources from the perspectives of space-time accessibility, the spatial distribution of educational resources, and school clustering and spatial pattern evolution, often with the help of GIS network analysis, the shortest time method, trend surface analysis in addition to other technologies[8–12]. Some scholars build equilibrium constraint models from variables, such as house prices, population, transportation, terrain, and the distance between schools, to analyze the availability of educational resources[13–17]. The National Education Department has issued a series of policies to promote the balanced development of educational resources. Whether or not the allocation of educational resources directly affects the development of education[18], especially under the "school district system" policy—although the phenomenon of "school selection by score" and "school selection by money" has waned—with the sharp rise in the mean price of "school district housing", the phenomenon of "school selection by housing" has greatly affected how fair the urban education resource allocation is in mainland China[19].

Optimizing the allocation of educational resources and realizing substantial fairness of this allocation is indispensable to, and plays a significant role in, the development of education[20]. As an important base of scientific research and education in China, Nanjing has amassed a wealth of educational culture, which may better capture the spatial configuration of educational resources in China's mega-cities. This dataset explores the spatial pattern and evolution of primary school and middle school locations and their school district division in Nanjing, which could provide a new perspective for the study of social problems such as class differentiation and residential space differentiation, thereby making a contribution to advancing the fair allocation of compulsory education resources in China, and alleviating the education gap between different socioeconomic classes in urban internal space.

2 Metadata of the Dataset

The metadata of the dataset[21] is summarized in Table 1. It includes full name, short name, authors, geographical region, calendar years, temporal resolution, spatial resolution, data format, data size, data files, data publisher, and data sharing policy, etc.

3 Data Source and Study Areas

3.1 Data Source

According to the education map and the list of schools on the website of the Education Bureau of Nanjing City and other administrative districts, data on the spatial distribution of the primary school and middle school educational resources, their school area, school district, and other basic education facilities in the main urban area of Nanjing in 2018 were obtained. The corresponding data in 2008 come from the data contained in the "Campus land planning of primary school and middle school in Nanjing (2006–2020)", "The statistical yearbook of Nanjing" and the 2008 edition of the map of Nanjing[23–25]. Data on Nanjing Foreign Language School's admission rate and the average score of middle school entrants were compiled from the Municipal Education Bureau as well as the soxue.com, and the data of campus area were compiled from soxue.com[26–28]. For some schools that could not be found, their respective area was digitized by using Google map satellite imagery and calculated in

ArcGIS software. The spatial database of educational facilities in Nanjing's primary schools

Table 1   Metadata summary of "School districts dataset of middle and primary public school in Nanjing urban area (2008, 2018)"

Items	Description
Dataset full name	School districts dataset of middle and primary public school in Nanjing urban area (2008, 2018)
Dataset short name	Middle&PrimarySchoolDistrict_Nanjing
Authors	Chen, Y. R. AAA-9864-2019, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, chenyanru18@mails.ucas.ac.cn
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	Song, W. X. N-1173-2018, Nanjing Institute of Geography and Limnology, Chinese Academy of Sciences, wxsong@niglas.ac.cn
Geographical region	Nanjing main urban area (31°57′10″N–32°09′43″N, 118°39′52″E–118°54′10″E)
Year	2008, 2018 Temporal resolution Year
Spatial resolution	30 m × 30 m Data format .tif, .shp
Data size	8.08 MB (before compression), 245 KB (after compression)
Data files	1. Location raster data (.tif) of public primary schools; 2. School district distribution data (.shp) of public primary schools; 3. Location raster data (.tif) of public middle schools; 4. School district distribution data of public middle schools (.shp)
Foundation	National Natural Science Foundation of China (41771184)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No. 11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	*Data* from the Global Change Research Data Publishing & Repository includes metadata, datasets (data products), and publications (in this case, in the *Journal of Global Change Data & Discovery*). *Data* sharing policy include: (1) *Data* are openly available and can be freely downloaded via the Internet; (2) End users are encouraged to use *Data* subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute *Data* subject to written permission from the GCdataPR Editorial Office and the issuance of a *Data* redistribution license; and (4) If *Data* are used to compile new datasets, the 'ten percent principal' should be followed such that *Data* records utilized should not surpass 10% of the new dataset contents, while sources should be noted in suitable places in the new dataset[22]
Communication and searchable system	DOI, DCI, CSCD, WDS/ISC, GEOSS, China GEOSS, Crossref

and middle schools were established using the Baidu Map tool, by collecting the longitude and latitude information of the schools' geographical position, and then arranging, compiling, and analyzing this collected data. As a result of the 2013 administrative territorial entity adjustment in Nanjing, this dataset has been revised for primary schools and middle schools in 2008 based on the latest (2018) administrative territorial entity's location.

3.2 Study Area

Nanjing is an important regional core city of the Yangtze River Delta integration, and also a typical representative cities in south-east China. With its long history, profound cultural accumulation, and significant modern urbanization features, Nanjing is apt to reflect the spatial configuration of educational resources in China's major cities. Therefore, as our study area, Nanjing has the significance of representativeness, universality, and diversity. Nanjing city is composed of 11 districts. The research scope of this dataset covers the main urban area of Nanjing, consisting of Xuanwu district, Gulou district, Qinhuai district, Jianye district, Yuhuatai district (northeastern part), Jiangning district (northern part) and Qixia district (western part).

3.3 Technical Route of Data Development

Technical Route was shown in Figure 1. Data on school distribution in the Nanjing's main urban area, in 2008 and 2018 respectively, were collected and collated. ArcGIS, concerning, for example, Open Street Map and Baidu Map, was used to obtain each school's location latitude and longitude, school area distribution, school location points for rasterizing, and

school area distribution boundaries for vector processing. First, according to the number, area, and grade of the schools, we evaluated the spatial and temporal differences in the scale and quality of compulsory education resources; then, we visualized the spatial distribution of primary schools and middle schools, in both 2008 and 2018, from which we analyzed the growth and change in the number structure of primary schools and middle schools from 2008 to 2018; based on those results, we next summarize the spatial distribution differences; finally, we compared the evolution characteristics of primary school and middle school districts from 2008 to 2018, and analyze the differences in the distribution.

Figure 1   Technical route

4 Results and Validation

4.1 Data Products

The dataset has four parts: (1) Raster data of public primary school locations (.tif); (2) School district distribution data of public primary schools, comprising their school district scope, school name, presence or absence of branch schools, the school area, and an admission rate of Nanjing Foreign Language School (.shp); (3) Raster data of public middle school locations (.tif); (4) School district distribution data of public middle schools, comprising their school district scope, school name, school area, and average score data for the senior high school entrance examination (.shp).

4.2 Data Results

According to the dataset compiled for Nanjing's primary schools and middle schools, from 2008 to 2018, the number of primary school districts in the study area decreased from 153 to 143, the total area of schools increased from 1.51 km^2 to 1.61 km^2, and the number of middle schools increased from 47 to 50, while the total area of school increased from 1.28 km^2 to 1.42 km^2 (Table 2). Despite a reduction in the number of primary schools, due to the merger of inner-city schools and the splitting and expansion of peripheral schools, the total area of schools has increased, the scale of primary education facilities has expanded, and the number of middle schools has increased by 3, but the total area of all schools has only increased by 0.14 km^2, with little change evident in their scale.

However, the development of primary education quality was relatively unbalanced. In terms of the admission rate of Nanjing Foreign Language School, only six primary schools exceeded the 10% threshold in 2008 and these were concentrated in the Gulou District. In 2018, only seven primary schools have an admission rate surpassed 10%: those same six from the Gulou District plus a new Beijing East Road Primary School in the Xuanwu District, and generally the high-quality schools are relatively concentrated geographically. Middle schools with the score above 550 decreased from 14 to 9, going from 2008 to 2008. Setting aside the difficulty of the examination paper, the schools with high scores have strong stability and the degree of educational quality aggregation is thus relatively balanced. Generally, the imbalance in the education quality of middle schools is less than that of primary schools[29].

It can be seen from Figure 2 that, for primary schools, the core-periphery spatial structure of their distribution in Nanjing is remarkable, showing a pattern expanding from the central urban area to the periphery. In 2008, the primary schools were mainly concentrated in the old urban areas within the Ming Dynasty city wall and their clustering is obvious, with the Gulou district accounted for 35.29%, while Qinhuai district and Xuanwu district respective-
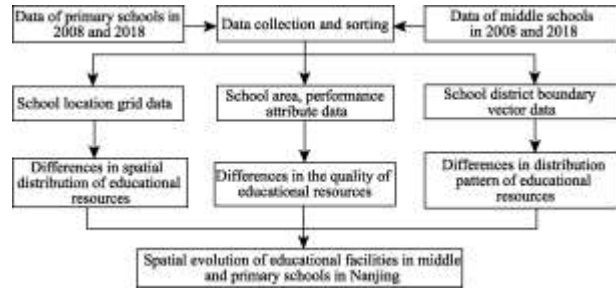
ly accounted for 28.10% and 16.34% of them. With the merger of inner-city primary schools and the splitting and expansion of peripheral primary schools, the spatial distribution of primary schools became more balanced in 2018, and the density of schools in Nanjing's peripheral areas increased. Yet, when compared with primary schools, the overall layout of middle schools is more balanced and stable. From 2008 to 2018, the layout of middle schools further expanded to the periphery, and the allocation rate of peripheral education resources likewise increased.

Table 2　Data characteristics of middle and primary schools in the main urban area of Nanjing

Item	2008		2018	
	Primary school	Middle school	Primary school	Middle school
Number	153	47	143	50
Total area (km^2)	1.51	1.28	1.61	1.42
High school entrance examination results (> 550); or Admission rate of Nanjing Foreign Language school (>10%)	Lhasa Road primary school (16.01); Langya Road primary school (14.05); Lixue primary school (12.24); Jinling Huiwen primary school (10.82); Fang-caoyuan primary school (10.24); Yincheng primary school (10.18)	Shuren middle school (624.2); Xincheng middle school (616.6); No.3 middle school (597.6); No.29 middle school (592.6); Kelihua middle school (589.7); Jinling Huiwen middle school (581.3); No.1 middle school (579.9); Zhonghua middle school(566.5); No.50 middle school (563.4); No.13 middle school (562.3); Bole middle school (558.2); Wenchang middle school of No.3 middle school (554.1); No.12 middle school (553.0); No.9 middle school (552.0)	Langya Road primary school (17.01); Lhasa Road primary school (16.25); Fang-caoyuan primary school (15.6); Bei-jing East Road primary school (13.2); Lixue primary school (12.5); Yincheng primary school (11.34); Jinling Huiwen primary school (10.07)	Shuren middle school (598.9); Huangshan Road, Xincheng middle school(577.5); No.3 middle school (577.0); No.29 middle school (576.8); Xincheng middle school (572.6); Kelihua middle school (572.4); Jiangnan middle school of the chemical plant (565.8); Jinling Huiwen middle school (561.7); No.1 middle school (559.5)

Note: The bracketed data in primary school is the admission rate of Nanjing foreign language school, and the bracketed data in middle school is the score of the senior high school entrance examination. Due to the reform of the Nanjing mid-term exam scores in 2014, to facilitate data comparison, the total scores of the 2008 and 2018 mid-term exams were standardized for 700 points.

The service scope in the inner city of the primary school district is smaller than that in the peripheral area, and the accessibility of the inner-city school district is higher. The middle school districts are larger in scale and wider in the scope of their services. From a spatial perspective, most of the residential areas are allocated to the nearest school district according to the principle of proximity to schools. However, a small number of residential areas are also allocated to school districts further away, resulting in reduced accessibility of students' getting to school and increased transportation costs. On the whole, the service range of the peripheral schools is wider than that of the inner-city schools, but the unbalanced distribution of educational resources has increased due to the outdated peripheral school facilities and the heavy load they shoulder. Changes in school-carrying pressures may, therefore, force the education authorities to adjust the boundaries of school districts, thus affecting the accessibility and quality of education in residential areas, which could have a profound impact on the allocation pattern of compulsory education[29].

5 Discussion and Conclusion

China's large population places a large demand on its educational resources. Based on ensuring basic educational resources, we should further ensure the effectiveness and efficiency of educational resources' allocation, aim to improve the balance of educational structure and distribution of educational resources and strive to achieve a fair and reasonable allocation of educational resources[30]. Using available data on the school district distribution and teaching

quality of primary and middle schools in Nanjing, this compiled dataset focused on analyzing the evolution characteristics of the spatial pattern of compulsory education in Nanjing, to provide new research materials and perspectives for studying the equitable allocation of urban compulsory education resources in China. The influencing factors of education inequality and the imbalanced allocation of educational resources are numerous and complicated. This article only visualizes the data of primary and middle school locations and school district ranges, expanded upon via a simple data description and spatial analysis. This was not com-

Figure 2   Distribution of middle schools and primary schools in the main urban areas of Nanjing

bined, however, with considerations of the relationships among traffic accessibility, time accessibility, opportunity availability, facility capacity allocation, education quality and allocation of teaching resources, or other external factors, such as government education policies, employment distribution, and changes in housing prices around each school. On its own, the dataset for Nanjing is insufficient, in that it cannot fully explain the issue of educational inequity, which many Chinese cities are facing. Nonetheless, this dataset does provide a data basis for further research, but additional data on internal and external factors that can affect the efficiency of educational resource allocation need to be collected and collated. The focus of subsequent research should be based on these data, to elucidate the mechanisms underpinning impacts as well as spatial effects behind the imbalance in the allocation of urban education resources; to strengthen the perspective of the social space allocation model of urban education resources in China, and to better understand the differentiation on the social class and living spaces caused by an unbalance in education resources. Social issues such as differentiation provide a reference point for the government to implement fair planning of space for educational facilities and to promote the high-quality and balanced development of compulsory education resources in Chinese cities.

Author Contributions

Song, W. X. was responsible for the overall design used for the development of the dataset; Tu, T. Q. collected and processed the data, such as the location of primary and middle schools and the boundaries of school districts; Chen, Y. R. sorted out the attribute data, analyzed the data, and wrote the data paper.

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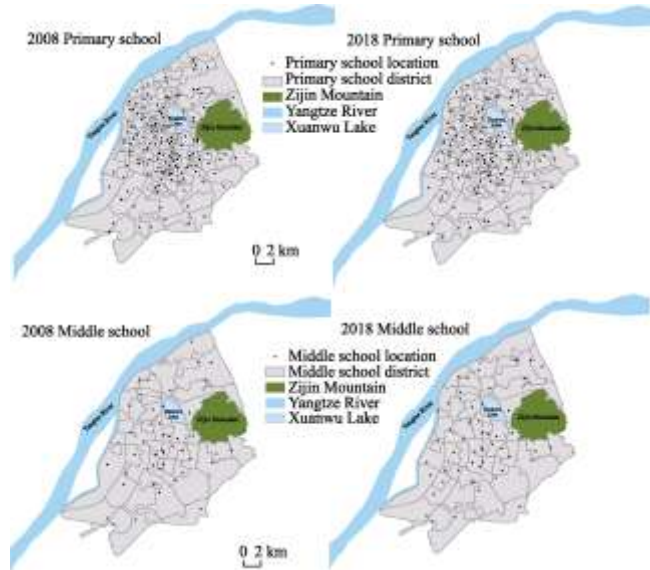
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